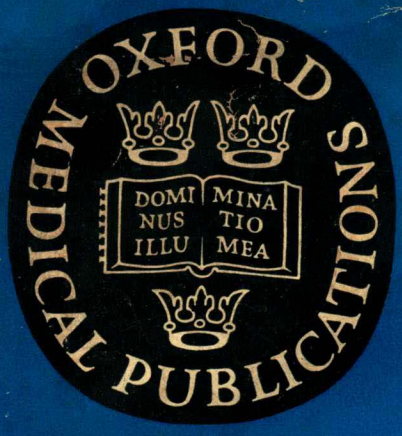

The Theory and Practice of Public Health

SECOND EDITION

W. HOBSON

THE THEORY AND PRACTICE OF PUBLIC HEALTH

Edited by

W. HOBSON

B.Sc., M.D., D.P.H.

Formerly Professor of Social and Industrial Medicine, University of Sheffield

SECOND EDITION

LONDON

OXFORD UNIVERSITY PRESS

NEW YORK TORONTO

1965

Oxford University Press, Amen House, London E.C.4
GLASGOW NEW YORK TORONTO MELBOURNE WELLINGTON
BOMBAY CALCUTTA MADRAS KARACHI LAHORE DACCA
CAPE TOWN SALISBURY NAIROBI IBADAN ACCRA
KUALA LUMPUR HONG KONG

First Edition 1961
Second Edition 1965

PRINTED IN GREAT BRITAIN

CONTRIBUTORS

KENNETH GLENNY BERGIN, M.A., M.D., D.P.H., F.R.Ae.S. *Consultant in Aerospace Medicine; formerly Director, Medical Services, British Overseas Airways Corporation.*

COLIN FRASER BROCKINGTON, M.A., M.Sc., M.D., D.P.H., Barrister-at-Law. *Formerly Professor of Social and Preventive Medicine, University of Manchester.*

FRANK EDWARD BRUCE, M.Sc. (Eng.), S.M., A.C.G.I., D.I.C., M.I.C.E. *Reader in Public Health Engineering, Imperial College of Science and Technology, London.*

JOHN PRINCE BULL, M.A., M.D., M.R.C.P. *Director, Medical Research Council Industrial Injuries and Burns Research Unit, Birmingham Accident Hospital.*

JOHN LANCELOT BURN, M.D., D.P.H., D.Hy. *Medical Officer of Health, Salford; Lecturer in Public Health to the Department of Social and Preventive Medicine, University of Manchester.*

SIR FRANK MACFARLANE BURNET, *O.M.*, F.R.S., Sc.D., F.R.C.P., F.R.A.C.P. *Formerly Director of the Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia.*

LUCAS JOHN HARMSWORTH BURTON, M.A., M.R.C.S., L.R.C.P., D.P.H., F.R.S.H. *Formerly Medical Director, Central Council for Health Education, London.*

JAMES RONALD BUSVINE, Ph.D., D.Sc., F.I.Biol. *Professor of Entomology as applied to Hygiene, University of London, London School of Hygiene and Tropical Medicine.*

JOHN O. BUXELL, B.S. in Chem. Eng., M.S., M.P.H. *Associate Professor of Environmental Health, School of Public Health, University of Minnesota; formerly Chief of Air and Water Pollution Unit, and Regional Adviser in Environmental Sanitation for Europe and the Eastern Mediterranean, WHO, Geneva.*

BRICE RICHARD CLARKE, *C.B.E.*, M.C., M.D. *Formerly Consultant Physician, Northern Ireland Hospitals Authority.*

CHRISTINE COCKBURN, M.A. *Senior Lecturer in Social Administration, London School of Economics and Political Science.*

GUY PASCOE CROWDEN, *O.B.E.*, *T.D.*, D.Sc., M.R.C.P. *Emeritus Professor of Applied Physiology, University of London, London School of Hygiene and Tropical Medicine.*

ROBERT CRUICKSHANK, M.D., F.R.C.P., F.R.C.P.E., D.P.H., F.R.S.E. *Professor of Bacteriology, University of Edinburgh.*

THOMAS HERBERT DAVEY, *O.B.E.*, M.D., B.A.O., D.T.M. *Emeritus Professor of Tropical Hygiene, University of Liverpool.*

NEVILLE MARRIOTT GOODMAN, *C.B.*, M.A., M.D., Ph.D., F.R.C.P., D.P.H. *Formerly Assistant Director-General, WHO, Geneva.*

PETER HENDERSON, *C.B.*, M.D., D.P.H. *Principal Medical Officer, Ministry of Education.*

LESLIE T. HILLIARD, M.A., M.B., B.Ch., D.P.M. *Formerly Physician-Superintendent, Fountain Hospital, London.*

WILLIAM HOBSON, B.Sc., M.D., D.P.H. *Formerly Professor of Social and Industrial Medicine, University of Sheffield.*

JOHN ALEXANDER HUGH LEE, B.Sc., M.D., D.P.H. *Social Medicine Research Unit, Medical Research Council, The London Hospital.*

ROBERT FRANCIS LESLIE LOGAN, M.D., B.A.O., M.R.C.P., D.I.H. *Reader in Social Medicine, and Director, Medical Care Research Unit, University of Manchester.*

WILLIAM PHILIP DOWIE LOGAN, M.D., Ph.D., D.P.H. *Formerly Chief Medical Statistician, General Register Office, London.*

GEORGE MACDONALD, *C.M.G.*, M.D., F.R.C.P., D.T.M., D.P.H. *Professor of Tropical Hygiene, University of London, Director of the Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine.*

JAMES M. MACKINTOSH, M.A., M.D., LL.D., F.R.C.P., Lond., F.R.C.P., Ed., D.P.H., Barrister-at-Law. *Formerly Acting Director of the Division of Education and Training, WHO, Geneva; and formerly Professor of Public Health, University of London.*

JEAN MACIVER MACKINTOSH, *C.B.E.*, M.D., D.P.H., D.P.A. *Senior Fellow, Department of Social Medicine, University of Birmingham; formerly Administrative Medical Officer of Health, Maternal and Child Welfare, Birmingham.*

JEREMY NOAH MORRIS, F.R.C.P., D.Sc., D.P.H. *Director, Social Medicine Research Unit, Medical Research Council, and Professor of Social Medicine, University of London, London Hospital Medical College.*

LESLIE GEORGE NORMAN, *C.B.E.*, B.Sc., M.D., F.R.C.P., D.P.H. *Chief Medical Officer, London Transport.*

DONALD DARNLEY REID, M.D., D.Sc., F.R.C.P. *Professor of Epidemiology, University of London, London School of Hygiene and Tropical Medicine.*

