

perhaps most important, the proportions of general practitioners, hospital doctors and community doctors who are aware that the unit is a centre for all communications relating to infectious diseases and their control.

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typhoid outbreak in 1897 (Borough of Maidstone 1898) was caused by contamination of the local reservoir at Barming by sewage-polluted water from the nearby catchment area at East Farleigh.

However, the spread of communicable disease began to change from local to national and then international by the turn of the century, and particularly after World War I, as a result of the widespread national and international distribution of foodstuffs and other materials and the greatly increased movement of population. The foodborne outbreak of typhoid fever in Aberdeen in 1964 (Aberdeen Typhoid Outbreak 1964) was caused by the contamination of canned corned beef in South America, where sewage-polluted river water had been used in the cooling process of the cans; it was one of a series of such episodes which had been taking place since at least as early as 1929 (Anderson & Hobbs 1973).

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A National Centre for the Surveillance and Control of Communicable Disease

The purpose of this paper is to describe the main events leading up to the establishment of the Communicable Disease Surveillance Centre and to consider its functions and how these might develop.

Introduction

Public health in Britain effectually began with the publication of the famous report of the Poor Law Commissioners, 'on an inquiry into the sanitary condition of the Labouring Population of Great Britain' in 1842, the principal author of which was Edwin Chadwick. He suggested 'that for the promotion of the means necessary to prevent disease it would be good economy to appoint a district medical officer, . . .' (Poor Law Commissioners 1842), a suggestion which was taken up first by the City of Liverpool with the appointment of Dr Andrew Duncan as Officer of Health in 1847; in 1848 Dr John Simon was appointed the Medical Officer of Health of the City of London. These and all the subsequent appointments of medical officers of health were district or local appointments, a most appropriate base because the diseases they were appointed to prevent were local diseases. The cholera outbreak in Soho, London, investigated by Dr John Snow in 1854, was caused by contaminated water from the local Broad Street pump (Snow 1855), and even at the end of the nineteenth century communicable disease still remained predominantly local; for example, the Maidstone

A National Laboratory Service

Recognition that a local public health service alone was inadequate for the control of nationally and internationally distributed disease came about because of the risk of epidemics in World War II. This risk, together with the threat of bacteriological warfare and the then inadequate laboratory facilities, particularly in the south of England, led to the creation of the Emergency Public Health Laboratory Service in England and Wales in 1939 (Wilson 1951). Similar considerations in the United States of America resulted in the inauguration of the Communicable Disease Center in 1946 (Andrews 1946). Although there were no large wartime epidemics, the Emergency Public Health Laboratory Service proved to be of great value in the investigation and control of national disease – for example, salmonellosis due to imported dried egg (Medical Research Council 1947) – and became a permanent part of the health service under the National Health Service Act 1946, dropping the word 'Emergency' from its title. The most important function of this national laboratory service was to provide an epidemiological intelligence network covering the whole country (Thomson 1943) supporting the local public health service. Together, these two services were well able to investigate and control communicable disease, nationally as well as locally, until the 1970s.

The Need for a National Epidemiological Centre

Although the need for national coordination of epidemiological services has been expressed previously (Galbraith 1967, 1968), three principal events led to the establishment of the Communicable Disease Surveillance Centre (CDSC) in 1977.

First, in March and April 1973 the infection of a laboratory technician with smallpox in London led to the deaths of two persons who visited the

general ward in which the patient was under investigation; these contacts were not traced until twelve days after the diagnosis of smallpox in the technician, when both people were already ill. The Committee of Enquiry Report (1974) recommended the establishment of 'a highly active information and coordinating centre . . . equipped with the means of rapid accurate communication with Medical Officers of Health' (now community physicians), and the establishment on a regional basis of specialist epidemiologists to advise and assist in the investigation and control of communicable disease.

