MEDICAL STATISTICS AND SANITARY PROVISIONS

A NEW WORLD OF SOCIAL RELATIONS AND THREATS TO HEALTH*

Eddy Houwaart

The nineteenth century witnessed a debate in several European countries on the question of preventing outbreaks of epidemic diseases – smallpox, cholera, typhus. There was gradually increasing recognition for the idea that the combat against diseases of this kind was a matter of universal interest: governments and citizens alike must share the concern for public hygiene. The measures proposed included the introduction of a programme for vaccination; improvement in supplies of drinking water and in diet; better housing, and a fight against the pollution of soil, water and air.

In some countries the groups of people advocating measures of this nature turned into a movement of sanitation reformers; doctors, engineers, teachers, lawyers and economists attempted to persuade the responsible politicians to introduce hygienic measures. One can first talk of *hygienists* in France and England in the period 1830-1850; they were those who fought for the establishment of permanent, scientific bodies for the advancement of public health. They also worked towards a health policy based on democratic principles and on initiatives taken by citizens themselves. The policy proposed here showed a marked difference, in form and method, from the authoritarian and paternalist strategy of health-care promotion which had been followed in most European countries, under the name of medical police, since the mid-eighteenth century.

From 1850 on, hygienists also made their appearance in the Netherlands. They wanted a new health policy directed towards placing public health care on a more professional and scientific footing, and over a period of approximately forty years they strove to bring greater "objectivity" into the realm of public

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health and sanitary reforms. They represented a clearly recognisable political-scientific current of thought. This current, and the way in which its proponents created a debate on the health conditions of *the population as a whole*, will constitute the subject of this article.

The emergence of the group of hygienists was not something that occurred overnight; it took place gradually, in a process of social differentiation within the ranks of medical practitioners as a whole. The group coming into being provided a context within which political-scientific thinking crystallized. In this way the formation of hygienist thinking, and of the social group of hygienists themselves, took place at the same time. If one looks more closely at the events of the period 1850-1890, and taking the previous period into consideration, then it soon becomes clear that the terms "public health" and "public hygiene" referred to a matter that at the time was still far from being established definitively. To be sure, the hygienists spoke of public hygiene and public health, but they still had to add content to these concepts. "Public health" and "public hygiene" had not yet become a reality when the hygienists appeared on the scene.

As the hygienists began to reveal themselves more clearly as a group, a new area of policy management and scientific research acquired a firmer shape – the area they described as "general conditions of health" or "the nation's health." This area included the topics which, in the first half of the nineteenth century, had played a different role from what had until then been customary. That which had occupied the centre-stage of policy and scientific interest before 1850, was now considered to be peripheral to the field of current concerns. Conversely subjects that up to then had barely been studied, were now given much greater attention.

Thus an epidemic in the early nineteenth century was viewed as the expression of disturbances in the balance of the natural environment, while after 1850 an epidemic was conceived as a sign of the poor management of society. Sick people themselves were defined and classified in a different manner, and the health conditions of the population was assessed according to new methods. Where an epidemic had once been fought with the aid of legal regulations and police supervision, after 1850 the greatest benefit was expected from collective measures such as the provision of drains and supplies of clean water. Whereas in the first half of the nineteenth century the doctor mainly restricted his attention in an epidemic to providing assistance and postmortems, the new standards decreed that his task was to coordinate the development of preventive techniques on the collective level, and the reorganisation of the social environment.[1]

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[1] See for example A. de Swaan, *In care of the state. Health care, education and welfare in Europa and the USA in the Modern Era* (Cambridge, 1988), chapter 4.

Thus public health and public hygiene were not a given fact; rather, they arose from an interaction between the efforts of hygienists to develop new research methods, and new structures of organization in health care. In this article we examine the arguments used by hygienists in launching the debate on public health. What were the social phenomena they translated into terms of medical knowledge and health policies? Following this, attention will be devoted to statistics: what did the hygienists understand by "statistics," what results did they expect from them, how was research into statistics developed, and why did this research meet with such success?

There are good reasons for allotting statistics a prominent place in the history of public hygiene. To begin with, the modernizing of state organization played a significant part in the development of statistics: the growth of statistical methods in the eighteenth and nineteenth centuries went hand in hand with the growth of government bureaucracies. The whole field of statistical studies was born in the eighteenth century with the express aim of describing a state, and of being able in time to make comparisons between states. For insight in practical policies, the eighteenth-century statisticians believed that landscape, economy, population, laws, public governmental bodies, finances and army must be described in the greatest possible detail. In this way it would be possible to verify the "happiness" or "unhappiness" of a state, the strength or weakness of a country, and its ruler's standing. Statistics could even reveal something of the cheerfulness or sadness of a state's subjects, and of their love or hate for its government. Statistical analysis would tell the sovereign what activities should be promoted for the benefit of the country.[2]

However, this description of statistics is not really applicable to those compiled and used in the nineteenth century, or to those we know today. Eighteenth- and early-nineteenth-century statistics were descriptive and qualitative, while those we are examining here were numerical and analytical, at least in intention. To summarise, one can posit that around 1800 statistics and mathematics cross-fertilized each other, resulting in the "mathematization" of statistical research. Since that time statistics have developed into "the art of combining observations," consisting of mathematical techniques for seeking the most likely combination. Statistics of population, mortality tables and statistical surveys of – for example – crime and suicide appeared in the first decades of the nineteenth century as the first results of this mathematization of statistics.

We find this development especially in France, Britain and Belgium; it achieved its peak in the work of L.A.J. Quetelet, the professor in mathematics and physics from Brussels. Quetelet not only integrated statistics with the

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[2] S. Stigler, *The history of statistics. The measurement of uncertainty before 1900* (Cambridge, 1986), pp. 24-25.

calculation of probability: statistics also developed into a determinist theory of society. Quetelet attributed the statistical regularity of social phenomena, expressed graphically in a normal or binomial distribution (a bell-shaped curve) to the existence of social laws with an underlying causal structure and thus to fixed cause-and-effect relations in society. Certain statistical results served as laws of society to which all individuals were subjected. In other words, Quetelet regarded the existence of statistical regularity as sufficient reason for extrapolating social theory from the eighteenth-century deterministic view of nature.

Although Quetelet's work had a strong influence over the emerging social sciences and social theory, "German" statistics – with their qualitative focus – continued to be used frequently, especially in Central Europe. In the course of the 1860s an alternative to "Queteletism" was actually derived from this "German" statistical tradition. Statistics discovered no social laws or causal structures; at most, it demonstrated a certain degree of regularity in social phenomena. A society was not constructed from separate, determined individuals as Quetelet believed, but was a community affording the conditions solely for individual actions. Such actions could not be analysed in any quantitative way.

Both traditions had a specific connection with what one might call the rationalization of governmental administration and the modernization or professionalization of the government machinery. Whatever the current of nineteenth-century statistics, the aim of each was more efficient government. Among other things this meant that the modern, rational state needed analyses of social life, as well as data on its own functioning. The results of this effort are well known. With increasing frequency the state relied on statistical calculations of social phenomena such as the number and nature of the crimes committed, the number of workers available, and mortality. In other words governments of the nineteenth century had an increasing need for "risk analyses," thus encouraging the mathematization of social existence. As we shall see, in the Netherlands this tendency revealed itself clearly in the area of public health, even though the use of statistical analyses began comparatively late.

A final reason for giving attention to statistics is that the field constitutes a specific technique for communication among scholarly researchers, between researchers and politicians, and between politicians and public. One can describe statistics as a standardized way of conveying data. It is precisely this which makes the history of statistics, in their political and social aspects, so interesting. With the development of numerical statistics in social-sciences research after 1830, the way in which the state and its citizens were beginning to talk to each other about society acquired structure, and communication between political centre and periphery was intensified. Statistics thus replaced old channels of communication with new ones, and above all they changed the relationship between state bodies, political and social groups. Merely by creating new

communication networks statistics contributed to the process of modernization. One can add here that while statistics were, it is true, expressly intended to provide an objective picture of political and social existence, in fact what was being expressed was an interpretation of social relations at a given moment in time. However numerical the presentation of statistical surveys might be, they nonetheless contained the norms and values of their compilers.

This article will first present a short survey of the period up to 1850, which was characterized by a slow accumulation of numerical data, a defective institutional basis, and an epidemiology unsuited for statistical calculations. Furthermore the Dutch state was relatively weak, and health care received barely any state direction. Consequently it must be admitted that an effective response to the cholera arriving in 1832 and 1848 was not forthcoming, either from the organization of health care or from scientific research. Subsequently certain doctors were brought in who, presenting themselves as hygienists, worked on the development of medical statistics in the context of a new theory of society. In this period epidemiology acquired a different theoretical structure and was mathematized.

After this we shall deal with medical statistics in the period 1850-1880. Finally, there will be a discussion of the role played by medical statistics in medicine and within the medical professions, and the significance of statistics for political thinking on the subject of public health. At the same time we shall be dealing briefly with the most important elements of the social organization of statistics.

Statistics in the Netherlands 1800-1850

Unlike Britain and France, in the first decades of the nineteenth century the Netherlands had only a limited number of publications providing numerical data on the functioning of the state, the economy and public health. This was due especially to the lack of any institutional basis for statistical research. A good example is the slow development of population statistics after 1800. As early as the end of the eighteenth century the Batavian reformers, who included a large number of physicians, were pleading for the institution of municipal population registers, uniform throughout the country, in which the births and deaths recorded would be differentiated according to age, civil condition, sex and occupation. With the aid of the knowledge this would provide about the extent and composition of the population, epidemic diseases could be investigated more effectively in the future. However, these attempts were unsuccessful. There was in fact a census, in 1795, the results being published a year later. Only in 1811, after the incorporation of the Kingdom of Holland into France, was there a

decision to introduce the concept of Civil Condition. All municipalities were obliged from then on to record the baptism, marriage and death of every inhabitant appearing in the registers of Civil Condition. However, there was nothing in the French regulation on the institution of statistics for births and deaths, and the causes of mortality.[3]

In the 1820s the central administration was still trying to develop statistics, although without much success.[4] The Minister for Home Affairs, Van Gobbelschroy, ordered the annual publication of a *Year Book* from 1826 on, which provided a number of statistics. The *Year Book*, the last edition of which appeared in 1849, was edited by R. Lobatto, adviser for Weights and Measures to the Ministery for Home Affairs. In the 1830s and 1840s Lobatto attempted to stimulate greater knowledge of "political arithmetic." The statistical chapter in each *Year Book* contained mainly Dutch demographic material plus a "Law of Mortality" for the city of Amsterdam prepared by Lobatto himself, drawn up in accordance with Quetelet's example. However, Lobatto was a square peg in the round hole of Dutch demographic science: before 1840 there was little evidence of mathematical population statistics in the Netherlands.[5]

The publication of census results was another attempt to develop population statistics. From 1829 on, a census was taken every ten years.[6] The result of this innovation was that, for the first time in the history of the Kingdom, data were made available for the name, age, birth place, sex, civil condition, religion and occupation of every inhabitant of the country. Yet even this attempt possessed little significance for medical research into epidemic diseases. Before 1850 the census results never appeared separately, although after 1831 some of them were printed in Lobatto's *Year Book*.[7] It was 1849 before such data were put on permanent record in the population registers that were made obligatory for every municipality in that year.