JOHN ALEXANDER FRASER ROBERTS, *C.B.E.*, F.R.S., M.A., M.D., D.Sc., F.R.C.P., *Geneticist, Paediatric Research Unit, Guy's Hospital Medical School; Honorary Consultant in Medical Genetics, Guy's Hospital.*

KENNETH SODDY, M.D., D.P.M. *Physician, Department of Psychological Medicine, University College Hospital, London.*

JAMES HARLAN STEELE, D.V.M., M.P.H. *Veterinary Director and Chief, Veterinary Public Health Section, Communicable Disease Center, Atlanta, Georgia.*

MERVYN WILFRED SUSSER, M.B., B.Ch. (Wits.), M.R.C.P. (Ed.), D.P.H. *Reader, Department of Social and Preventive Medicine, University of Manchester.*

IAN TAYLOR, M.D., M.R.C.P., D.P.H. *Principal Medical Officer (Epidemiology), Greater London Council.*

BERNARD BROUGHTON WADDY, D.M., B.Ch., D.P.H. *Reader in Tropical Hygiene, Ross Institute of Tropical Hygiene, London.*

GEORGE REGINALD WADSWORTH, M.D. *Formerly Nutrition Adviser, WHO Regional Office for the Western Pacific; now Senior Lecturer, Department of Human Nutrition, London School of Hygiene and Tropical Medicine.*

EMILY KATHARINE WILLIAMS, B.Sc., M.B., B.Ch., M.R.C.P., D.I.H. *Formerly Principal Medical Officer, Atomic Energy Research Establishment, Harwell.*

THOMAS WILSON, *C.B.E.*, M.D., D.P.H., D.T.M., D.T.H. *Professor of Tropical Hygiene, Liverpool School of Tropical Medicine, University of Liverpool.*

PREFACE

Doctors and others concerned with the everyday problems of health and sickness approach their problems from varying points of view, depending on the way they have been trained and upon the particular kind of work they are engaged in. There are two important and essentially different lines of approach; the first is that concerned with the problem of health and sickness in the individual, and the second, the problem of health and disease in the community as a whole. Let us consider the first.

For at least 5,000 years the practising physician has been chiefly concerned with the cure of the sick individual, taking payment for services rendered and making a living from so doing; one can say therefore that in one respect he has had a vested interest in disease. The growth of knowledge in many fields has brought with it an increasing amount of specialization; this came to its height before the Second World War when clinical medicine had become highly 'departmentalized'. After the end of the war, however, there came an increasing awareness of the need to consider the person from what Smuts has called the holistic point of view, to look on the 'person' as a whole, as a part of his family and as a part of the community in which he lives. It has become increasingly apparent that both in diagnosis and treatment it is important for the physician to take into account the social and emotional aspects of illness. Many physicians in treating their patients are also concerned with the preventive aspects of illness and with the promotion of health in their patients. The family doctor, paediatrician, geriatrician, obstetrician, industrial physician, and even the general physician and surgeon, all in their special fields, are becoming more and more aware of the importance of considering the physical and emotional environment in relation to sickness, not only in practising their art but also in teaching and research. I believe that these topics should be included in textbooks of clinical medicine because they are part of the knowledge which the doctor needs for the handling of his patient in a full and comprehensive manner. This does not, of course, preclude the fact that there is a place for specialized textbooks on the social aspects of disease.

This new concept was emphasized by Ryle (1948) when he became the first Professor of Social Medicine at Oxford University just after the Second World War. He referred to this branch of medicine as 'Social Medicine'; whereas public health places the emphasis on the environment and deals with communities, social medicine derives its inspiration from the field of clinical experience and deals with individuals. Social medicine is really concerned with *the social aspects of disease in the sick person*. As far as hospital practice is concerned, it includes the whole of the work of the almoner's department. This includes social diagnosis and therapeutics and the organization of after-care, rehabilitation, and resettlement.

The second line of approach to sickness became important when it was realized that in order to combat epidemic disease it was necessary to consider a disease from a totally different aspect. Men began to ask, 'How can we prevent this disease from entering our country?' and when it had entered, 'How can we get rid of it?' From this developed the concept that the State had a responsibility for the health of the community as a whole, and there came into being public health organizations in which were employed administrators, doctors, nurses, engineers, and chemists to deal with the many problems.

The attack first of all was on the purely physical environment and on the communicable diseases, later on the organization and development of medical and social services became important as public health measures. Today there are new problems connected with non-communicable diseases such as accidents, radiation hazards, mental ill health, peptic ulcer, cancer, heart disease, the chronic rheumatic diseases, and the problems of old age; these can be tackled by such methods as health education, early detection of disease, and the provision of the necessary special services to deal with the problems. This pattern of development, which began in the economically highly-developed countries, is now being followed in the newly-developing countries. During recent years a totally new concept has emerged, namely the possibility of eradication of disease in the world as a whole. This can only be achieved by a 'wholly holistic' approach, i.e. by considering the whole community of man as the unit with which we deal; this has been made possible by the formation of the World Health Organization. Malaria is the first disease in history to be attacked simultaneously all over the world with the aim of complete eradication within a given period of time. It is expected that this will be achieved within 10–15 years; consideration is now being given to the eradication also of smallpox, diphtheria, and tuberculosis. This is truly a long way from the concept of the sick patient who comes to the doctor complaining of illness which the doctor diagnoses and treats. The efforts to control common diseases are not always popular with the practising physician, however. I am reminded at this point of the doctor I met in an Indian village who was complaining that since the teams of DDT sprayers had been to the village there had been no more malaria and he had as a result lost his livelihood. There are also other problems created by the large-scale control of killing diseases, i.e. over-population and the danger of malnutrition. It is probable that we could reduce the prevalence of 'chronic bronchitis' and lung cancer considerably in western Europe if we were able to eliminate atmospheric pollution and cigarette smoking. Unfortunately we do not have the 'know how' with regard to these problems, and attempts to change old-established habits, such as smoking, by propaganda have so far failed.