Secondly, there was the appearance of Lassa fever and Marburg disease (Monath 1974) and other viral haemorrhagic fevers, with the possibility of case-to-case spread in Britain. In their original description of Lassa fever, Frame *et al.* (1970) pointed out 'The fact that the incubation period allows one to be infected in Africa then become ill with so contagious an illness a week later, and perhaps thousands of miles away, is in itself a cause for concern'. Although these diseases may not be so contagious as at first thought (Keane & Gilles 1977), they are of considerable public health importance in Britain because of the increased volume as well as the increased speed of international air traffic. The first scheduled air flights to West Africa by Imperial Airways began in 1947 using Dakotas, an aircraft carrying 23 passengers and taking two and a half days for the journey. The present day Boeing 747 aircraft carry nearly 400 passengers and fly a more direct route in six and a half hours. The number of passengers carried on main international scheduled flights alone increased from 5 million in 1950 to nearly 80 million in 1971; domestic and international passenger traffic on scheduled flights grew from 121 million in 1962 to a projected 580 million in 1975 (Bruce-Chwatt 1974). These figures do not include non-scheduled charter flights.

Thirdly, the reorganization of the National Health Service in 1974 (National Health Service Reorganization Act 1973) caused a sudden decrease in the number of experienced doctors working in the field in the investigation and control of communicable disease. The Act abolished the post of medical officer of health, the control of communicable disease duties passing to newly created posts of community physician, either district community physician or specialist in community medicine (environmental health). Over 300 senior medical officers of health elected to retire and about a further 100 were appointed to administrative posts in the new health service and were replaced by younger doctors with less experience of communicable disease control.

A search of the Medical Directory in 1976 for the previous posts of district community physi-

Table 1

Previous posts of district community physicians (DCP) and specialists in community medicine (environmental health) (SCM) in England and Wales 1976

<i>Previous post</i>	<i>DCP</i>		<i>SCM</i>	
	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>
MOH or deputy	81	124	28	32
Other public health	43		4	
Hospital administration	18	20	—	—
Clinical and other	2			
Total traced	144	100	32	100
Not known	17	27	7	12
Vacant	10		5	
Grand total	171		44	

cians and specialists in community medicine (environmental health) showed that, of those who could be traced, 86% of the former and all the latter had occupied posts in which they were likely to have had some experience in the control of communicable disease (Table 1). Most district community physicians have responsibilities for the control of communicable disease, and although it was not possible to identify those with and without these responsibilities in this study, nevertheless the finding that 14% probably had no experience in this field, and the knowledge that in many of the remainder experience was likely to have been limited, emphasized the need for their epidemiological support in addition to the support available from public health laboratories.

Functions of the Communicable Disease Surveillance Centre

The CDSC was set up on behalf of the Department of Health and Social Security (DHSS) and the Welsh Office by the Public Health Laboratory Service (PHLS) to undertake three main functions in England and Wales: the surveillance of communicable disease; to provide advice and assistance in the investigation and control of communicable disease; and to contribute to teaching the epidemiology and control of communicable disease. These functions bring together the communicable disease information responsibilities of the two departments with those of the PHLS to create the coordinating centre recommended by the Committee of Enquiry Report (1974). They include the investigation and control functions of the departments, which will be developed to provide the support in the field also recommended by that report (Berrie 1977). In January 1977 the first appointments were made to the CDSC, and with additional appointments proposed, the transfer of these departmental functions will be completed by the end of 1977.

Surveillance

The term 'surveillance', originally restricted to the

follow up of cases and contacts of infectious disease, is now used to mean also the surveillance of disease as well as individuals. Langmuir (1963) defined it as '... the continued watchfulness over the distribution and trends of incidence through the systematic collection, consolidation and evaluation of morbidity and mortality reports and other relevant data'; and Cockburn (1970) pointed out the three essential processes for its implementation, namely: (1) the systematic collection of data; (2) the orderly assembling, analysis, and interpretation of the data; (3) prompt distribution in a readily assimilable form of the information obtained. The subject was reviewed at a meeting of the Section of Epidemiology and Preventive Medicine of this Society in November 1970 (Langmuir 1971, Raska 1971, Roden 1971).