In addition, before 1850 the value of available medical statistics was only a limited one. The "Provincial Reports" of the Provincial Executive do, it is true, contain quantitative information on mortality, but in the absence of good

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[3] G.J. Heederik, *Van kasboekregister tot burgerlijke stand. Medisch-demografische aspecten van de registratie van huwelijken, geboorte en sterfte* (Meppel, 1973), p. 196 ff.

[4] Centraal Bureau voor de Statistiek, *Geschiedenis van de statistiek in het Koninkrijk der Nederlanden* (1902; photographic reprint, published under the auspices of the student association for socio-economic history, Amsterdam: Wageningen, 1974), pp. 3-4.

[5] R. Lobatto, *Jaarboekje, uitgegeven op last van Zijne Majesteit den Koning* ('s Gravenhage, 1826-1849). For a discussion of Lobatto's significance see I.H. Stamhuis, *'Cijfers en Aequaties' en 'Kennis der Staatskrachten'. Statistiek in Nederland in de negentiende eeuw* (Amsterdam, 1989), pp. 67-131.

[6] Koninklijk Besluit (Royal decree) 29 September 1828 (*Staatsblad* 57).

[7] Centraal Bureau voor de Statistiek (n. 4), *Geschiedenis van de statistiek*, p. 62.

population statistics there was little that could be done with them.[8] The numerical reports on mortality and disease published in the 1830s and 1840s by individual physicians, consisted of simple tables with absolute and relative figures intended to reflect the extent and severity of an epidemic and the numbers affected by it.[9] The Groningen doctor L. Ali Cohen published a *Statistical Medical Year Book* from 1847 on; apart from providing extensive information on "the whole range of medical life" in the Netherlands, this publication contained a great deal of demographic data borrowed from Lobatto.[10] Cohen was, however, unable to provide a systematic survey of demographic developments in the preceding years.

Various ministeries had already been recording their (numerical) data on police and prison matters, trade and shipping, and on insanity, when the development of population statistics was finally set in motion in 1848. In that year the Minister for Home Affairs, De Kempenaer, decided to add a Statistics Office to the Home Administration department of his ministery. M.M. von Baumhauer[11] was appointed as its head. The first population tables for the period 1840-1851 appeared in 1856; they included the records of births and deaths. In 1859 Von Baumhauer published a demographic survey for the period 1850-1859.[12] In the same year the range of governmental statistical tasks was extended with the establishment of the State Commission for Statistics and of the Provincial Offices for Statistics. Their most important task was the development of population statistics.[13]

In "political-economist" circles the increase in statistical activity and the publication of data were greeted with enthusiasm. J. de Bosch Kemper, Solicitor-General for the provincial law courts in North Holland and, after 1852, professor of Economics at Amsterdam, found the new legal constitution a good reason for making a start with the publication of the *Year Book of Politics and Political Economy* in 1849. This was to inform voters about political, social and economic

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[8] *Ibid.*, pp. 5-6.

[9] J.C. de Man, *Over de statistiek der maandelijksche sterfte, of over den invloed der jaargetijden op dezelve* (no pagination, no date [1848]).

[10] L. Ali Cohen, *Nieuwe Statistisch Geneeskundig Jaarboek(je)* (Gorinchem, 1847-1852).

[11] In 1857 Minister A.G.A. van Rappard made the senior official Von Baumhauer head of a new, eighth department of statistics. Up to 1876 Von Baumhauer was responsible for, among other things, the processing and publication of the results of the censuses taken every ten years.

[12] Bureau voor de Statistiek (n. 4), *Geschiedenis van de statistiek*, pp. 7-8.

[13] The National Committee and the Provincial Bureaux for Statistics were instituted by the Royal Decree of 5 November 1858 (*Staatsblad* 76). Unhappily, in 1861 the Second House decided to abandon the National Committee in order to effect economies. It would be the end of the nineteenth century before the creation of any sizeable new national institute for statistics. Centraal Bureau voor de Statistiek (n. 4), *Geschiedenis van de statistiek*, pp. 17-20.

questions so that they would be able to use their vote in a responsible manner. In 1857 the staff of this *Year Book* created the Association for Statistics, which stimulated interest in the subject and argued for the establishment of governmental statistical bodies.[14]

Scientific research into epidemics before 1850

The lack of reliable population statistics before 1850 was a hindrance to medical research into the origins of epidemics, investigations based on numerical data and the mathematical processing of such data. Yet the fact that, with a single exception, physicians produced no numerical data on the incidence of diseases and of mortality, derived primarily from the structure of existing theory on disease, and from current diagnostic procedures. The production of useful numerical data on the prevention of disease, and on causes of death, is only possible when diseases can be distinguished from one another on the basis of clear criteria. To be able to utilize an overall view of the number of pleurisy cases in a particular period, for example, there had to be certainty that all the cases were identical or, at all events, that they had been selected according to one and the same definition of "pleurisy." In other words, the use of figures in the field of medicine only made sense when there were valid units of disease: some of the things we know cannot be counted, and that which is counted we know to be identical. In order to reach a situation of this kind in medicine, one could divide diseases according to the organs which deviated, structurally, from the normal (pathological anatomy), or to the causes of the disease (poisonous material, a bacterium, a genetic defect).

Were such nosological units available in the Netherlands of the first half of the nineteenth century? In view of the current state of historical research, one needs to be wary in answering this question. The success of pathological anatomy in French medicine at the end of the eighteenth century is a topic that has been dealt with extensively in the literature, yet there has been barely any investigation of the significance of this success in the Netherlands before 1840.[15] However, if we take into consideration the classification of diseases and the surveys of causes of mortality that were utilized in various monographs and in the registers of Civil Condition kept by several municipalities, then Dutch

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[14] Stamhuis (n. 5), *Cijfers en Aequaties*, pp. 187-188. In 1892 a Central Committee for Statistics was created. In 1899 the Central Statistics Office (Central Bureau voor de Statistiek) came into being. Centraal Bureau voor de Statistiek (n. 4), *Geschiedenis van de statistiek*, pp. 23-45.

[15] For France, see for example M. Foucault, *The Birth of the Clinic. An archeology of medical perception* (New York, 1975).

medicine appears to have been predominantly one of symptoms. These were always described at length (nosology). Thus attention was given to skin colour, cramps in the stomach or limbs, pain, tongue coating, irregular or weak pulse and signs of tightness in the chest. There were descriptions of any fever present (acute, third- and fourth-day fevers), diarrhoea or spitting of blood. It was established whether the symptoms were chronic or acute. Patients' deaths were sometimes even followed by pathological-anatomical investigations.

No symptom was significant in itself alone; it only acquired significance in combination with other signs of disease and with the patient's biographical data. It was believed that a finite number of symptoms or signs of disease could be distinguished. However, there was no restriction on the number of possible combinations. This meant that, in medical practice, a doctor had to form the most detailed image possible of the patient, by accumulating all the (acknowledged) signs and by recording all relevant events in the patient's history. Subsequently the doctor had to find the combination of signs that best characterized the patient's condition. A special name was given to this combination – pleurisy, for example – whether or not this was supplemented by special features of the complaint and appropriate aspects of the patient's former history. In this way medical practice possessed a markedly particularist character. It was precisely this character that in many cases made it impossible to compile numerical surveys of diseases.[16]

However particularist medical practice may have been, from the eighteenth century on there had been attempts on the academic level to systematize the knowledge of symptoms or signs of disease. With the aim of introducing order into the world of symptoms, a system of disease categories called "classes" or "disease characters" was utilized. Thus the Nijmegen doctor A. Moll posited in his *Handbook on Medical Semiology*, published in 1826, that diseases could be divided into five classes: fevers, infections, bleeding, nervous disorders, and general illnesses accompanied by motor deficiencies.[17] A class was subdivided into disease characters, each of which represented a specific manifestation of the disease in question. Thus, symptoms of disease were divided according to a particular disease character according to similarities that could be established externally. For example, the disease character indicated whether there was fever accompanied by abdomenal symptoms, or fever with a disorder of the respira-

[16] In the case of smallpox and some other skin diseases, surveys of this kind were actually possible, since in general these sicknesses had already been described in detail.

[17] A. Moll, *Handboek tot de leer der teekenen van gezondheid en ziekte* 2 vols. (2nd impression; Amsterdam, 1826), vol. 2, sections 3 and F.

tory system.[18] Thus medical science classified diseases in the same way as a botanist identifies a plant according to genus and species.

Medical geography and historical pathology

This semiology was to provide a consistent basis not only for medical practice but also for investigations into the propogation of disease – medical geography. Towards the end of the eighteenth century this research had acquired a stable form as a scientific discipline. Medical geographers studied the distribution of all the combinations of disease symptoms appearing in the known world, and tried to explain the appearance of these combinations in terms of geographic and climatic factors.[19] Up to the 1840s observations of climatic and geographic conditions, supplemented by more or less explicit indications of people's living conditions, were held to be the best analytic instruments for investigations of epidemics.[20]

The development of medical geography reveals an unmistakable tendency towards an "ontologization" of the disease characters and classes that had been developed in the semiology. Already by the end of the eighteenth century, combinations of symptoms had become entities which could occur independently from the individual, and which like hostile spirits could take possession of the human body. The spectrum of diseases arising, divided according to disease

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[18] The classification of diseases had been recommended as early as the seventeenth century by the English doctor Thomas Sydenham, as the best method for deciding the causes of disease. In his view, investigation at the patient's bedside was the basis for medical practice: it was the doctor's task to describe the illness, in meticulous detail, just as the painter describes the object of his artistic attention. Inspired by Sydenham, F. Boissier De Sauvages published his *Nouvelles Classes des Maladies* in 1732; in this he distinguished between a great number of classes and types of disease. Later on this system of classification underwent a number of changes. Until the mid-nineteenth century the separation of diseases into classes and disease characters remained common practice. K. Dewhurst, *Dr. Thomas Sydenham (1624-1689), his life and original writings* (London, 1966), pp. 60-67; J. Bleker, "Die Idee einer historischen Entwicklung der Krankheiten des Menschengeslechts und ihre Bedeutung für die empirische Medizin des 19. Jahrhunderts," *Berichte zur Wissenschaftsgeschichte* 8, 1985, p. 197; J.C. Riley, "The medicine of the environment in eighteenth-century Germany," *Clio Medica* 18, 1983, pp. 167-168; L.G. Stevenson, "New diseases in the seventeenth century," *Bulletin of the History of Medicine* 39, 1965, p. 10 ff.

[19] E.S. Houwaart, *De Hygiënisten. Artsen, staat en volksgezondheid in Nederland 1840-1890* (Groningen, 1991), pp. 59-62.

[20] Well-known studies on this are to be found in H.F. Thijssen, *Geschiedkundige beschouwingen der ziekten in de Nederlanden, in verband met de gesteldheid des lands en de leefwijze der inwoneren* (Amsterdam, 1824); F.W. Bu[e]chner, *Verhandeling over den invloed der Noord-Hollandsche droogmakerijen na 1608 op de gezondheid der ingezetenen* (Utrecht, 1826); J. Banga, *Verhandeling over de epidemische ziekte, welke omstreeks 1826 in de noordelijke provinciën der Nederlanden geheerscht heeft* (Amsterdam, 1828).

characters, was dependent upon natural conditions just as the composition and appearance of members of the plant kingdom was dependent upon seasonal change and differences in climate. Diseases showed a characteristic development over time, with phases of growth, florescence and dying off.