The control or eradication of disease requires the participation and co-operation of large numbers of people of widely different interests, including politicians, administrators, doctors, teachers, and especially the people themselves. Certainly the doctor must play a large part in this work: it is important to realize that the function of a doctor now and in the future is not merely to treat the sick or even to promote health in the patient, he has a fuller and larger role, he must also play his part as an important member of a team concerned with disease control and eradication. If he is a public health

officer or a medical administrator he will have to play a much greater part than, say, a physician in a hospital or a teacher of physiology in a medical school. There is clearly a great deal which the family doctor will have to know and which he will have to consider if he is to practise 'comprehensive medicine', i.e. to take into account the preventive and social aspects of illness when dealing with patients, and to play his part fully in community schemes for the control of disease and the promotion of health. The great majority of doctors and even teachers of medicine do not think on these lines, while the teaching curricula of many medical schools are still based on the anatomo-pathological concepts of the nineteenth century. Can we do anything to alter this state of affairs? Certainly many medical schools are making valiant efforts to effect changes. As far as textbooks are concerned there are plenty which give details of the work of the public health officer and the laws which govern his work in any one particular country. The majority of these books have been written by single authors, usually medical officers of health, and are intended for undergraduate and graduate students of the country of origin. They contain much detail of history, law, and administration for the examination requirements of the country concerned. These textbooks are usually unsuitable for students, whether undergraduate or postgraduate, from other countries or for administrators who wish to acquire some ideas on the best way to organize health services. It is true that customs and practices vary in different countries, and they will affect the way in which he will cope with problems within the family or the way in which health services are administered, nevertheless there is a great deal of basic knowledge and many fundamental principles relating to family care and health administration which are common to people everywhere; moreover, comparison of the relative advantages and disadvantages of different systems can be of great value in deciding what are the best ways of providing new services or of changing old ones. I have tried to fill this gap and to provide a textbook covering the community aspects of medicine which will give basic information of value to those engaged in health work in different parts of the world. The book has been planned also to provide for the requirements of postgraduate students in public health. It covers, for example, all the areas outlined by the National Board for Specialists in Public Health in the United States, and for the M.P.H. of North America and the D.P.H. (England), with the sole exception of biometrics; this is so specialized that it requires a textbook of its own. It is hoped also that undergraduate students will find it useful as a book of reference, particularly where 'public health' forms an important part of the undergraduate curriculum, for example, in Africa, South-East Asia, and South America where many doctors have to combine the functions of a public health doctor with those of treating the sick in a setting where prevention of disease is of enormous importance. For the postgraduate public health student reading an elective or special subject the book will need to be supplemented by further reading. A number of key references have been carefully selected from this point of view and these are listed under various headings at the end of each chapter.

A great deal of thought has been given to the title of the book. The word hygiene indicates to many those topics concerned with sanitation or with personal habits and cleanliness. The term 'social hygiene' has been used to describe services provided for diseases of special social importance, such as venereal disease, juvenile delinquency, problem families, etc. Some consider social medicine to be synonymous with schemes for social security or so-called socialized medicine, while Ryle's concept, as stated previously, is a wider one and embraces the social aspects of disease affecting the sick individual.

The term preventive medicine indicates that prevention is something which the doctor practises apart from cure; this separation is artificial; in dealing with a patient there should only be comprehensive medicine. Fifty years ago, the term preventive medicine meant little more than the use of immunizing procedures. In the United States preventive medicine has now a much wider meaning and is used to describe different levels of prevention, from prevention of illness to the prevention of disability or progression of disease! The term 'preventive medicine' is therefore capable of a wide variety of definitions depending upon individual concepts and, indeed, this idea has only to be extended a short stage farther, i.e. to the prevention of pain or of death, and the whole of medicine becomes preventive. In any case, not all aspects of preventive medicine can be covered by the work of the public health doctor, some form part of the work of the doctor treating individual patients, e.g. health education of patients, after care and rehabilitation. There is also some confusion of thinking when one refers to the work of assistant medical officers of health working in local authority clinics, most of this is not public health at all, immunization of persons, routine examinations are part of clinical medicine although the *organization* of clinics and services of this nature is public health.

We must not ignore the importance of the idea of the promotion of health; this is particularly stressed in the Constitution of the World Health Organization. The term 'positive health', however, now seems to have fallen into disfavour.

It seems to me that the best term to use to describe the community approach is one which has withstood the test of time, namely, 'public health'. A comprehensive definition has been given by Winslow (1951); it reads as follows:

'Public Health is the science and the art of preventing disease, prolonging life and promoting physical health and efficiency *through organized community efforts* for the sanitation of environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health.'

It emphasizes the fact that no sound distinction, therefore, can be drawn between sanitation, preventive medicine, curative medicine, health promotion, and improvements of standards of living. All are parts of a comprehensive public health programme in the modern sense. The prime purpose of Public Health is to modify man's environment and his own behaviour in order to promote health and change the natural history of disease. The practice of public health is based on a number of scientific disciplines such as physics, chemistry, physiology, microbiology, parasitology, pathology, engineering, sociology, psychology, and statistics, but has one which belongs essentially to itself, namely, epidemiology. We can define epidemio-

logy quite simply as the study of causes of morbidity and mortality within groups of people as distinct from their study within the individual person. Its methods of study are essentially statistical in nature.

Throughout this work the importance of the 'epidemiological approach' has always been kept in mind, not only in solving the problems of controlling disease but also in finding the most efficient ways of organizing health services, so-called 'operational research'. It is in this last respect that we can see the emergence of a new scientific discipline in the practice of public health, namely, public health administration. This is a subject which has now found acceptance in many universities as a subject worthy of academic study basing its work on studies in operational research and using techniques such as 'the case study method' developed by schools of business administration. It is sometimes said that administrators are born, not made; this is untrue, they are made by experience and training, and just as some men are more fitted to become surgeons so others are more fitted for the difficult task of administration. If we compare public health with clinical medicine then we can say that epidemiology is the diagnostic tool of public health and public health administration its therapeutic armamentarium.

PREFACE TO THE SECOND EDITION

This, the second edition, follows on the first after an interval of four years, during which time there have been considerable advances in many of the subjects covered by the book. There have been, for example, great advances in the control of communicable diseases, particularly the arthropod-borne diseases and the zoonoses, in genetics, and in the application of epidemiological methods to non-communicable disease. Legislation in all fields is, of course, continually changing, and therefore a book which is concerned with the practice of public health requires frequent revision. During recent years there has been increasing evidence of the importance of the role of the social sciences in public health, in prevention, in therapy, and in rehabilitation. On the other hand, the social character of many public health problems has focused the attention of sociologists on the study of medical sociology, i.e. the role of social forces in health and medical care. Many schools of public health and some departments of preventive medicine in medical schools have sociologists on their staff to help with teaching and research. Sociology and public health have similar foci of attention and similar methods of study, i.e. they are concerned with groups of people and use statistical techniques in their investigations. The precise relationship between the two subjects has, however, not always been clear. A new chapter entitled 'Social Science and Public Health' by Dr. Mervyn W. Susser has been added in order to delineate the role which the social sciences play in a better understanding of the social factor in health and disease and for better planning and administration of health services.

Dr. J. A. H. Lee of the M.R.C. Social Medicine Research Unit has co-operated with Professor J. N. Morris in a complete revision of the chapter on the 'Epidemiology of Non-Communicable Disease'.