In Britain this concept of disease surveillance or infection surveillance began in the sixteenth century, mainly in London, with the publication of 'Bills of Mortality', which was designed to detect any increase in plague deaths which might make it wise for the Court to leave for the country. John Graunt (1662) analysed these in his famous book 'Natural and Political Observations made upon the Bills of Mortality', comparing mortality by age and sex and in town and country. It was William Farr, the first chief medical officer of the registrar general's office, who, during his forty years in office, laid the foundation of modern surveillance based on mortality data (Humphreys 1885). Farr's system of mortality surveillance has been added to by morbidity surveillance of statutory notifiable infectious diseases, laboratory data, general practitioners' reports, hospital admissions, hospital discharges and deaths, new claims for sickness benefit, industrial health data, school health data and other data.

The new CDSC offers an opportunity to conduct studies, with others concerned, to define more precisely the needs for communicable disease information and then to determine how these needs could best be met by the many separate data collecting systems, either by continuing them as separate systems or perhaps by combining them in some way. Whatever the outcome of such studies it is the function of the CDSC to convert the data derived from all these sources into information in the 'readily assimilable form' referred to by Cockburn (1970). Three information outputs from the CDSC will be developed as resources permit: first, immediate information about communicable disease in England and Wales; secondly past information of communicable disease in England and Wales; thirdly monitoring communicable disease.

(1) Immediate information will continue to be provided in a weekly document but the present

confidential Communicable Disease Report (CDR), for which the CDSC is responsible, could evolve into a more widely distributed published report containing relevant information derived not only from laboratory reports, but from some of the other sources already mentioned, and more of the information could be presented visually. There have already been suggestions of a two-part weekly CDR: a detailed confidential report of laboratory isolations restricted to the contributing laboratories and a shorter published report. Whatever style of weekly report that evolves, its function of providing up-to-date information quickly could be supplemented by greater use of telephone communication and telex. It is intended also to develop an information room at the CDSC, suitably staffed and equipped to answer telephone and other enquiries about the current communicable disease picture in England and Wales and about disease abroad relevant to the United Kingdom. This information room would become the operations room in the event of an incident of national importance or an incident involving many local authorities - 'the highly active co-ordinating centre' recommended by the Committee of Enquiry Report (1974).

(2) Past information about communicable disease is already retrieved and published in quarterly tables and in occasional reports on particular subjects. It is hoped to develop this in response to the information needs and it is anticipated that certain information might be provided monthly, quarterly or annually. In addition to an annual general review of communicable disease it is proposed that the CDSC should produce, in association with specialist laboratories and experts, periodic reviews of particular diseases such as the report on food poisoning last published in 1974 (Vernon & Tillett 1974).

(3) Monitoring of information concerns two main comparisons: the current incidence of disease in one locality with the incidence in others, and the current incidence with past incidence. These comparisons are made in the three classical epidemiological criteria, namely time, place and persons, and their purpose is to search for problems in routinely produced information. The use of statistical methods to assist in the study of information in this way could follow a similar pattern to that developed by Hill *et al.* (1968) for the surveillance of congenital malformations.

For certain diseases a more positive approach is necessary and the PHLS is particularly well placed, because of its national organization, to undertake special surveillance programmes. A recent example is influenza surveillance in England and Wales

(*Journal of Hygiene* 1977) by seventeen collaborating laboratories and 76 general practitioners.

Investigation and Control

The legal responsibility for the investigation and control of communicable disease rests with the community physicians appointed to the local authorities as 'proper officers'; the function of the CDSC is to advise and assist them. This advice and assistance is envisaged as an active and key function of the centre; not only in response to requests but also positive involvement in all important incidents and particularly those involving several local authorities. An example of the part the CDSC intends to play is the investigation of the outbreak of *Salmonella typhimurium* infection in the south of England in 1958 (Anderson *et al.* 1961) in which 90 geographically widespread cases were linked by phage-typing of the organisms, and a national investigation identified the source of infection as veal from particular abattoirs all obtaining calves from one collecting centre. Without such national coordination and support it is unlikely that this outbreak could have been identified and investigated.