This "natural history" was classed together with the concept of *constitutio* – a concept in use since the time of Hippocrates, but which in the seventeenth and eighteenth centuries had come to occupy central place in the theory of epidemics. The idea was that the constitutio rendered people more prone to certain diseases, and caused these diseases to develop either fast or slowly. The one with the greatest influence on public health was termed the *constitutio epidemica* (*stationaria*).[21] This constitutio could be "inflammatory" or "bilious" for years together. This abiding general disease character could influence the entire image of the diseases occurring, whether these were sporadic, endemic or epidemic in kind.

It was assumed that the *constitutio epidemica* derived from cosmic influences exercised by, for instance, the positions of heavenly bodies, and telluric influences stemming from certain processes, not yet understood, in the earth's interior. Cosmic influences could cause atmospheric changes, while telluric influences could contaminate the air with harmful vapours, also called *effluvia*, *emanations* or *miasmata*.[22] These vapours were created particularly in places where there was decaying organic material, such as marshes. The interplay of atmospheric and telluric changes could, within one human life-span, cause frequent alterations in the character of the constitutio epidemica; because of these alterations the spectrum of diseases could also acquire an entirely different aspect. There were periods in which fevers with dysentery or exanthema were prevalent, and periods in which intermittent fevers would predominate. The epidemic constitution could be so unfavourable that it developed into an epidemic of, for instance, typhoid fever.

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[21] Apart from this, a constitutio endemica and a constitutio annua were taken into account. The constitutio endemica included diseases typical of a particular part of the world. Thus scrofula was regarded as a typically place-linked illness. The constitutio annua was connected with seasonal changes. Croup and other acute respiratory diseases for example, appeared in epidemic form in cold weather with persistant north-easterly winds, while diarrhoea and other intestinal illnesses were linked with hot weather.

[22] The last-mentioned concept, the Greek noun "miasma", was the most often used after Sydenham's time. It stems from the verb *miaino*, meaning to soil, stain, defile. Since Greek antiquity it had been used in medical texts (especially under the influence of Hippocratic writings) to indicate the uncleanness, the defilement of the human environment. Use of the concepts "emanation", "effluvium" and "mephitic vapours" since the seventeenth century resulted from attempts to determine with greater exactitude the nature of the miasma, with the aid of the scientific method. H. ten Have, *Geneeskunde en filosofie. De invloed van Jeremy Bentham op het medische denken en handelen* (Lochem, 1983), p. 59.

Thus in early-nineteenth-century "epidemiological" research, diseases were not defined solely in an ontological manner. The origins of diseases and the changes they underwent were also regarded, with increasing frequency, as the result of a web of natural causes, large or small. This ontological, ecological and determinist thinking in epidemiology reached its peak in historical pathology, a form of epidemiology practiced a great deal in Germany especially, in the period 1820-1840. It was also often used in the Netherlands until the 1850s.[23]

According to historical pathology, the manifestation of diseases was linked with alterations in the natural world, or with particular events in human history. For further investigation of these links it was necessary to collect as many historical facts as possible. This would enable the historian-pathologists to devise an "historia morborum," by which means they hoped to explain the existence of particular diseases, and at the same time to highlight the relationship between the different diseases. With this in mind the diseases were classified into disease characters described variously as "gastro-bilious," "catarrhal" or "catarrhal-rheumatic to sthenic." In this way the "constitutio epidemica" for a particular year could be established. This constitutio was subsequently linked with the temperature and barometric readings and wind directions of the time.

This research went hand in hand with the analysis of the pathogenesis of the diseases under investigation. The essential features of the diseases could be discovered by systematic comparison of the ways in which those diseases were manifested. Diseases were investigated intensively for their differences from, and similarities to maladies described by doctors in previous years, and even in previous centuries. In the historian-pathologists' view, the repetition of such comparative historical research would produce continually improving definitions of diseases. These would provide the physician with an objective basis for his practice. An historical analysis of this kind also had to demonstrate the ways in which changes in the natural conditions of a country could alter the appearance and virulence of disease characters. Climatic changes could cause a particular disease character to occupy so much of the foreground that manifestations of disease that really belonged to another disease character could be completely "suppressed." Thus an epidemic of *febris intermittens* could cause a marked fall in the number of typhus cases.

Knowledge of the pathogenesis of diseases was thus, in historical pathology, based largely upon the history of diseases. The historian-pathologists believed that this history displayed objective regularities which would ultimately lead to certainty about the origins of diseases. They therefore also expected that in the long term they would be able to predict the origins, course and consequences of

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[23] Houwaart (n. 19), *Hygiënisten*, pp. 163-165.

epidemics with the same accuracy with which astronomers could calculate the timing of solar eclipses.[24]

The organization of the research

The doctors who published works on the subject nearly always posited particular measures for preventing diseases and epidemics. Even if there were sometimes assertions that, given the history of a particular disease, it nevertheless "far exceeds human powers to prevent (it)," generally speaking doctors believed that the results of historical pathology would enable humanity to protect itself against diseases which nature still held in store.[25] Thus there were proposals for protecting healthy areas of the country from the regions which could harbour epidemics, for example by planting crops in the polders in such a way that they would act as a protective barrier against marsh vapours. Further, spacious and airy houses were recommended, with their fronts turned away from harmful winds. There was a search for "general means of maintaining a good atmosphere" so that a barrier could be erected between healthy and unhealthy areas. For the areas dangerous to health, there were proposals for improving the system of drainage or for constructing dykes to prevent floods. In the event of epidemic diseases the emphasis thus lay on adaptation to the demands of nature rather than on changing nature, or removing the actual diseases themselves.

Proposals of this kind seldom served much purpose, especially since doctors' publications reached only a limited public. These works were seldom discussed outside the small elite circle of academically trained doctors, while the government devoted barely any attention to research into epidemic disease. A strengthening of the links between medical science and the government, which was implicit in the aims of medical geography and historical pathology, always foundered on the reefs of the defective organization of medical research into epidemic disease.

In the Netherlands, epidemic diseases were studied both by the provincial medical supervisory boards and by the various scientific associations in the country. These medical boards were instituted in 1818. Their task was the supervision of medical practice and the removal of medical examinations from the hands of doctors (the city and rural surgeons) who had not received a higher education. In addition to this they had to oversee the quality of poor relief, and

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[24] J. Bleker, "Die historische Pathologie, Nosologie und Epidemiologie im 19. Jahrhundert," *Medizinhistorisches Journal* 19, 1984, p. 34 ff.

[25] J. Vitringa Coulon, cited in Banga (n. 20), *Verhandeling*, pp. 115-116.

be on the alert when epidemics began.[26] Some of the scientific associations had been created, in the second half of the eighteenth century, with the aim of promoting social reforms and of collecting knowledge useful to the country.[27] The Dutch Society for the Sciences and the Utrecht Provincial Association for Arts and Sciences, for instance, belonged to this category. The others consisted of associations, or "reading clubs," for the improvement of medicine or surgery. These bodies came into existence after 1800, especially in places where there was a university or school of clinical studies.[28]

The provincial medical boards were obliged to compile a report each year on the diseases prevalent in their areas, and submit it to the Minister for Home Affairs. It was hoped that, in this way, the Minister would remain up-to-date on developments in public health and would be able to taken the required measures against threats to public health. Scientific research was now organized on a national basis, and the results of investigations were to be collected and analysed in the same place each year, for example at the annual meetings of the Minister with the chairmen of the provincial committees. This made it possible to exchange information, which was beneficial to the development of scientific research.

In practice however, nothing came of this plan. The board reports were never processed at the Ministry, and the conclusions deriving from research were never discussed in a countrywide gathering of committee chairmen. Furthermore, the results of research were never made public, thus robbing them of their potential role in scientific discussion. The greater part of the research was performed in "a fog of secrecy" as the Amsterdam doctor J. van Geuns wrote in 1842.[29] The lack of administrative openness may well have protected the administrative class from outside criticism, but it was a serious hindrance in the fight against epidemics, for example. The State Administration for Medicine (*Geneeskundig Staatsbestuur*) thus never fulfilled its original aim, i.e., to constitute the centre for scientific research into epidemics. In other words the progress of research was dependent (just as it had been before 1818) upon initiatives taken by the associations mentioned above, or by individual members of the supervisory boards.

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[26] Houwaart (n. 14), *Hygiënisten,* pp. 30, 32-33.

[27] W.W. Mijnhardt, *Tot Heil van 't Menschdom. Culturele genootschappen in Nederland, 1750-1815* (Amsterdam, 1988), p. 106 ff.

[28] M.J. van Lieburg, "Geneeskunde en medische professie in het genootschapswezen van Nederland in de eerste helft van de negentiende eeuw," *De Negentiende Eeuw* 7, 1983, *passim*.

[29] J. van Geuns, "Blik op onze tegenwoordige geneeskundige staatsregeling," *Bijdragen tot Geneeskundige Staatsregeling* 1, 1842, pp. 4-17, 57-73.

The riddle of cholera

Even though epidemiological practice was poorly organized, and the institutional links between medical world and government were weak, there was nevertheless continuity in the research into epidemic diseases, and the system of committees and associations was maintained with no great difficulty. Furthermore, before 1830 there was little reason for fundamental criticism since the pattern of mortality and morbidity was a relatively stable one. The spread and nature of diseases such as fevers, smallpox or syphilis were predictable, and changes in public health were gradual.[30]

This comparatively restful era came to an abrupt end in the 1830s and 1840s. There was an increase in the number of smallpox cases; the general physical condition of the population deteriorated in the wake of bad harvests and growing poverty, and in the 1840s there was an epidemic of typhus. However, it was the appearance of cholera in 1832 and 1848 that put the existing health-care provisions to a stringent test. It rapidly became clear that the system of health care for the poor, and governmenatl policies on health, were dramatically defective.

The cholera laid bare the gaps in health care and the impotence of medical science, and caused a great deal of disquiet within administrative and medical circles. The destabilizing effect of cholera derived not only from large numbers of victims; in the period 1832-1849 cholera deaths represented only a very low percentage of total mortality. At least equally important was the growing feeling of insecurity that came to dominate the people of those times, as a result of the cholera. Not only was Europe struck by a pandemic for the first time since 1720, the year of the last plague epidemic; cholera was a new and unknown disease. Cholera did not obey any familiar pattern in the way it spread, and therefore traditional means could not be used to limit the disease to a geographical area, or to a particular group among the population, that could be monitored. Cholera was a disease that aroused the fear of its possible dissemination among the entire population from the areas inhabited by the poor. Consequently right from the beginning the government, doctors and the middle classes regarded cholera as an extremely threatening disease.