Increasing emphasis is now being paid to the planning and evaluation of health services relating quality and quantity to the needs of the community. The economist is also becoming increasingly concerned with the problems of health and medical care, and we now begin to hear of 'public health economists' who are studying the relationship between health and economic growth in the newly-developing countries. It may be, for example, that the first priority for health may not be a specific programme in public health but one, say, in road building, water supply, or agriculture. In order to cover this field a new chapter has been written by Dr. R. F. L. Logan entitled 'The Planning and Evaluation of Health Services'. This chapter covers the topic known as 'Operational Research in Public Health', studying objectively the workings of health services with a view to their more efficient administration. This concept of long-term planning promises to be one of the greatest advances in public health in the present century.

A textbook of such wide scope could not be written by any one person, and it has required, therefore, the help and collaboration of experts in many fields, and I am truly grateful to them for their help.

Several of the contributors either are, or have been, staff members of the World Health Organization; their views are personal ones and do not necessarily represent those of the Organization. I wish to thank the Editor of *The Lancet* for allowing us to adapt the paper of Dr. M. W. Susser (1964, i, 425) for use in this volume and to thank Dr. Ian Taylor and the editor of the *Proceedings of the Royal Society of Medicine* for permission to include Figs. 24 and 25, also the editor of the *British Medical Journal* for Fig. 31.

In conclusion I should like to express my grateful thanks to my wife, whose help and encouragement have been invaluable.

Copenhagen,
February 1965

W. HOBSON

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CONTENTS

I

THE HISTORY OF PUBLIC HEALTH

C. FRASER BROCKINGTON

PUBLIC HEALTH FROM THE DAYS OF THE ANCIENTS UNTIL THE RENAISSANCE OF LEARNING

'On the State of Public Health', the phrase coined by John Simon, we can hardly speak with accuracy before the nineteenth century; for diseases continued to be largely undifferentiated and unclassified, and records of birth and deaths were not kept. All the evidence suggests that, with few exceptions of time and place, it was bad. Human life was short and hazardous and human communities died, like creatures of the wild, from a multitude of accidental causes. Against a host of invaders, noxious agents, and brutal assaults, the human race survived; but there was such fearful mortality that the population of the world advanced only slowly, and at different times and places it is known to have declined. The importance of each cause of death throughout the world will often have varied. Deliberate destruction of young life at various times may have played an important role; to this many earlier civilizations, Egyptian, Hebrew, Hindu, Chinese, Greek, Roman, and Teutonic, resorted, although such practices were strongly countered by religious sanctions, which have had their roots in the urge for survival. The killing of female infants has been a deeply rooted custom among nomads and hunters in Africa, south-west Asia, and India; it was practised in England before and after the Black Death; it caused the cessation of population growth in Japan between 1750 and 1850 during the Tokugawa era. Abortion, by artificial interference and by medicines, has also been widely practised; sometimes, as on the Pacific atoll of Yap today, it has caused a heavy decline in population. Yet such man-made hazards, including deaths in war and famine, have generally been of less importance than disease as a cause of death. In particular, infant and child mortality throughout many thousands of years continued grievously heavy. In enlightened Rome, famous for her aqueducts, public baths, thermae, and *Cloaca Maxima*—symbolizing a preoccupation with sanitation hardly less marked than that of Chadwick nearly 2,000 years later—and in Greece, it was customary to wait a week before naming the babies, for so few survived. Plague, smallpox, typhus, and other of the major killing epidemic diseases made periodic invasions, while chronic endemic infections, such as tuberculosis and malaria, reduced vitality and shortened life. In 400 B.C. the life expectancy of Grecian city dwellers, calculated from burial inscriptions, was about thirty years; and this may well be the general picture covering five thousand years of civilization. Some diseases, as still today, long remained localized, so that parts of the world were free while others suffered; but, in general, all diseases since differentiated seem to have affected man since earliest time. Indeed, a catalogue of conditions identified in Egyptian mummies, and in the writings of the Ancients, is almost as imposing as the latest nosology in the seventh revision of the *International Statistical Classification of Diseases, Injuries, and Causes of Death.*

Thus, there is nothing new in public health as a human need. Every community has in some measure felt the need for it. Disease and the impairment of vitality must always have been a disadvantage, however much the value system of a group made it possible to ignore the effects. The same sorts of hazards to health—epidemic spread, nutritional disorders, occupational risks, the perils of child bearing, the inadequacies of child care—have long prevailed.

From earliest civilizations some form of public health has existed—as a conscious effort by authority to apply social, scientific, and medical knowledge to the protection of the health of the community. Crete, Egypt, Greece, and Rome, all, at some time, built model towns and had finely developed sanitary systems. In Rome public baths were available to everyone; here the workers went in the evening 'to wash and to undo the fatigues of the day'. Inoculation against smallpox was practised in India and China before the Christian era. Rome built leprosaria and, like Greece, sought to regulate prostitution. The latrine and the flush closet were invented not as some have said during the European Renaissance, but in Crete 3,000 years before, or earlier. The Arabic civilization carried on where Rome and Greece left off; Cordoba and other Arabian cities had health departments with sanitary inspectors. The Arabs built the first hospitals with differentiation between patients (Khairallah, 1946). Europe in the Middle Ages continued to isolate leprosy and almost eliminated it. It also evolved, with hesitation and many second thoughts, primitive measures of limiting epidemic spread by the *cordon sanitaire.*

The cult of personal health is as old as medicine itself; at least as regards the foundation of maxims for healthy living. Indeed, the Ancients prided themselves upon their ability to dispense wisdom about how to live; although much of it was speculative and coloured by the hot and cold theory of disease. Some of the teaching in the major religions can also be regarded as a form of public health—aiming at sobriety, cleanliness, the avoidance of excretal pollution, the maintenance of family life, isolation of sufferers from infectious maladies, and the ritual abstention from food likely to convey parasites.

Barriers to the Development of Public Health

If public health has been an ever-present need there have been many forces acting against it. That which most readily springs to mind is ignorance of the scientific bases of health.

Environmental hygiene, as conducted by the Ancients and developed by the Arabs and in China, had little scientific background, except in the practice of inoculation against smallpox. Avicenna, in his *Qanun*, is said to have recognized the spread

of disease by water; but it is more likely that the sanitary systems of ancient times depended upon aesthetic rather than scientific considerations. Contagion was recognized; indeed, Galen knew that phthisis was contagious; but the Greek theory of miasma, basically a belief in the odours of putrefaction as a cause of epidemics, had little, if any, relationship to the modern concept of the biology of infection. This miasmic theory, which gave little opportunity for specific public health action in the field of infectious disease, although it may have encouraged general sanitary measures, was stubbornly held for over two thousand years. Alongside this, the Hippocratic concept of disease—in its simplest form postulating the existence of a balance of four cardinal humours, blood, phlegm, black and yellow bile, themselves endowed with elementary qualities—hot, moist, dry, and cold—was equally unhelpful; for it denied the specificity of disease, which, with few exceptions, was long continued unrecognized.