In developing this function of support for community physicians, proposals have been made to base consultant epidemiologists linked with the CDSC locally in National Health Service regions. The advantages of basing epidemiologists locally would be that they could work more closely with their colleagues than if based centrally, and furthermore they would become identified locally as the regional specialist in communicable disease epidemiology. This proposal has evolved from the original suggestion for the creation of posts of regional epidemiologists within the PHLS (Howie 1970).

As soon as the CDSC is adequately accommodated an 'on call' system for the epidemiologists will be instituted so that advice and assistance will always be available to community physicians. This will supersede the present DHSS arrangements for communicable disease advice, and will, of course, be closely associated with the information function already described.

Teaching

The CDSC is primarily a service unit and not an academic or research unit, but nevertheless it has an important part to play in the teaching of investigation and control of communicable disease. This function could develop in four main ways: teaching aids; assistance in teaching programmes; in-service training; senior registrar training.

(1) Teaching aids could be provided, displaying information about communicable disease in tabular, graphical, geographical or diagrammatic

form. Such provision could be developed in association with the weekly, monthly, quarterly and annual reports. The teaching about particular episodes of disease could be assisted by recording photographically those episodes investigated by the CDSC and possibly by adding written texts to the photographs or producing tape-slide programmes.

(2) Assistance in teaching provided by academic departments by members of CDSC staff initially will be mainly postgraduate teaching of community physicians, but it could include microbiologists, infectious disease physicians, environmental health officers, undergraduate medical students and others.

(3) In-service training could be developed and might best be undertaken in multidisciplinary groups, in regions, based on the regional public health laboratories. In this way the training could be orientated practically, relate to local problems and involve people from different disciplines working locally in communicable disease control.

(4) Senior registrar training programmes – such as those described by Howie (1970) – will be set up for training in communicable disease epidemiology, and will include four main elements: field epidemiology in the United Kingdom and possibly overseas; microbiology; clinical infectious disease; and community medicine, especially that part concerned with environmental health. Parts of such a senior registrar training programme could be of value to doctors entering other specialties and the CDSC will endeavour to provide for short-term attachments to meet such a need should it arise.

Future Development

The CDSC has now been established within the PHLS, but before it can become fully effective it requires adequate accommodation – particularly to set up an information/control room envisaged by the Committee of Enquiry Report (1974) – and it needs suitable equipment and staff. A centrally-based senior medical staff of 5 with statistical, information, graphical, secretarial and clerical support – amounting to a total staff of about 25–30 people – is an estimate of the immediate need, based on the experience of other national centres. Senior medical staff based in regions might number 3–5 initially, with additional appropriate support staff.

With a centrally organized service of this size it should be possible to provide national coordination and support for community physicians in communicable disease control. Clearly it would not be possible to provide all the required expertise in such a small group, but by making use of existing local expertise through this nationally coordinated service, together with the expertise

already available within the PHLS, it should be possible to ensure that the gap in the health service in the control of communicable disease is covered until a new generation of specialist epidemiologists and more broadly trained community physicians are in these positions.

Internationally the CDSC should develop close links with corresponding units in other countries and with the World Health Organization to facilitate the rapid and frequent exchange of information about communicable disease in all parts of the world. In this way the CDSC could provide information about the prevalence of diseases abroad which are likely to affect this country.

Beyond the narrow field of communicable disease control the CDSC should consider short latent period non-infectious disease because the epidemiological problems are similar. Poisoning, drug-induced disease, congenital malformations and accidents are aspects of acute community medicine which logically should be brought together and coordinated nationally. The final goal should be a nationally-coordinated epidemiological service also covering other aspects of community medicine.

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