At first the cholera was viewed as a contagious foreign disease. The aim of governmental measures was to prevent the infection from entering the country by refusing to allow infected shipping to enter Dutch waters. When attempts to keep the cholera outside the country's borders failed, additional efforts were

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[30] In 1826 the north of the country was smitten by a serious epidemic of fever (probably in combination with typhus and malaria). Although the number of victims was unusually large, and more doctors than normal were involved in combatting the results, this was a "familiar" disease that could be analysed by means of standard scientific knowledge.

made to prevent further dissemination of the disease by keeping the lower classes under supervision; disinfecting their dwellings, and isolating the victims. However, in the course of the 1840s it became obvious that cholera was not spread from person to person, but could appear in different places at the same time without any connection between these places having occurred. An increasing number of doctors in Europe therefore opposed quarantine regulations since, in their view, these had achieved nothing in preventing the spread of cholera. These "anticontagionists" or "miasmatists" concluded that cholera belonged among the noninfectious epidemic diseases – maladies originating in the constitutio epidemica. Only investigation of the earth's surface, chemical research into air and water, and analysis of climatic conditions could, together with investigation of living conditions, show the causes of cholera. Yet in the 1830s and 1840s the miasmatists also proved unable to demonstrate the validity of their theory. They could produce no convincing proof that environmental factors played any role in the origins of cholers.

Cholera thus reduced the ability to predict the place and time in which dangerous diseases would appear. It was consequently all the more alarming that doctors were seriously divided over the cholera question in the 1830s and 1840s. It was not merely a question of a simple difference of scientific opinion within academic circles. One could talk of a crisis in epidemiological theory that made itself felt far beyond university walls. The fact that epidemiology had no answer to the problem of cholera caused great uncertainty within the government, which promulgated quarantine regulations one minute, then allowed matters to follow their own course the next. The theoretical quandary created a great deal of doubt over the usefulness of the health regulations and health-care bodies in which doctors and middle classes alike had always put their faith. The crisis damaged the credibility of academic medicine, and more than ever the people of that time realised the limited ability of doctors to prevent or treat diseases.

In the course of the 1840s the medical profession therefore confronted grave problems. Doctors were unable to offer any explanation for cholera, and no clear guidelines for dealing with it. There was a drop in the public's faith in doctors, and research into epidemics appeared, in the discussion between contagionists and miasmatists, to have reached an impasse. Organization of research was inadequate, and there were barely any institutional links between medical profession and government.

The answer to this scientific and political crisis in health care emerged from the ranks of the younger generation of doctors such as J.Penn, A.H. Isräels, L.J. Egeling and L. Ali Cohen. They demanded "general regulations" directed towards improving hygiene in public life; they used statistics as a means of hauling medical science out of its morass, and to provide guidelines for the

creation of practical measures to be taken by doctors and government. We shall now examine these hygienists, their programme and their statistical work.

The hygienists

Hygienists were doctors who were fighting for a complete reform of health care and for standardization of research into public health. Moreover, they developed a new epistemology in medical science. During the course of the 1850s they made the prevention of epidemics and the improvement of public hygiene their profession. They were unique in this respect. Before 1850 the doctors who had demonstrated a concern for public hygiene had never intended to exchange their healing practice for full-time work in public hygiene. At first it was merely a question of several full-time hygienists in cities such as Amsterdam, The Hague, Utrecht and Groningen, but by 1860 the hygienists' group consisted of many doctors from all over the country who devoted a great deal of their time to questions of drains, drinking water facilities, housing and so on.

Why were so many doctors intensely involved with questions of public hygiene, some of them even to the extent of surrendering their physicians's practices in order to work in the field of preventive medicine? In most cases the hygienists had graduated from a faculty of medicine between 1835 and 1845. After receiving their doctorates in medicine they subsequently went to work with a medical service for the poor, run by a municipality or by one of the many church societies operating in the Netherlands. Working conditions for these doctors were unfavourable, to say the least. Their earnings were low, and their work-load was a heavy one in view of the great number of the poor requesting help from the bodies concerned. Time and again church societies economized on their expenditure, and the deacons often found fault with the doctors' work. Added to this was the fact that it took a long time to build up a successful private practice, and taxes were a heavy burden.

These doctors felt that they were undervalued. They had grown up and received their education in a spiritual climate characterized by a mixture of Dutch humanism, admiration for the classics, and ideals stemming from the Enlightenment. Such a mixture was typical of part of the Dutch culture of those days. The doctors we are discussing regarded themselves as representatives of western civilization, as standard bearers for a cultural tradition. Nevertheless they did not occupy a particularly high rung of the social ladder, and there were no signs that this situation would change. However, what caused the doctors most disquiet was their low status as medical practitioners. Medicines seldom had the desired effect; the programme (dating from 1800) for combatting smallpox had had little success; mortality was high and public health even

appeared to be deteriorating; quack medicine was widespread and the health insurances had a bad reputation. To compound the disaster, this situation deteriorated still further with the outbreak of a cholera epidemic in 1848. This epidemic, which claimed at least 22,000 victims from among a total population of 2,453,111 (not counting North Brabant and Limburg) made a deep impression on the young doctors, not least because they – and medical science – had been powerless in the event.

In short, these doctors were relatively well trained and were often from the middle classes, yet once they were working as doctors they appeared to be sinking down the social scale rather than making careers for themselves. Some of them could scarcely make a bare living, and their prospects were poor. Trust in the medical profession – already rather weak – declined still further with the cholera epidemic. The situation was frankly depressing.

Positivist ideals

At the end of the 1840s two events acted as catalysts in the emergence of the hygienists. The first was the changes in the constitution carried through in 1848 under the guidance of the liberal politician J.R.Thorbecke. It would be difficult to exaggerate the significance of these changes for the ensuing revival of political debate. With the direct elections to the Second Chamber, Provincial States and municipal councils; with the granting of active and passive voting rights to doctors; and through the new administrative openness, many doctors rapidly became involved in local and national politics. This new involvement derived partly from the intention to exact better working conditions, and partly from the desire to institute more radical changes in health care.

The second catalyst was provided by the political and idealogical changes taking place in neighbouring countries. As early as the 1820s and 1830s the French were debating the question of the most effective ways of investigating social life, and of imposing regulations aimed at promoting better health. French doctors such as Parent-Duchatelet, Lévy and Villermé were looking for chances to reform medical practice, to create a *practical* science of public hygiene. After the 1830 revolution these hygienists gave their support to the efforts of the liberal politician François Guizot to promote industrialization and economic progress.[31] Yet at the same time the hygienists hoped to see economic improvement linked with a policy of social justice: the former function of the sanitary police must be extended to social and sanitary reforms ("assainissement"). With

[31] W. Coleman, *Death is a social disease. Public Health and political economy in early industrial France* (Madison, 1982).

this end in view it was the government's task to create a centralized, national bureaucracy; with the help of this framework, professional hygienists would be able to follow the course of daily life, and would be able to record its events where these related to public health. In this way it was the task of the doctor-hygienist to act as intermediary between the enlightened state and the everyday world.

The medical practitioner's task was only to collect and arrange empirical facts. He was to limit him attention to the description of relations between verifiable quantities such as the number of sick people, the dissemination of disease, pathological-anatomical deviations, and the chemical composition of water, soil and air. The *numerical method* – the tabulation of data, expressed in figures, of such matters as age, sex, number of births and deaths, the height, weight and diet of patients, and the calculation of averages for each group of the population – would render developments in public health easier to survey and more manageable.[32]

Many English doctors had comparable views. They developed a statistical model in which cities and counties could be divided according to grades of health. William Farr wanted to use statistics as a socio-biological thermometer or "biometer" in the cause of a policy of social justice. He established that a mortality rate of seventeen per thousand inhabitants was, from a physiological point of view, unavoidable. However, a higher death rate could be expressed in grades of unhealthiness. In this way Farr developed a concrete scientific instrument which could be used to show local authorities the extent of bad health in their municipalities.[33]

In the beginning these developments passed unobserved by Dutch doctors. Events in the field of sanitary reforms abroad were only fully recognized by

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[32] E.H. Ackerknecht, "Hygiene in France, 1815-1848," *Bulletin of the History of Medicine* 22, 1948, p. 141; K.H. Metz, "Social thought and social statistics in the early nineteenth century. The case of sanitary statistics in England," *International Review of Social History* 39, 1984/II, pp. 264-265.

[33] In 1848 Farr's biometer was adopted as the starting point for the first Public Health Act in England, except that this legislation took the national average of 23 deaths per thousand of population as its physiological percentage, rather than a mortality of 17 per thousand. Where a local mortality rate was higher than this average, a national supervisory organ (the General Board of Health) sent inspectors to investigate the sanitary conditions of that locality. A local health committee could also be instituted, with the aim of improving drinking-water facilities, drains, or clearing away rubbish, and rubbish dumps. For the history of the English sanitary movement see J. Eyler, *Victorian social medicine. The ideas and methods of William Farr* (Baltimore, 1979); J. Eyler, "The conceptual origins of William Farr's epidemiology. Numerical methods and social thought in the 1830's," *Bulletin of the History of Medicine* 54, 1980, Suppl. pp. 1-21; R.A. Lewis, *Edwin Chadwick and the Public Health movement 1832-1854* (Cambridge, Mass., 1983). For the mutual influence between the English and the French sanitary movements see A.F. La Berge, "Edwin Chadwick and the French connection," *Bulletin of the History of Medicine* 62, 1988, pp. 23-41. For Jeremy Bentham's influence on Chadwick and Southwood Smith see Ten Have (n. 22), *Geneeskunde en filosofie.*

Dutch doctors after their confrères in Germany demanded a new health-care policy along French lines. Under the slogan "unity and liberty," radical-democrat groups in various German cities unleashed a revolution in which a countless number of doctors took part. For Rudolf Virchow, "der grosse Kampf der Kritik gegen die Autorität, der Naturwissenschaft gegen das Dogma" had at last begun.[34] For a year the journal *Die Medicinische Reform* published the views of doctors inclined towards reform, and printed reports on the many conferences and meetings in which medical reforms were discussed. In the journal and at the medical conferences there was an emphasis on the individual citizen's constitutional right to a healthy life. The tasks of a democratically elected government with respect to social misery and epidemic diseases must be described by doctors, independent and scientifically trained – the advocates for the poor, according to the rebellious doctors.[35]

Events in Germany in 1848 made a deep impression on Dutch doctors. As if shocked into awareness they began translating and discussing foreign socio-medical publications. The debate on epidemic diseases quite unmistakeably acquired the tone heard in England and France in the years preceding.

There were fundamental similarities between the social orientation of the Dutch hygienists and that of their colleagues abroad. They viewed society as an organism in which consensus constituted the foundations of the social order, and in which ideas determine social reality. They had the firm conviction that these ideas would henceforth be of the "positive"-scientific kind. The political and social changes of 1848 had ushered in a new era in which the "positive" sciences would offer solutions to social problems. According to the doctors these sciences were free of a priori knowledge, and were confined to the collection and classification of knowledge about nature and society. With descriptions (as concise as possible) of the observations made, in the long run regularity in the natural and social phenomena would be spotlighted, which would make it possible to predict these phenomena. In other words, the positive sciences enabled humanity to find for itself as good a position as possible within the environment, and to adapt to that environment.