Nevertheless, although in comparison with modern times, ignorance of the scientific basis of health has been immense, it has never been such that effective public health could not have been developed. Social barriers have been of far greater importance in retarding progress in public health than has mere ignorance. Many scientific discoveries, which could have been so applied to public health, have passed unnoticed for want of a champion; much as did Hero's steam engine in Alexandria (A.D. 135) for lack of the values upon which an industrial society is built. The connexion between marshy terrain and malaria had been noted in Roman times and certainly by the eighteenth century drainage had proved itself to be an effective preventive. Quinine, in malaria, was being used prophylactically from the middle of the eighteenth century. We have had the technical knowledge for malaria eradication for a long time; but lacked the organization, the driving force, and, perhaps most of all, the sense of urgency necessary for its effective use. Why, we might equally well ask, did the Roman Empire not develop a service for maternity and child welfare, based upon the teaching of mothercraft in Galen's first volume of hygiene? Why did Rome not have an industrial health service? Many of the ill effects of industrial processes were already known; the 'trembling' due to inhalation of mercury vapour and lead paralysis were described by writers in Rome and Greece; and many early writers referred to the short-lived fate of those condemned to work in mines. Galen wrote that 'the life of many men is involved in the business of their occupation and it is inevitable that they should be harmed by what they do'. He added 'and it is impossible to change it'—symbolizing in his scepticism the long centuries when public health remained in the wilderness.

As the centuries passed the opportunities for effective action increased; but with little response. The Arabs described smallpox, anthrax, measles, and scabies as specific diseases, but with little change in public health practice, except perhaps to enhance the growing belief in contagion and the possibilities of preventing epidemic spread. The cure and prevention of scurvy was known to the Renaissance explorers—certainly by Jacques Cartier (1535), to whom the natives of the New World demonstrated the virtues of stewed pine cones in the treatment of his scorbutic sailors. But scurvy continued to lower the stamina of the northern hemisphere for many centuries—even after the final scientific proof of the effectiveness of oranges and lemons which James Lind was to provide on H.M.S. *Salisbury* (1748). Likewise, the value of mercury for the treatment of syphilis was known at the beginning of the sixteenth century, within a few years of the epidemic spread of the disease. Benvenuto Cellini records in his autobiography that he himself drank the milk of a goat inuncted with mercury. Here was the basis of a system of clinics for the treatment of venereal disease; but none was adopted, with the exception of Denmark (1790), until modern time. Such examples of knowledge slowly accumulating to little purpose, its benefits long denied to societies by social barriers of one sort or another, might be multiplied many times.

Such social forces have been many and varied. Public health could mean little to peoples whose food supplies were precarious and when a lack of general education made communication difficult. The value system, upon which the western world now leans heavily in its development of new health measures, has too often itself served as a deterrent, since health is not an absolute quality, but has the value which the culture of society accords it. In at least one major religion, health of the body was long thought to be of little account, and disease was a grace to purify the soul. Such an attitude continues to be common in many parts of the world today. The fact that none knew the size of the problem—at least till John Graunt analysed the *Bills of Mortality*—was a more serious handicap than we, in the age of statistics, can easily appreciate. And above all else, lack of organization, of responsible people, and of trained staff have been stubborn deterrents—themselves dependent upon a general failure to regard health and disease as proper subjects for public action.

Indeed, the most important social barrier has undoubtedly been the absence of recognition by authority of any precise obligation to develop public health services. Thus, the Ancients who wrote profusely about hygiene did not seem to consider public health in its widest sense. Galen's *Hygiene* was written for the intelligent few. The thoughts which came to him in Pergamos (A.D. 175), when, as physician to the School of Gladiators, he walked the wards of the Aesculapian hospital high up on the Acropolis, were directed to the privileged few. Barbarians and slaves were disregarded when he began to develop 'a certain art of hygiene'. So, too, in the cities of Rome and Greece, the aqueducts, fountains, and sewers still left masses of the people living in squalor in overcrowded tenement blocks. In the form we know it today—the highest measure of health for all—public health has never, until recently, been a national objective; for Galen was no exception in writing for the civilized citizens of the city states of Greece and Rome, and not for the barbarian hordes. This was the outlook of most people until the Renaissance, and, even after that, of all except the enlightened few. Nor is this surprising, since the struggle for freedom from ill health for all had necessarily to follow upon the other great battles for universal privileges which now began to be waged—to be free from tyranny, to be equal before the law, to vote; these were necessarily the first objectives, and upon their achievement, in the normal course of history, public health has depended.

The climate of opinion favourable to public health, when it did come, depended more upon enlightened self-interest than on a visionary dedication; the development of a social conscience often followed when diseases of squalor were seen to endanger the lives and health of the rich and poor alike; and when the health of industrial workers became an important

consideration in improving output. There was little evidence until then that the authorities recognized any direct and continuing responsibility for the health of the people. Thus we approach the Renaissance of Learning with little, if anything, more accomplished than in the days of Rome and Greece. In terms of world population, which must reflect public health, numbers remained almost static; a probable 275 millions in A.D. 1000 had become about 400 millions by the time of the Renaissance of Learning.

PUBLIC HEALTH AFTER THE RENAISSANCE OF LEARNING

From about 1500 in Europe there began a growth of ideas about public health which, with the passage of time, led to action. The great minds of many countries began to evolve schemes for the improvement of the human race. The earliest of these was named by its author, Thomas More, *Utopia* (1516), and it was to this fictitious dreamland that many followed—the land where hygiene protected health and medicine restored it; where all that was needed was to hand, from hospitals to pure water, insurance against sickness and unemployment, health examinations before marriage. . . . English, French, Dutch, Italians, all had their pipe dreams. Daniel Defoe wrote *Essay on Projects* (1697); Ludovico Muratori, *Della Publica Felicita* (1749); Joseph-Benôit Fodéré (1798), *Les Lois éclairées*. . . . But all these ideas, and many others, were little more than ferments, each leavening a little the societies in which they appeared—none of which were ready yet to be organized, or organized yet to be ready, for any of the social services which we, today, find commonplace. Ramazzini's great work on occupational disease (1700) must have set people thinking; but the immediate effect upon the world's workers cannot have been very great. Progress in the understanding of disease processes, coupled with a growth of social conscience, led in various if limited ways, to public health action. Workers began to be protected against the worst risks of the most obvious poisonings; ingenious devices, including masks to put over the mouth and nose, and extraction conduits for sucking out the foul vapours of the workshops, were early inventions. Mercurial poisoning among the gilders caused a distinguished merchant of gilded bronzes in France to finance research through the Royal Academy of Sciences resulting in a reasonably effective suction device, the '*fourneau d'appel*'.