A science of this kind, intimately linked with social living, together with the appropriate technology, would give birth to a just society in which the former contrasts between the social classes would be abandoned. The hygienists believed that when medicine was transformed into a positive science, useful to society, there would be an end to doctors' impotence in the face of epidemics. Furthermore, society could then be so ordered that each of its members would have an equal chance of good health, regardless of income.

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[34] E.H. Ackerknecht, *Rudolf Virchow. Arzt, Politiker, Anthropologe* (Stuttgart, 1957), p. 35.

[35] Ackerknecht (n. 34), *Virchow*, p. 111.

Insight into the social and biological regularities of human existence would consequently lead both to concrete improvement of living conditions and to solidarity between "workers" and "capitalists." Consensus would even be reached on the foundations of such a society if there could only be sufficient stimulus for the positive knowledge of that human existence. In 1850 the professor of pathology, anthropology and history at Leiden, C. Pruys van der Hoeven, expressed his ideas on the matter in the following way:

> Sooner or later it (i.e., science) will have to make itself social, it must become communistic, and the scientific aristocracy must democratize itself. Science, or rather the scientific element as a constituent of society, has to penetrate society, has to spread itself right through, it ought not to be the exclusive property of a special, privileged class; it has to be divided between all classes, and extend to every household in the State, it must increasingly improve and perfect materials, intellects and moral welfare.[36]

Many doctors entertained high hopes of medicine, if only this were applied to matters of public hygiene. The doctor could himself contribute to the restoration of the Dutch nation's former glory. As Voorlhelm Schneevoogt expressed it in *De Gids*: "Through its influence through its power, the Dutch people might once again attain its former greatness."[37] The necessary condition was that public hygiene must be studied in a scientific manner. A new science, known as *public health theory*, was to be founded upon the topographical method developed in the eighteenth century, and upon the science of social living: the science of statistics. This would be able to demonstrate, with scientific certainty, the fixed relationships between social and sanitary evils on one hand, and high mortality and epidemics on the other. Once topography had been used to make a close analysis of these evils, then health theory could provide the necessary technical solutions to problems of hygiene in society. Consequently medicine must be transformed into a technique for ensuring the health of the whole population – a technique which would enable the responsible authorities to realise an effective health-care policy.

The prospect of developing this new science induced a number of urban medical practitioners to collect, in systematic fashion, facts concerning "social conditions." They were very happy with the increase in statistical knowledge; they viewed the development of population statistics, especially, as a significant step forwards. It was now possible to make a systematic comparison of mortality figures with population size and determine the death rate for each year. Immediately following the establishment of the Association for Statistical Studies

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[36] C. Pruys van der Hoeven, *Anthropologisch Onderzoek*, 2 vols. (Leiden, 1851-1854), vol. 1, p. 208.

[37] G.E. Voorhelm Schneevoogt, "Hygiene," *De Gids* 25, 1861/I, pp. 554-555.

(*Vereeniging voor de statistiek*) the doctors Zeeman, Israëls, De Man and Ali Cohen became members, with the particular aim of keeping abreast of advances in statistical knowledge. A few years later they were joined by Van Cappelle, Egeling, Coronel and Blom Coster.[38] At the same time some doctors, Zeeman and Ali Cohen for example, participated intensively in the tasks undertaken by the governmental statistical bodies mentioned above, providing at least guidance.[39] These doctors, as hygienists, were embarking on a new career. In their view the health of the population at large – the general health conditions or public health – could only by improved under their guidance.

Thus, some twenty years after the hygienists had appeared on the scene in France and Britain, a group of doctors emerged in The Netherlands who wanted to make the field of public hygiene more professional. With this end in view they began to specialize in public-health theory. All these doctors were influenced by positivism with its principle of utility, its conception of society as an organism, and its orientation towards the collection and arrangement of facts. They were particularly anxious to see the establishment of medical-scientific bodies, which could provide government and citizens alike with a compass for finding a path through the complexities and uncertainties of this world of social evils and disease. Social progress was sited along the same continuum as their own social and political emancipation.

Queteletism and the significance of statistics

In order to map out the health conditions of the population, the hygienists established the numbers of deaths and cases of sickness per month or per year in, for instance, their own places of residence. Subsequently they expressed this as a percentage of the population at large. In this way the doctors confirmed, for years on end, the global mortality rate for their own municipalities. The results were staggering. Where in c. 1850 quantitative data for mortality were still seriously incomplete, only fifteen years later the hygienists had developed health statistics in which, for every municipality and province, annual mortality could be differentiated by cause of death.

In order to comprehend what the hygienists intended to do with these data we first have to understand precisely what "statistics" meant at that time. The discovery of numerical, mathematical statistics as a scientific instrument was

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[38] *Staatkundig en staathuishoudkundig Jaarboekje* 18, 1866, pp. V-X; Stamhuis (n. 5), *Cijfers en Aequaties*, pp. 198-201.

[39] Among others, Zeeman and H. van Cappelle were members of the National Committee, and Ali Cohen headed the Provincial Bureau for Statistics in Groningen.

without doubt largely the work of the Brussels professor of mathematics and physics L.A.J. Quetelet. He had summarized the past thirty years of scholarly discussion over social processes, and over the best way of recording them, in a social science based on statistical regularities and the deterministic interpretation of these. Quetelet defended the thesis that in every country there are fixed distributions of social and biological phenomena such as crime, suicide, body height, and mortality – distributions which he regarded as the laws of a social system. He demonstrated that the distribution of particular biological and other, non-biological characteristics of a population, could be reproduced in a diagram as a "normal distribution." In his view, it must be possible to develop a "physics of society" able to explain, and even predict, social change.In 1848 Quetelet compiled a list of "laws" which were to provide an explanation for the normal distribution of biological and social phenomena in each country.[40]

Quetelet's ideas gained a considerable reputation in Europe, not least because of the international conferences on statistics held under his auspices from 1873 on.[41] "Queteletism" also raised an echo in the Netherlands at the beginning of the 1850s. For instance, there were high hopes of social statistics within the Dutch Association for Statistical Studies:

> In order to track down the laws underlying social living, observations have to be made that will allow (us) to obtain what those (working) in Physics and Chemistry have gained through experience. There are no better means for this than statistics, which teaches us about society in

[40] For a discussion of Quetelet's work, see for example Th. Porter, *The rise of statistical thinking 1820-1900* (Princeton, 1986), pp. 46-47, 52, 62, 93-100, 163-165; Stamhuis (n. 5), *Cijfers en Aequaties*, pp. 43-44, 56-62; Z.G. Swijtink, "The objectification of observation: Measurement and statistical methods in the nineteenth century," in L. Krüger, L.J. Daston & M.J. Heidelberger (ed.), *The Probabilistic Revolution* (Cambridge, Mass.), p. 272. I. Hacking, *The Taming of Chance* (Cambridge, 1990), p. 106; Stigler (n. 2), *History of statistics*, p. 169 ff; R. Taton (ed.), *Histoire générale des sciences* vol. 3 pt. 1: *Le XIX^e siècle* (Paris 1964-1969), pp. 77-92; M. Gysel, "Adolphe Quetelet (1796-1874), la statistique et la biometrie de la croissance," *Orthodontie Française* 45, 1974, *passim*; L. Krüger, "The slow rise of Probabilism," in Krüger, Daston & Heidelberger, *The Probabilistic Revolution*, pp. 65, 75. For a critique of the determinist thinking in Queteletism, see Porter, *Statistical thinking*, pp. 64, 70, 164-192; Th. Porter, "Lawless Society: Social Science and the reinterpretation of statistics in Germany 1850-1880," in Krüger, Daston & Heidelberger, *The Probabilistic Revolution*, pp. 362-365.

[41] The conferences were held in Brussels (1853), Paris (1855), Vienna (1857), London (1860), Berlin (1863), Florence (1867), The Hague (1869), St. Petersburg (1872) and Budapest (1876). After 1878 international contacts were maintained in the context of the "International Demographic Conference (later called the "International Demographic and Hygienist Conference"), and after 1885 at gatherings of the "Institut International de Statistique."

> all its facets. The figures, the tables that give us our print of life in the society are for us what experiments are for these other sciences.[42]

Naturally, the hygienists were greatly impressed by this optimism. After all, for many years they had been preoccupied with biological phenomena among the population, and by the end of the 1840s they had reached the conclusion that "l'état sociale," or "social conditions," for which Quetelet had provided the contours, must be studied in order to arrive at an understanding of these phenomena. A statement often heard in circles connected with the Dutch Society for the Improvement of Medical Science (*Nederlandse Maatschappij tot bevordering der Geneeskunst*, hereafter NMG) was that the virtually certain probability inherent in statistical results would enable scientific demonstration to replace speculations about the links between disease and environment. With the aid of statistics, the complex "structure of causality" in the constitutio epidemica could be reduced to simple relationships between the human body and the milieu.[43] With the aid of these "sciences borrowed from sociology, without which a social physiology cannot be achieved" the numbers of deaths, demographic developments, and social conditions were being summarized in a relatively simple and convincing manner in just a few tables. [44]In 1852 the Groningen doctor L. Ali Cohen wrote:

> We know that life and human development are subject to fixed natural laws ... This dependence of the entire society upon higher laws is so great, and so certain, in human morality as much as in bodily condition, that (we) can determine in advance, more or less, how many people in a given country at a given time will sully their hands with the blood of their fellow beings, how many of them will be guilty of forgery and poisonings, to the extent that one can state the rules for births and deaths in that country and time. These fixed and certain phenomena in the life of human society are the necessary consequences of fixed and certain phenomena in nature, which lie as much outside human beings as inside them in so far as they result from their organization, their civilization, their prosperity, the institutions under which they live, and many other circumstances ...

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[42] H.A. Wijnne, "Statistische studiën over Nederland" (1856), quoted by I.H. Stamhuis, "The 'Vereeniging voor de Statistiek', 1857-1892," *Statistica Neerlandica* 39, 1985, pp. 74-75. For Quetelet's significance for medical statistics in the international context see G. Rosen, "Problems in the application of statistical analysis to questions of health: 1700-1880," *Bulletin of the History of Medicine* 29, 1955, pp. 27-45; E.H. Ackerknecht, "Statistics: contributions of Lambert Adolphe Quetelet and Louis René Villermé," *Bulletin of the History of Medicine* 26, 1952, pp. 317-329.

[43] In Metz's opinion, thinking on the subject of causality (probability), based on mathematical statistics, had exerted a far-reaching influence not only over theory on epidemic diseases, but over the whole field of medicine. He viewed medical statistics as an historical link between traditional medical knowledge based upon skill and experience, and the modern concept of scientific medicine based upon chemistry and microscopy. Metz, "Social Thought," p. 257.

[44] J. Penn, discussion of *Bijdragen tot de statistiek der sterfte in de gemeente Amsterdam* by E.C. Büchner, in *Nederlandsch Weekblad voor Geneeskundigen* 3, 1853, p. 53.

He continued that research showed "how surely birth and death, bodily temperature, natural death and suicide, mental capacities, insanity, crime and so on, depend upon the general laws to which our earth, and all that lives upon it, is subject."[45]

One good example of the influence of Queteletism on the hygienists is found in the "conscripts research." In 1852 Zeeman, Egeling and Ali Cohen, members of the influential NMG committee on statistics, decided to use Quetelet's "concept of probability" to investigate the reasons for the rejection (on physical grounds) of people eligible for military service, in order to improve knowledge of the etiology of disease.[46] In 1854 Zeeman published a report on health conditions among males of eighteen years or so in the province of North Holland. A few years later Ali Cohen and De Man also published reports, for the provinces of Groningen and Zeeland respectively.