At the beginning of the sixteenth century in European countries compulsory parish registration began and when, a century later, the slow process of classifying disease was started, the study of vital and health statistics was the natural result. John Graunt (1662) analysed the London *Bills of Mortality*, the weekly compilations of deaths obtained by house-to-house visiting, from the sixteenth century; so began a process without which all public health must remain in the dark. 'Vague conjecture,' as William Farr was to remark two centuries later, 'began to be replaced by numerical expression.' In the middle of the eighteenth century (1758) Sweden created an official statistical commission charged with the tabulation of vital records received from the clergy. Civil registration of births and deaths followed—pioneered in the British colony of Massachusetts Bay (1639), it was extended by the *Napoleonic Code* (1792) to the whole of France, and thus influenced vital registration throughout western Europe, Latin America, and parts of the Middle East. Registration of births and deaths in England and Wales (1836) had the same, and perhaps even more, influence—largely because of the appointment of William Farr to the office of the Registrar General in Somerset House, London; it was to influence the course of events throughout the English-speaking world, including the Dominions and the United States.

Attempts were made from about 1600 onwards to establish services to meet one need or another, as these appealed to men of action; of these, many and varied, the following are but examples. Thus it was that St. Vincent de Paul (1576–1660), the parish priest of Chatillon-les-Dombes, began home nursing through his Sisters of Charity (1617). 'Before your establishment,' he said in one of his Conferences, 'there was never a community destined to serve the sick in their homes.' Robert Owen (1800) showed that care for the worker, besides immensely benefiting health, increased rather than diminished output. Of equal, if not greater, significance, national and local health organizations also began to appear; municipal doctors of many European states, and particularly the *Kreisphysikus* in Prussia, became effective agents for arousing public interest. *Bureaux de Santé*, with limited objectives to combat the plague, were established as early as the sixteenth century in the big towns of southern France. But none of these were effective by modern standards; all failed for one reason or another—including the Voluntary Board of Health at Manchester (1795), the *Comité de Salubrité publique* in Paris (1802), the *Collegium Medicum* in Denmark (1740)—either on account of lack of authority, or money, or of personnel.

The possibilities of public health action began to benefit from additions to scientific knowledge about the causation of disease; notably James Lind's experiment on board H.M.S. *Salisbury* (1748), which finally proved that oranges and lemons could prevent and cure the scourge of scurvy; and that of Edward Jenner (1796), which demonstrated the prevention of smallpox by vaccination. Jenner's work followed upon a century during which the age-old practice of inoculation had been popularized by the indefatigable Lady Mary Wortley Montague (1689–1762). From the beginning of the nineteenth century vaccination began to be practised as a public health measure, with and without compulsion. Lind's work on scurvy had less immediate effect, except that it led after half a century to preventive action in the British Navy. Of much more importance was the establishment of a preventive service in general for naval seamen, which followed Lind's *An Essay on the Most Effectual Means of Preserving the Health of Seamen* (1757). Pringle (1752) and Colombier (1775) wrote on the subject of army health. Such preventive services were the prototypes of those for infant hygiene, maternal and child health, and school health, which were to be developed a century and a half later. Thus the growth of public health presents itself as a multitude of small changes not always easy to distinguish, rather than as a few spectacular events.

After 1650 industrialization began to have an effect upon living standards; this was particularly so in England, where the Industrial Revolution started. Mechanical aids to living were now to influence health in a thousand new ways. In the next 150 years world population advanced sharply, and by the date when Malthus wrote (1798), it had already doubled to reach some 920 millions, suggesting that the state of public health

had begun to improve, if not spectacularly, in all parts of the world, except perhaps in Africa. In particular, infant mortality and child mortality had begun to lessen and life to lengthen out. In this setting the movement to towns, in that part of the world where the Industrial Revolution had begun, which resulted in the industrial slums, provided an even greater contrast with the improving standard of living. The time for action had come.

PUBLIC HEALTH IN THE NINETEENTH CENTURY

Modern public health was the result of a growth of understanding and sense of responsibility among peoples in Europe, who, although they had a common cultural setting, were living in very different conditions and under different forms of government. Naturally therefore, this new social service had many points of origin. Two of these are of particular importance, that of Johann Peter Frank (1745–1821), who wrote about public health, mainly as social medicine, and as a police measure; and that of Edwin Chadwick (1800–90), whose main concern was with sanitation and with local government. Frank's *System einer Vollständigen Medicinischen Polizey*, an expression of the autocracy under which he and his forbears had lived, grew naturally out of *cameralism*. The benevolent dictator, or enlightened ruler, sitting with his advisers *in camera*, sought ways and means to raise his country's wealth; conceiving the idea of people themselves as the natural wealth of his country, he began to take steps to preserve their life and health and so to increase his estate.

Frank's system concerned itself with almost every aspect of public health, with the exception of industrial hygiene, and the emphasis was upon hospitals and medical care. Frank saw ill-health as an expression of poverty, a philosophy which he boldly stated in his oration as Dean of the Medical School in Austrian Lombardy (1790). Chadwick's public health was, to some extent, an expression of the political philosophy of his country, a distrust of autocratic rule; but it was also a child of the Industrial Revolution, which by the second quarter of the nineteenth century had given rise to remarkable changes in both the environment and the demography of a small island. Chadwick, influenced by his earlier association with Jeremy Bentham, began, like Frank, to see in poverty the main cause of ill health; and his first, and to many most striking, achievement was the reform of English Poor Law, with a uniform locally elected administration which gave, among other things, free medical care to the poor. Practical experience of the new industrial slums, however, soon convinced him that the most important forces were acting in the opposite direction; he came to see disease as a cause of poverty, 'the pecuniary cost of noxious agencies' as he described it. A nation-wide survey, using the Poor Law medical officers as the surveyors, resulted in *The Sanitary Condition of the Labouring Population* (1842), a powerful indictment of insanitary living, mirrored against rising standards.