For North Holland, Zeeman concluded that the number of conscripts who were "below standard" height, i.e., less than 1.57 metres tall, had shown a sharp increase between 1821 and 1850. In 1852 the number of those under the standard height had grown to more than twenty per cent of all conscripts. Another ten per cent of all conscripts were unfit for military service on other grounds such as physical defects and disease. According to Zeeman, "lack of nourishment, and malaria" were the cause of the deterioration in these young men's state of health.[47]

After 1855, research in the field of military statistics grew steadily in scope. A great many doctors throughout the country were involved in these enquiries, the result being an extensive investigation of conscripts at the national level during the period 1861-1865. The Ministery for War and various provincial authorities also collaborated in the investigation.[48] The significance of the project lay in the fact that a comparison of the data on body height, and on the health of potential recruits over a number of years and in different municipalities, would teach

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[45] L. Ali Cohen, "Over openbare gezondheidsregeling, de gevolgen van hare verwaarlozing en de noodzakelijkheid van hare invoering hier te lande," *Nieuw Practisch Tijdschrift voor de Geneeskunde in al haren omvang* N.S. 4, 1852, pp. 254-255.

[46] J. Zeeman, "Programma vanwege geneeskundige statistiek in Nederland," *Tijdschrift der Nederlandsche Maatschappij tot Bevordering der Geneeskunst* 1, 1850/I, pp. 161-169; *ibid.* 4, 1853/I, p. 52.

[47] J. Zeeman, "Verslag namens de commissie voor geneeskundige statistiek," *Tijdschrift der Nederlandsche Maatschappij tot Bevordering der Geneeskunst* 5, 1854/I, p. 71.

[48] For example, L.J. Egeling, "Een vlugtige blik op de vrijstelling van de nationale militie wegens Ligchaamsgebreken, verleend in de provincie Noord-Holland in de jaren 1841-1855," *Tijdschrift der Nederlandsche Maatschappij tot Bevordering der Geneeskunst* 7, 1856/I, pp. 206-226; J. Zeeman, "Rapport van de commissie voor statistiek over de lotelingen van de provincie Groningen van 1836-1861," *Nederlandsch Tijdschrift voor de Geneeskunde* 5, 1861, pp. 691-723.

something about the relations between the physical development of the population on the one hand, and health conditions and level of prosperity on the other. Further, it was instructive to compare the number of conscripts from a particular municipality with the number of male births in the place where these potential conscripts had been born in the year of their birth. As Zeeman stated in 1861: "We can then assume that the ratio between those registered for conscription and all those born in the same year of birth provides a gauge of the sum total of lethal influences to which the childhood years, especially, are vulnerable."[49] In other words, local conditions within a municipality were clearly more favourable where average body height of the conscripts born there was greater, or where the number of those registered for military service was closest to the number of those born in the relevant birth year.

Zeeman included general standards of nutrition in his investigations. With the help of a chart he showed that every time the price of rye went up, there was an increase one to two years after this in the number of potential conscripts rejected because of insufficient body height. He attributed the observable growth retardation to diminished consumption of grain products resulting from the rise in prices on the market.[50] Thus in his view there was not only a structural causal link between local environmental conditions and average body height; there was also a relationship between nutrition and body height. This could either strengthen or weaken the effects of topographical data.

The planning and execution of the conscripts research displayed many similarities to Quetelet's investigations carried out at the beginning of the 1840s.[51] In his quest for the truly average human being, of which every person actually existing was an imperfect replica, Quetelet compiled a table (an empirical one) of the distribution of body height among French conscripts. It bore a striking similarity to Gauss' error-curve, even though the number dropped sharply above the 1.57 metre mark.[52] This resemblance between the measurements and the error curve implied that the distribution was the result of an error. These soldiers were "designed" according to the uniform pattern of the average man. However, because of a number of irregularities in their development, they had failed to reach perfection in embodying this archetype of the

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[49] Zeeman (n. 48), "Rapport van de commissie," p. 691.

[50] *Ibid.*, p. 712 ff.

[51] Hacking (n. 40), *The Taming of Chance,* pp. 109-110; Porter (n. 40), *Statistical thinking,* pp. 106-108; Gysel (n. 40), "Adolphe Quetelet," pp. 650-653.

[52] Quetelet believed this to be the results of fraud. He calculated the number of men eligible for military service whose actual height had been reduced in the registration, in order to exempt them from service.

French soldier. The agreement between the distribution and the Gaussian curve could be explained in terms of Quetelet's customary distinction between the constant and the accidental causes of disturbance. The accidental causes were, for example, nutrition and climate – all rather variable in this imperfect world – which produced a series of small errors, independently of each other, which could cause increases or decreases in body height.

The NMG committee for statistics, like Quetelet, took as their starting point the idea that statistical investigation of conscripts' body height could reveal something about a real, thhough underlying, characteristic of the male population. The average height of conscripts was an aspect of the average man, and was determined by particular social or natural factors. Zeeman and other tried to give a name to some of these factors and to relate them to the percentage of those rejected, for instance. It was expected that the greater the number of observations made, the more trustworthy this percentage would be. Consequently this research must be extended to include all conscripts in the Netherlands, and even all the inhabitants of the country. Scientific opinion maintained that, if the conclusion of this investigation of young men was valid, why should they not be also hold good for young women, or even for the whole population?[53]

Community statistics: the biometer

Nevertheless, there is little relationship between Queteletism and the statistics finally developed by the hygienists. Although the hygienists never criticized Queteletism in so many words, we have to assume that they rejected Quetelet's deterministic interpretation of statistics. After 1865 the hygienists seldom referred to Quetelet and his ideas on social physics. Further, graphic forms of the kind Zeeman produced disappeared from the scene.

The basic principle of statistics developed by the hygienists in the 1850s was a simple one. It consisted of the calculation of ratios between deaths and the number of the living, or between cases of sickness and the number of healthy people. The most important datum was mortality per thousand of the population; according to the hygienists, this ratio could be compared to the value on a thermometer. This datum constituted the "objective reproduction" of health conditions in a particular municipality or area. Once the percentages of deaths had been established for a series of municipalities, then they could be compared

[53] In a number of ways, the conscripts research provided the model for the 1860s investigation into child labour. Houwaart (n. 19), *Hygiënisten,* pp. 275-277.

with each other. Once again, this provided the chance to develop a norm, and to establish deviations from that norm.

This method of working was adopted by W. Farr, already mentioned above; Quetelet had personally encouraged him to develop population statistics. His "biometer," by means of which the healthy and unhealthy districts could be distinguished from each other each year, had (as already stated above) a "normal value" of seventeen deaths per thousand of local population. Thus the Dutch hygienists' statistics had been organized in accordance with the example given by their English colleagues. Certainly, the hygienists learned the value of statistics from Quetelet, but the English taught them how to apply the "statistical investigation of social life" on a practical, day-to-day basis, without complicated mathematical calculations.[54]

The first statistical study in which the concepts behind the biometer were incorporated was carried out by the Hague doctor J.W.Schick. In 1851 Schick calculated, on the basis of data from the provincial archives, that in the period 1837-1848 the province of South Holland had experienced a mortality rate higher than the average for the rest of the Netherlands. Furthermore the urban mortality rate was much higher than the rate for the countryside. Schick provided a map in which he showed the mortality figures, in order to demonstrate that the "mortality ratio in particular places ... shows a very striking similarity," and that there were "circumstances that exert an influence over a particular area." He added a diagram with a summary of all the "natural and societal causes" of differences in deaths and incidence of disease.[55]

In 1852 Schick produced a report on research into health conditions in The Hague. He established that these had deteriorated considerably since the eighteenth century. With the aid of his own diagrammatic division, Schick was able to determine a number of factors responsible for this retrogression: inadequate drainage, noxious vapours from canals with their stagnant water and decaying detritus, overcrowding of dwellings, insufficient street cleaning, contaminated water supplies, and pollution of the soil with organic materials.[56]

Schick's first step was take the insights reached long before by foreign hygienists and apply them to the Dutch situation, thereby bringing a totally new perspective to the scientific research being carried out by Dutch hygienists. Just as the French hygienists defined the mortality pattern as "l'expression pathologi-

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[54] Otherwise Farr's influence extended no further than this. The Dutch hygienists did not adopt many of the improvements Farr had made in population statistics, such as calculation of life expectancy and population density.

[55] J.W. Schick, "Over de sterfteverhouding in verband tot hare oorzaken," *Tijdschrift der Nederlandsche Maatschappij tot Bevordering der Geneeskunst* 2, 1851/II, p. 37.

[56] J.W. Schick, *Over den gezondheidstoestand van de 's Gravenhage* ('s-Gravenhage, 1852).

que des localités," and just as the English sanitary reformers used the "health thermometer" to measure health conditions in residential places, Schick linked differences in mortality rates in the province with local living conditions. To this end he, like the foreign hygienists, had refashioned data from population statistics into "statistics of public hygiene." Wherever sewers, street cleaning and housing were neglected, the mortality rate showed a rising line.

Schick's "local" approach dominated the hygienists' epidemiology until well into the 1880s. From 1866 on, local studies of mortality were published for Amsterdam, Rotterdam, Groningen, Middelburg, Leeuwarden, Arnhem and a number of other places both large and small. In 1866 the NMG published the first map of mortality for the whole country in which the biometer played an important part.[57] In each case the authors wanted to demonstrate the close link between local sanitary conditions and the death rate. After 1876 the hygienist L.J. Egeling published the annual mortality figures for the fourteen larger municipalities; they appeared in the Dutch Journal of Medicine (*Nederlandsch Tijdschrift voor Geneeskunde*). Further, in 1880 Ali Cohen classified the largest cities according to the state of their "health thermometers."[58] Both concluded that, in the municipalities showing the highest mortality rates (and thus placed lowest in the tables) there was the least effort to combat the factors conducive to disease. In 1890, in a review of the results from the State Health Inspectorate (*Geneeskundig Staatstoezicht*), the hygienist G. van Overbeek de Meijer could still present the mortality figures for a large number of municipalities in order to show that mortality was closely linked with municipal health policies.[59]

The tables for mortality percentages were not simply an objective description of reality. Statistics brought order into reality, in a specific way. To begin with they used statistics to place all citizens on an equal footing. For the hygienist-doctor a death always possessed the same importance as every other. Whether the person dying of cholera was prosperous or poor, in either case the mortality figures had to be augmented by one. Moreover, use of the biometer had nothing to do with the proportion of those dying within the different social classes.

In the second place the hygienists regarded a mortality rate as a thermometer value expressing the consequences of the pathogenic local, environmental and living conditions. Figures for deaths and cases of disease were

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[57] *Sterfte-atlas van Nederland* [for 1841-1860]. Published by the Dutch Society for the Improvement of Medicine (Nederlandsche Maatschappij ter bevordering der Geneeskunst) (Amsterdam, 1866).