Chadwick and, to a less extent, the public health pioneers on the Continent were aided by the arrival of cholera. In the first quarter of the nineteenth century this disease, with all the dramatic urgency of the plague, had spread from India relentlessly across the Continent; its course was watched everywhere with apprehension. It provided the final irresistible challenge to the complacent acceptance of slum living. It focused the attention of government and people on the need for sanitation. Doctors began to connect ill health more specifically with pollution of the environment; local citizens of initiative and public spirit began to see the need for public measures of control. Chadwick was able to marshal these forces and to bring them to a successful conclusion. His Public Health Act (1848), must for ever be a landmark in the history of world public health. He will always be famed for hammering home relentlessly his conviction that health depends upon sanitation. Chadwick's empirical system of sanitation, dependent upon an inviolable circuit of incoming and outgoing fluids, as an essential of urban life, has been as momentous for man's progress as Harvey's scientific discovery of the circulation of the blood. If Chadwick were alive today he would find nine-tenths of the world still suffering the torment of intestinal infections from which most of Europe and the New World, in following his teachings, has escaped. But Chadwick should be remembered even more for his less-considered teachings; the use of local government in public health administration, and of the medical officer of health as a specialist adviser. It was his evangelism which began the participation of the people in protecting their own health, by franchise from among themselves for voluntary service on local Boards of Health and through giving the means to finance the services needed out of their own pockets. It was his idea that doctors should discharge a function towards society as a whole, as well as towards the treatment of sick individuals.

Chadwick's public health, emphasizing the environmental rather than the personal aspects of hygiene, with the hospital little considered, influenced developments in North America and in the British dominions and colonies. The influence on America was striking; Shattuck's monumental report on health conditions in Massachusetts (1850) followed Chadwick's main lines of thought; America looked across the Atlantic to a country that 'had far outstripped any country in the world in the direction of state medicine' (Hanlon, 1955). American public health was based on local government with 'the role of national government confined primarily to providing plans, financial aid, advice and supervision' (Wyatt, 1951). Such differences as have developed in the American scene are derived from two contingencies; the fact that she did not follow Chadwick's new Poor Law with all that this entailed in social thinking; and the influence of federalism, which has led the States to develop along their own lines.

Public health on the continent of Europe followed a very different course. The administration, although widely different in detail, tended towards centralization, to state control and state officials; of this, France is the greatest exponent, with its public health services based on the *département* under the supreme authority of the prefect and with a medical director on the staff of the central organization. France has dealt with preventive work essentially by means of national circulars, with all the advantages of central stimulation and the disadvantages of a lack of local autonomy. Continental countries have also developed public health with emphasis upon personal rather than environmental hygiene. French Utopians in the nineteenth century dwelt upon the need for organized medical care. Condorcet (1793), in *L'Esquisse d'un Tableau historique des Progrès de l'Esprit humain*, wanted a system of insurance to do away with poverty; Jules Guérin (1848), editor of the Parisian jour-

nal *Gazette Médicale* asked that medicine should be dedicated to society; Phillippe Buchez (1839), asked for a national health service in France with 16,000 district doctors, each giving free treatment to approximately 2,000 persons.

The French prefects received their first national circular about hospitals in 1840. European countries began to build state hospitals at an early date and, as Newsholme recorded of Denmark, they established 'an admirable system of municipal and county hospitals . . . supported out of taxes, which removed hospital treatment from the category of problems still to be solved' (Newsholme, 1931). European countries also tended to develop insurance against sickness. This continental pattern of public health spread in its turn to colonial territories dependent upon it; and, by the chance of association with Germany, to Japan.

Public health began with little scientific basis for action. At the time of Chadwick's Act (1848), and the first International Health Congress in Paris (1851), diseases were still largely undifferentiated and there was no absolute proof of the bacterial origins of much of it. The six months spent in Paris during 1851 by delegates from twelve nations was mainly a debate between contagionists and miasmatists, as it might have been in Sydenham's day. Yet evidence for the germ theory was piling up. Oliver Wendell Holmes in America and Semmelweiss in Vienna in the early nineteenth century added puerperal fever to the lengthening list of diseases known to be conveyed by human contact. John Snow, practising medicine in Soho, London, published his 'slender pamphlet' on cholera (1849); and in 1854, through further research, gave convincing evidence of its waterborne spread. William Budd did the same for typhoid (1856). The specificity of disease was becoming plain, and infectious disease, under the generic term 'fever', began to be sorted out into its component parts. Burdon Sanderson's study of tuberculous material (1867–68) made it almost certain that infection was a biological process. The second half of the nineteenth century was heralded by Pasteur's identification of bacteria, with the final rout of the theory of spontaneous generation. Koch isolated the tubercle bacillus in 1882, and, in rapid succession, scientists in different parts of the globe did the same for many other common maladies. Public health began now to look like an exercise in practical bacteriology; a realization particularly favourable to countries that had adopted the Chadwick pattern, but of importance to all through the development of artificial immunization and the tracing of carriers. Thus we entered the golden age of environmental hygiene, particularly in Great Britain, where public health laws followed one another in bewildering succession and where local government grew in importance, with medical officers of health and sanitarians employed in increasing numbers.

The bacteriological concept of disease processes, interpreted by Joseph Lister (1827–1912), together with the evolution of professional nursing following the teaching of Florence Nightingale (1820–1910), also gave birth to the modern hospital. In earlier civilizations the hospital had been little more than a place of refuge; a grave misfortune for whomsoever entered its portals. Infection, the spread of pathogenic organisms from patient to patient and ward to ward, had been a constant nightmare. The growth of the modern hospital, beginning with the simple laws of antisepsis and of aseptic rituals, quite transformed the public health scene, gradually shifting the balance of emphasis, already precarious, from prevention to cure.

For a time also the science of bacteriology obscured other equally significant aspects of public health. Bacteria occupied the forefront of the stage. But public health was soon falling back again on social issues. Miss Nightingale began to preach household hygiene (1858) as the answer to Britain's excessive infant mortality. John Simon (1816–1904) began his famous survey—or series of surveys—to determine the chief causes of excess mortality in 1858; and by 1871, when his period as Chief Medical Officer to the Privy Council in London came to an end, he had quite transformed the general understanding of public health problems. This episode in public health history, in which nation-wide studies were conducted by doctors of distinction in a wide range of important health problems—diet, infantile mortality, dust as a cause of pulmonary disease, worm infestations, lead, arsenic, and mercury poisoning in industry, housing, etc.—has probably no equal in world public health history.