[58] "Rangorde van de voornaamste steden des lands, naar het algemene verhoudingscijfer van hare sterfte tot hare bevolking, in de jaren 1873 tot tot en met 1878," *Nederlandsch Tijdschrift voor Geneeskunde* 24, 1880/I, pp. 31-32.

[59] G. van Overbeek de Meijer, "Verbetering van den gezondheidstoestand in Nederland sinds 1865," *Nederlandsch Tijdschrift voor Geneeskunde* 34, 1890/I, pp. 34-39.

represented on maps together with data on geographic or sanitary conditions; it was thus possible to recognize at a glance the "sick" areas of the country or the city. A comparison with mortality figures from other places showed the extent to which the circumstances were healthy or otherwise.

In addition to their statistics the hygienists were concerned with a third, political order. Where a place was unhealthy, this showed that inadequate measures had been taken in preceding years to guarantee the quality of drinking water and hygiene of the soil and air. In other words, a locality with a relatively high mortality rate was also a place where there was insufficient use of insights taken from preventive medicine and of modern techniques of hygiene. Where a relatively high death rate was found, "civilization" had not yet penetrated the locality.

The manner in which the hygienists used statistics in the theory of epidemics created a completely new connection between disease, the causes of disease, the individual, the political and the social. Diseases were the expression of the poor management of the environment, a result of insufficient civilization and faulty policy making. Diseases were thus signs of poor leadership. This link, demonstrated statistically, between disease and policies in its turn created a particular relationship beteen disease and the individual, since the connection implied that citizens dying as a consequence of an epidemic must henceforth be regarded as victims of those obstructing "progress." Thus within the field of medical statistics there came to be a society constructed of local (moral) communities which offered citizens, more or less favourable conditions in which they could develop as valuable members of society. According to the hygienists this reality, brought to life by statistics and corresponding so closely to the image of society held by Dutch liberalism, had to be the central issue in the debate on the nation's health.

The utilitarian-scientific network of hygienists

It is plain that the hygienists chose statistics as their most important research method from the fact that, unlike existing research, statistics offered a clear perspective for a *practice* of improving health conditions. Statistics turned the theory of epidemics into a practical science of great social usefulness. For the hygienists the discussion that dragged on about whether or not cholera, typhus and other epidemic diseases were contagious, was irrelevant. In the period before this, such discussion had produced very few tangible results. Neither chemical experiments with bodily fluids, infected materials, air and water, nor botanical-microbiological investigations had produced convincing proof for the existence of contagions. Ideas on the nature of the infective agent, the life cycle

of the infection and the pathophysiological effects within the human body, had remained purely theoretical constructs. In other words, research into the gravest epidemic diseases had reached an impasse by c.1850.

As against this discussion, hygienists proposed "objective" measurements and empirical research. Statistics fitted the need for an inductive science of epidemics, in the same way as the natural sciences fulfilled the need for an inductive foundation for pathology and therapy. Just as the microscope and the pathological-anatomical atlas were the chief instruments for clinical medicine, statistics and medical topography performed the same function within the theory of epidemics.[60] Statistics offered the possibility of arguing from a scientific basis, at a time when the ultimate causes of epidemic diseases were obscure. Without devoting too much attention to the difficult search for concealed causes (for example the contagium) one could move directly to the study of correlations between a number of aspects of public hygiene, and the manifestation of epidemic diseases. The theory of epidemics had thus become a science which could at the same time lend itself to social and policy action, not only by doctors but also by politicians.

Nonetheless, the hygienists would never have been able to develop their statistical programme without a national network of medical practitioners. These doctors not only had to collect the necessary data and pass it on to national bodies; they also had to ensure that the tables, surveys and comparisons compiled by the same national bodies found their way down to the local level. The network within which statistics came to fruition, and could function as a technique, consisted of three elements: local medical associations, local organizations for the improvement of public hygiene, and governmental authorities.

The hygienists' organizational basis did not possess an hygienist character. Virtually all its activities derived from local medical associations which merged, in 1849, into the Dutch Society for the Improvement of Medical Science (the NMG). In the course of the gatherings of these associations and of national meetings of the NMG, doctors' professional interests and all manner of topics concerning medicine were discussed. The hygienists' activities were thus closely interwoven with those of the professional group as a whole. This poses the question of the way in which the hygienists' programme related to the interests of the professional group.

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[60] To a certain extent the claim of objectivity was justified. The biometer consisted of average mortality percentages calculated over a long period and on the basis of countless observations. Taking as one's starting point Gauss's postulate that the mathematical average of a set of observations is, a posteriori, the most probable value, one can therefore posit that possible errors of calculation made by individual researchers – for example, inaccuracies in demographic data – play no part of any consequence.

At the inception of the NMG there were six hundred members, approximately a third of all medical practitioners, half them doctors. The NMG consisted of autònomous local sections, obliged to maintain the status of the medical body by their scientific activities, by reorganizing medical aid and by ensuring that no colleague damaged the good name of the profession. A national administration, democratically elected, coordinated these activities and negotiated with the government on legislation able to guarantee good medical practice and the evolution of the Society.

The medical practitioners who, working full time or part time, played a significant role in the sphere of public hygiene, constituted no more than five per cent of all practitioners and somewhat more than eleven per cent of the NMG membership. Despite their small numbers these hygienists exercised a great influence within the NMG. They mostly belonged among the founders and administrators of the local associations, and many of them were members of the main managing body of the NMG in the period 1851-1870. Even the most important medical journals such as the Dutch Weekly Journal for Doctors (*Nederlandsch Weekblad voor Geneeskundigen*) and the Dutch Journal of Medicine (*Nederlandsch Tijdschrift voor Geneeskunde*) were largely in their hands. In fact, they were the only doctors able to review the whole field of medical legislation.

The fact that the hygienists were able to obtain such a prominent position within the professional group was connected with the important scientific role they were able to play by means of statistics. Initially there was a great difference between this group and the existing research organization. Prior to 1851 research was based on loose and informal contacts between medical practitioners scattered throughout the country. Investigations of epidemic diseases were characterized by an extremely slow accumulation of knowledge. After 1851 however, there was a network of practitioners exchanging statistical information and amalgamating quantitative data in series of tables. Several hygienists in this network were rapidly in a position to draw several general conclusions concerning the causes of epidemics. Matters in which the local investigator had once been predominant, were now carried off (in a manner of speaking) to the offices of the Ministry of Home Affairs, where it became possible to obtain a good overview and predict future developments. Further research could be carried out from this centre, research that revealed new facts. Thus on the basis of the organization of statistical research, the hygienists set in motion a cycle of accumulation of knowledge which produced an increase in the scale of the investigations. They possessed the knowledge of health conditions in every part of the country. The hygienists thereby became the most important suppliers of medical knowledge to the national government. Moreover, the new knowledge

gave the hygienists a stronger scientific position than was occupied by doctors following traditional paths.[61]

In the second place, statistical research brought about a national standardization in the definitions of the diseases under investigation, and of investigative procedures.[62] This standardization enabled the hygienists to give far greater importance to the theory of epidemics in the eyes of the government. It became possible to provide a great quantity of data in comparable figures, formulae, simple concepts and succinct texts. In this way the health conditions of a particular place could be compared at a glance with those in another locality; health conditions in the country as a whole became easier to survey than ever before. From that time the hygienists' analyses and arguments could give a new political perspective to the health of the country's citizens.

A second reason for the relatively great influence enjoyed by the hygienists was the significance attributed to the sanitary programme by many medical practitioners. The rather pessimistic view on the possibilities of medical therapy, the wide perspectives of hygiene, combined with liberal principles, found a sympathetic hearing among discontented doctors with urban practices. While there was little perceptible progress in the clinical field, and there were barely any plans to provide the Netherlands with modern hospitals, the sanitary programme in contrast promised an extension of doctors' social influence and a higher social status. The programme fitted the doctors' need for practical alternatives to a medical science that had, in the theoretical sense, reached an impasse.

Furthermore, the sanitary programme offered the NMG the opportunity for placing professional interests in a broader context. The programme would make it possible to improve the system of medical insurance, to further the fight against charlatans, and to link better medical training with national objectives. The programme linked professional interests with the general interest. Conversely, the programme permitted politicians to see that national policies were important to a modern professional group. It mobilized elements within national politics for the benefit of the professional group, by demonstrating that a new infrastructure for public health and a better organization of the professional

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[61] Political problems arising between the Nederlandsche Maatschappij ter bevordering der Geneeskunst and the Ministry for Home Affairs in the 1850s, certainly delayed the creation of this stronger scientific position, but could not prevent it. Houwaart (n. 19), *Hygiënisten*, pp. 210-212, 219-223.

[62] The hygienists entirely rejected the historical-pathological manner of classification. In their view, diseases were not independent entities able to flourish and die away with changes in the natural environment, but the result of disturbances in anatomical and physiological relationships in the human body itself. From the 1850s on, they classified most illnesses according to their anatomical localization, or the physiological disturbance taken to be the cause of the disease.

group were essential for economic and political modernization. In the period 1851-1870 the sanitary programme thus constituted the link between policy and medicine, between social theory and medical theory.

The sanitary programme

The second component of the utilitarian-scientific network consisted of local associations and committees for the promotion of public health. These organizations obtained the support of the citizenry and of municipal officials, provided the finance for scientific research and for activities connected with preventive medicine, and exerted political pressure. Local developments in policy, new sanitary initiatives, and research were coordinated by national committees and were analyzed in national medical and hygienist journals. This coordination made it possible for the same sanitary problem to be discussed in different cities, producing similar suggestions for alternatives. The sanitary programme gained a national character, and was a factor in the struggle to create a national renaissance.

The "Local Health Committees," as they were called, played a significant part in the sanitary programme; these bodies had been instituted in the course of the 1850s in a large number of cities and towns. The committees usually consisted of doctors, lawyers, and scientists in the fields of physics and chemistry. They investigated the conditions of school localities, took over the compilation of medical statistics, and made proposals to the mayor and civic councillors or aldermen (*burgemeester* and *wethouders*), for instance suggestions for building regulations, plans for improving supplies of drinking water, and the combatting of soil pollution.[63] The health committees themselves became the subject of parliamentary debates; in the period 1854-1856 parliament discussed a proposal for a private-member's bill on the institution of local health councils to advise local administrations. The proposed law included the idea that local administrations would be allowed to decide for themselves whether or not to institute health councils for their localities. However, where the choice was made to institute such a council, the law on health councils would become operative in the municipality concerned. The law outlined the council's tasks and powers. The intention was that the health councils, its members elected by the municipal administration, would initially concentrate on devising a form of supervision over

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[63] *Nederlandsch Weekblad voor Geneeskundigen* 5, 1855, pp. 40, 130 and 189; *Nederlandsch Weekblad voor Geneeskundigen* 4, 1854, pp. 196, 255 and 371; D. Bosschaert, *De stad Utrecht als medisch ontwikkelingsgebied* (Rotterdam, 1969), pp. 93-95; G.J. Mulder, "Voorstel tot oprigting eener gezondheidscommissie te Utrecht," *Nederlandsch Weekblad voor Geneeskundigen* 4, 1854, pp. 383-388.

building work and dwellings. After a certain time, this task could be extended, together with various others in the field of public hygiene.[64]

The parliamentary debate on this bill signified a turning point in national policy on public health. For the first time in many years matters of public health were widely debated, and for the first time the hygienists' activities and publications made themselves felt within national policy.[65] Thereafter the debate concerned not only doctors' training and their working conditions; there was also the question of how best to create an effective national policy for health, and which tasks belonged to the (local) government, especially those connected with public hygiene. After 1856 the policies of successive Ministers for Home Affairs always embraced new – albeit modest – measures for the promotion of public hygiene.[66]

The parliamentary debate produced no national measure for instituting health committees. Further, in a number of municipalities proposals for creating committees of this kind were rejected.[67] Yet in some municipalities the discussion on the health committees contributed to a better understanding of problems in public health. To an ever increasing extent, health committees drew public attention to the data on differences in mortality rates for municipalities or urban quarters. The high infant mortality rate in poor districts was particularly difficult

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[64] "Ontwerp van wet tot instelling van Plaatselijke Raden van voor Gezondheid, 3 october 1894," *Bijlagen Handelingen der Staten-Generaal* 1854-1855, II, pp. 69-72. The proposed legislation showed a close resemblance to the Public Health Act brought into force in England in 1848. The greatest difference from the English law was that no criteria were given for whether or not a municipal administration had to create a health council, and that a council of this kind was more restricted in its powers than its British counterpart. Otherwise, the Bill had been introduced at an opportune moment: in the previous year the King had requested the Royal Institute of Engineers (Koninklijk Instituut van Ingenieurs) to "make the ... housing of the working class a subject for regular consideration". In 1855 – the year in which Wintgens' Bill was given its plenary discussion – the K.I.V.I. published its report. The wretchedness of living conditions was confirmed, and it was established that legal regulation was necessary to bring about improvement in workers' housing and in their health conditions in general. H.W. Lintsen, *Ingenieurs in Nederland in de negentiende eeuw. Een streven naar erkenning en macht* ('s-Gravenhage, 1980), p. 318.

[65] *Handelingen der Staten-Generaal* (1855-1856), II, pp. 770-783, 784-791.

[66] Thus in 1856 Minister Simons sought to institute municipal health committees. Ministerial circular, 2 August 1856 in *Bijvoegsel Staatsblad* (1856), no. 167.

[67] In Groningen the municipal council twice rejected a request by the local doctors to establish a health committee. *Nederlandsch Weekblad voor Geneeskundigen* 5, 1855, p. 510. By 1860 there were health committees in Rotterdam, Schiedam, Utrecht, Delft, The Hague, Hellevoetsluis, Leiden, Middelburg, Vlaardingen, Vlissingen, IJsselstein, Zutphen and Gouda. In 1864 Amsterdam also acquired a health committee. L.J. Egeling, "Brieven van een geneesheer," *De Economist* 6, 1857, p. 244.

to ignore.[68] Although the local authorities of most municipalities had little desire for an active health policy, municipal administrations could no longer refuse to adopt a point of view on the matter. In the largest cities in the country genuine municipal building regulations had already come into force, and all kinds of sanitary questions connected with building regulations were being discussed within the municipalities. For example, one question evoking a good deal of discussion was the soil pollution that rendered certain places unfit for building sites. In addition, the number of dwellings sharing a privy, the maximum number of inhabitants sharing a drinking-water pump, and the filling in of canals, provided topics of increasingly frequent debate within municipal councils. In the second half of the 1850s small improvements were made in a great number of municipalities, in matters "concerning public cleanliness": an increase in the number of urinals, improvements in drainage by the provision of street gutters, the filling in of stretches of canal, or the regular freshening of the canal water. Further, police regulations on preparation of bread and on the sale of milk were in force in many places, while concessions on rubbish collection were rented out to private firms. Several municipalities even introduced their own cleansing services. Finally, there was an increase in the number of vaccinations after various municipalities had made the vaccination of school children obligatory, and clinics had been established where the children of the poor could be vaccinated free of charge.

In 1865 the hygienists' network gained real political recognition. In that year Minister Thorbecke replaced the health regulation of 1818 with four new laws, and introduced the State Health Inspectorate (*Geneeskundig Staatstoezicht*). Virtually every hygienist became a staff member of the Inspectorate; some hygienists worked as inspectors and were made full government officials, while others were unpaid officials on the health councils of the new body. Inspectors and members of the health councils brought unceasing pressure to bear on municipal and provincial administrations to improve public hygiene in their areas. The most important "action points" were solutions to the question of night-soil collection and disposal, and provision of good-quality drinking water. However, members of the State Health Inspectorate also repeatedly made it

[68] A splendid example of the use of the "health thermometer" described above can be found in a letter from the Local Medical Board in Rotterdam, dated 26 September 1856, to the Mayor and Aldermen (Burgemeester and Wethouders) of that city. Comparison of the Rotterdam mortality in 1855 with the rates for previous years showed that health conditions in the city had deteriorated. A comparison with mortality rates in other cities demonstrated clearly that Rotterdam was one of the unhealthiest cities in the Netherlands. The Board concluded its letter with the hope that "the municipal council would develop the unshakeable conviction that the evil must be confronted as quickly as possible." "Brief van de Plaatselijke Commissie van geneeskundig Toevoorzigt, aan H.H. Burgemeester en Wethouders, over de sterfte binnen Rotterdam," *Nederlandsch Weekblad voor Geneeskundigen* 7, 1856, pp. 443-451.

their business to oversee the establishment of new factories and workshops, working conditions in factories, public housing and the quality of foodstuffs. Moreover, they devoted a great deal of attention to combatting infectious or contagious diseases such as smallpox, cholera and typhus. Every hygienist was member of a health committee or of an association for the promotion of public health, which he had often established himself. Hygienists performed administrative functions in the associations for the promotion of vaccination, in bodies devoted to improving milk supplies, in corporations for building housing, and in many other organizations marching under the banner of the promotion of public and private hygiene. In the battle for the improvement of public hygiene, a number of hygienists were also members of the municipal council, or even full councillors in their own localities.

Bureaucratic institutions

The governmental bureaucracy consistuted the third component in the network within which medical statistics developed. This bureaucracy consisted of municipal and provincial authorities for the registration of (for example) causes of births and deaths, and of a statistics department in the Ministry for Home Affairs. Registration accorded with laws that obliged municipal governments to keep population registers, doctors to record cases of contagious diseases, citizens to surrender details of births, marriages, deaths, and age to their local administration. The manner of recording and registering deaths and causes of deaths was also subject to legal regulation. These government authorities and regulations formed the real basis of the hygienists' activities in the field of medical statistics. If the NMG had been indispensible for the professionalization of epidemiology, it was clear from the outset that the hygienists needed government support in order to carry out their research into matters of public health in a systematic manner. Consequently it is no wonder that from 1850 onwards, they fought incessently for the creation of a governmental machinery for dealing with population statistics. The hygienists thus succeeded in obtaining a legal footing for their classification of diseases and causes of death.

At the beginning of the 1850s the hygienists were barely able to compile trustworthy statistics for mortality and sickness. The registration of the necessary data was inadequate, and nothing was known about changes in the age structure of the population, or about migration. A reliable survey covering the previous ten years for purposes of comparison was not possible. The position changed with the appointment of Von Baumhauer as head of the Department of Statistics in the Ministry for Home Affairs. Von Baumhauer's publication of the *Statistical Year Book* from 1851 on, his publications on the censuses of 1849 and

1859, and the mortality tables he issued for the period 1840-1859, placed knowledge of population matters on a considerably higher level than before. One significant improvement was the introduction of municipal population registers on 1 January 1850. With these, the necessary data on changes in population structure were made available every month. This provided the doctors of the NMG with a basis for demanding, in addition, the recording of causes of death in the population registers. No legal provisions were made for this, either in the medical legislation of 1804 and 1818, or in the prescriptions on Civil Status and on population registers, the recording of causes of death thus being left to the discretion of local government bodies. Furthermore, the majority of people in the country died without benefit of medical aid, and there was thus great difficulty in creating a uniform registration of causes of death.

The NMG was obliged to fight a lengthy battle, on both local and national levels, for a reliable registration.[69] The doctors' organization were aiming at a position in which the submission of details for a death would be accompanied by a declaration on cause of death, issued by a medical practitioner. Finally, with the promulgation in 1865 of the Law on Medical Practice (*Staatsblad* 60), doctors were legally obliged to give a signed declaration at the death of a patient, in which the cause of death was also stated. There was a further step forward with the introduction of the Burial Law in 1869. Permission to bury a corpse could only be given after reception of the death certificate signed by the doctor who had treated the case, or after an official municipal autopsy. Moreover, the doctor or pathologist carrying out the autopsy had to try to establish the cause of death.[70] After this development, it was possible to compile local and national-level statistics for causes of death, in accordance with a classification developed in the 1850s by the NMG, partly after the example provided by W. Farr's schema.[71]

With the introduction of municipal population registers, and with the 1865 Law on Medical Practice and the 1869 Burial Law, the registration of deaths and sickness was, in principle, regulated. By 1870 there existed a bureaucratic machinery to guarantee the validity of the hygienists' statistical work and to ensure the cooperation of municipal authorities, citizenry and doctors in matters

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[69] W. Cappers, "Op zoek naar zekerheid omtrent de dood. Totstandkoming en uitvoering van de begrafeniswet van 1869 in Nederland," *Groniek* 20, 1987; Centraal Bureau voor de Statistiek (n. 4), *Geschiedenis van de statistiek*, p. 14.

[70] "Wet van 10 april 1869, houdende bepalingen betrekkelijk het begraven van lijken, de begraafplaatsen en de begrafenisregten," *Staatsblad* 65. In the event of violent death or of contagious diseases, a declaration as to cause of death was required. An autopsy was not obligatory.

[71] Houwaart (n. 19), *Hygiënisten*, pp. 180-182; M.G. Neurdenburg, *Doodsoorzaak en statistiek* (Amsterdam, 1929), p. 28.

of registration. Further, it was also through the hygienists's efforts that the government adopted the classification of diseases developed within the NMG. This not only provided the network of researchers into medical statistics with a permanent anchorage; at long last a permanent connection had been created between scientific discourse within the medical profession and governmental policies on public health.

Summary

This article describes the rise of a distinct group of medical practitioners in the Netherlands in the years 1840 to 1890. These doctors, who will be referred to as sanitary reformers or hygienists, participated in a network of organizations involved in public health research and worked for the improvement of public hygiene and for the introduction of preventive medical legislation. Their scientific publications aimed at demonstrating the connection between the health of the nation and the state of public health. Statistics became the most important research tool, because statistics, unlike existing methods of research, offered a clear perspective on a programme to improve the nation's health. Statistics transformed epidemiology into a practical science with great social benefit. It is argued that the statistical publications of the hygienists did not just present an objective description of reality. Statistics created a specific order within this reality. The rearrangement of social reality in statistics was connected with the dissemination of new medical theories and a new way of thinking about the nation's health, breaking with the paradigms of the old class-ridden society and fitting in with the liberal-democratic state that was created in 1848.

University of Limburg
Department of History
P.O. Box 616
6200 MD Maastricht
The Netherlands