In consequence of this, and of pioneer work in the rest of Europe and the United States, public health broadened its front with new services and fresh developments in professional work. The public health nurse appeared on the scene in Britain and the United States at about the same time (1872); Pierre Budin, Variot, and others in Paris, and Ballantyne in England, sought practical answers to antenatal and neonatal disorders. Nurses going into the homes, together with clinics at which mothers and babies might attend for advice, shifted the emphasis of public health work once again to a consideration of habits of living. The discovery of the tubercle bacillus, it was now realized, had done little to solve the problem of the white scourge; Philip and others began to study the social aspects of this disease and to find at least the beginning of a means to remedy them. Thus, personal hygiene, in its many forms, came now to fill an increasing part of the public health picture, developing many new aspects to meet the risks of the vulnerable classes. *Social hygiene*, one of its offspring, evolved services to protect mother and young child, schoolchild, homeless children, industrial workers; schemes for tuberculosis and venereal disease; and, as ideas further developed during the century, for problem families, the handicapped, the aged, and the mentally ill. Two other offspring of personal hygiene, children of earlier years, began to grow in strength and quality: *preventive medicine* extended its techniques in immunization, in health education, and in preventive examinations; *social medicine* extended the participation of curative medicine in public health through organized medical services. *Social insurance* began to combat poverty in various countries of Europe and the Commonwealth.

The origins of social medicine are not easy to define. They might be found in Galen's *Hygiene*, or, perhaps more realistically, in Frank's omnibus of social medicine. But the term itself was first used by Grotjahn (1869–1931). Most of the pioneers of personal hygiene were exponents of social medicine, which is essentially the approach of the clinician to the problems of community health. However, the world waited until 1943 for the first Chair to be created with social medicine in its title, when John Ryle (1889–1950) went from the Regius Professorship of Physic at Cambridge to the Chair of Social Medicine at Oxford. No more moving statement of the ideals to which John Ryle subscribed can be imagined than that which he

propounded on his American lecture tour. In *Changing Disciplines* (1948) he wrote:

'Thirty years of my life have been spent as a student and teacher of clinical medicine. In these thirty years I have watched disease in the ward being studied more and more thoroughly—if not always more thoughtfully—through the high power of the microscope; disease in man being investigated by more and more elaborate techniques and, on the whole, more and more mechanically. Man, as a person and as a member of a family and of much larger social groups, with his health and sickness intimately bound up with the conditions of his life and work—in the home, the mine, the factory, the shop, at sea, or on the land—and with his economic opportunity, has been inadequately considered in this period by the clinical teacher and hospital research worker. The medicine of the teaching schools has, as I have suggested, undergone a gradual conversion to a highly technical exercise in bedside pathology and therapeutic method. The morbid "material" of the hospital ward consists very largely—if we exclude the emergencies—of end-result conditions for which, as a rule, only a limited amount of relief repays the long stay, the patient investigation, and the anxious expectancy of the sick man or woman. With aetiology—the first essential for prevention—and with prevention itself the majority of physicians and surgeons have curiously little concern. Nor have they at present the opportunity, nor yet the appropriate types of training or assistance, requisite for the study of aetiology or prevention. Their material is mainly selected by four factors: the gravity, the difficulty or the rarity of their cases, or their suitability otherwise for admission to a hospital. Some of the most common diseases, the less lethal diseases, and the beginnings of disease are even considered as providing "poor teaching material". Health and sickness in the population and their possible correlations with significant and measurable social or occupational influences are outside their province.'

Public health has been developed in the countries of the western world in widely different ways; measures have been evolved, generally, only when pressing needs have come to be felt. Denmark began a system of gratuitous treatment for venereal disease, irrespective of social and financial station, as early as 1790; Britain followed 150 years later (1916), and Switzerland, for indigents only, even later (1931). Smallpox vaccination was made compulsory in Germany over a century before this step was taken in France. Sweden established a statistical commission in 1758, whereas Britain began official analysis of vital statistics only in 1837. Holland and Scandinavia developed the midwife to a high professional standing shortly after the turn of the century while Britain lagged behind some twenty-five years; the United States has not thought it necessary to have midwives. Sanitary hygiene began through national legislation in 1848 in England and not until fifty years later (1902) in France. Instances of wide differences in timing and emphasis could be multiplied many times. The philosophy of public health has been given many interpretations; and the human being, subjected broadly to the same occupational, ecological, nutritional, psychological, and other hazards, has nowhere been given any uniform protection. Recent developments in comprehensive medical care have tended to hasten the development of a common pattern. Britain, Australia, New Zealand, and Canada are now engaged, more deeply even than the Scandinavian countries where such developments were pioneered, in operating schemes of medical care, financed by the State or by insurance, according to taste. The final phase of public health in the western world is witnessing an increasing centring of interest upon the hospital; as specialist medicine and surgery develop their technical skills the future in Europe and the New World may well be a fight to prevent the hospital from taking control.

PUBLIC HEALTH IN EASTERN EUROPE AFTER THE FIRST WORLD WAR

The rest of the world awaited the influence of world wars before embarking upon public health practice in any real sense —apart from the initiation which colonial territories experienced from their parent bodies. After the First World War, Turkey, Russia, and Yugoslavia, at once engaged upon gigantic efforts to 'develop', began their own schemes of public health with little if any reference to the European pattern. Russia and Yugoslavia adopted a scheme based upon principles which had been long discussed in Europe, but never practised: complete integration of curative and preventive services; medicine as a social service; the predominance of preventive medicine; community participation, largely by means of Soviets; and health centres as the basis of day-to-day work. Yugoslavia, with Andrija Stampar as its adviser, also introduced the Institute of Hygiene, combining administrative work with research, an ingenious device to ensure that practical schemes for applying epidemiology, industrial hygiene, bacteriology and parasitology, food hygiene, maternal and child health, nutrition, etc., will be kept in touch with scientific developments. The distinctive new feature in this east European scene has been the subordination of medicine to the needs of the community. Thus enlightened authority has been able to impose upon the medical profession that which deliberate democratic choice has found difficulty in doing. The forty years which have elapsed since these three exciting adventures in large-scale public health schemes organized on a national basis were begun, have provided dramatic proof of the possibilities of public health even in under-developed countries, if backed with sufficient authority and direction; success has been most marked in Russia, where the health picture is now, in its main aspects, that of a developed country.

After the Second World War the movement for public health became general, aided by the World Health Organization, which began to function in late 1948. Many new countries, Indonesia, Burma, Thailand, India, Pakistan, and some South American States, have taken part in a general awakening, urgent and impulsive. For these countries health problems of even greater magnitude than those of Russia, Turkey, and Yugoslavia in the 1920's, or of Europe in the early nineteenth century, had to be faced. Communicable diseases have been even more widespread; and these have been exacerbated by nutritional disorders almost unknown to Europe. Intestinal infections and infestations of many kinds, and many special diseases, such as yaws, leprosy, and filariasis, have for long prevailed. Widespread lack of sanitation has caused untold illness. Childbirth remains in the hands of the village handywomen; doctors, nurses, sanitarians, and other auxiliaries hardly exist. In Indonesia, where there is one doctor to 57,000 people, it is said that a woman dies in childbirth every quarter of an hour and a baby every minute.