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THE HEALTH ASPECTS OF INDUSTRIALIZATION

Presented by the World Health Organization

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67-15999

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

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Introduction

1. For the purposes of this paper, the term "industrialization" includes:
 - (a) Efficient operation of existing factories and their further development;
 - (b) The promotion of primary, secondary and tertiary industries, both large and small;
 - (c) The development of various types of educational and technical institutions.

2. "Health" is comprehensively defined, namely, as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". 1/

3. Many excellent papers and documents have been produced on the health aspects of industrialization. A World Health Organization paper prepared for the 1964 United Nations Inter-regional Seminar on the Social Aspects of Industrialization 2/ discussed:
 - (a) The impact of rapid industrialization on health.
 - (b) The role of the health authorities.
 - (c) Planning and organization of health services to cope with the impact of industrialization on health.
 - (d) The role of the World Health Organization.

1/ World Health Organization. Basic documents, 17th edition, p.1. Geneva 1966.

2/ "Health aspects of industrialization", paper prepared for United Nations Inter-regional Seminar on the Social Aspects of Industrialization. Minsk, Byelorussia. 11-25 August 1964. The report of the seminar was published by the United Nations in 1965 (sales no: 65.IV.7).

I. GENERAL CONSIDERATIONS

4. Many factors must be considered in industrialization, "health" being an important one. Without healthy workers the rate of successful industrialization is reduced. "Health", good or bad, is rarely the outcome of a single factor. In many instances, the relationship between cause and effect is not clear.

5. The health of a group may also be affected by such considerations as poor transportation; the lack of educational facilities, water supplies, housing and sewerage; and inadequate general medical services. Therefore, many divisions and units of the World Health Organization have an interest in industrialization and urbanization.

Social considerations

6. Health may be affected by interrelated factors associated with work, the home, leisure and relationships with other human beings. A worker transferred from his rural home to a large industry, located in a city hundreds of miles away, may spend his wages on his own pleasure, leading to neglect of his family; this may result in problems that distract his attention from his work on a lathe, for example, thus causing an accident.

7. The social problems are varied. The worker, and sometimes his family, often has to adjust to a new way of life; he may be a stranger in an area unknown to him and may have few direct links with old friends, institutions and customs. The community as a whole may also have to face certain problems, such as air pollution.

8. The engineer, town planner, public health administrator and public-spirited citizen can all make contributions towards the prevention and remedy of such problems. The usefulness of trained sociologists and social workers in this effort must not be overlooked.

Health programme essential in industrialization

9. In any discussion of industrialization, it is important to consider health as an essential element in the social and economic development of a country.

Unfortunately, this fact is often overlooked. However, at the 1966 Conference on Industrial Development for the Arab States, a recommendation was made "to take the necessary measures to ensure the participation of health authorities in the planning and execution of industrialization programmes at all levels, and creating the health environment required to ensure proper medical treatment, the adoption of preventive measures, and providing healthy living conditions and adequate public facilities".^{3/}

The effects of unplanned industrialization

10. Each developing country should try to learn from previous mistakes made by industrialized nations during their attempts to provide better living and working conditions. In this connexion, it should not be forgotten that the harmful effects of unplanned industrialization may not appear until years later. Economic pressures may be acute for a long time; once mistakes are made, their correction is frequently much more expensive, both in terms of money and manpower, than avoiding mistakes in the first place.
11. It is therefore important for a country to seek authoritative advice in the early stages of its over-all industrial development programme. The doctor and scientist have important contributions to make, as have the economist, planner and politician.
12. It is not proposed in this paper to discuss the possible ill effects in detail. As another WHO paper states, the "harmful influences include factors such as urbanization, with a marked increase in population density, accentuated environmental health problems that favour the spread of certain communicable diseases, creation of new occupational health problems, aggravated nutritional problems and an adverse effect on mental health".^{4/}

^{3/} Conference on Industrial Development for the Arab States. Kuwait. 1-10 March 1966. (ID/CONF.1/R.R.4)

^{4/} Op.cit., "Health aspects of industrialization".

13. In numerous countries, at least for many years, the main industrial development is likely to take place through the growth in the number of small industries. It must not be forgotten that some industries are started in homes and that if machinery is used, children as well as workers may be injured. Because of the development of new, and sometimes inexpensive, chemicals, workers in small industries may also be exposed to hazards from dust, solvents and metals.
14. Today, as in the past, unplanned industrialization can adversely affect the physical, mental and social health of any nation. Disease may follow, and situations of stress may develop through changes in the cultural pattern of the community.
15. On a global level, the extent of future industrialization is difficult to estimate. The picture becomes clearer if one thinks in terms of comparatively small geographical areas; for example, the future small-plant development in the West African sub-region in 1980 has been estimated as involving an additional 10,752 new units, requiring some 300,000 workers.^{5/} Even in many of the highly industrialized countries, such undertakings employ a very large percentage of the over-all labour force. This is also the case in some other countries; for example, in India, small industries employ about eight million persons.
16. In the "selection of industrial projects to secure maximum economic benefits", general medical and occupational health considerations must be taken into account. The suggestion has been made that a "manual on industrial project evaluation"^{6/} should be prepared for developing countries; this should give guide-lines on ways to make a preliminary assessment as to whether sufficient emphasis has been given to health, safety, welfare and social issues. The final assessment must be made by trained personnel.

^{5/} United Nations. Economic Commission for Africa. "The Development of small-scale industry in the West African sub-region". Sub-regional meeting on economic co-operation in West Africa, Niamey, 10-22 October 1966. (E/CN.14/INR/121).

^{6/} United Nations. Report of Symposium on Industrial Development in Africa. Cairo. 27 January-10 February 1966. (ID/CONF.1/R.R.1-E/CN.14/347).

The provision of labour for industrialization programmes

17. Workers for a new industry can sometimes be found within a country; in other instances, this is not possible. Because of the acute labour shortage in many countries, some of the regional symposia on industrialization held interesting discussions on the most effective utilization of human resources. There seems to be merit in the suggestion to hold 'a special symposium on human resources development, including training, education and productivity ...'.^{2/} The latter three aspects are intimately connected; a wide definition of "training" and "education" should be made, thereby enabling occupational health issues to be considered.

Health aspects of industrialization programmes

18. In any public health matter, it is necessary first of all to recognize the difficulties and to define the problem, then to establish a policy and priorities, to work out the pattern and scope of the programme, to determine the respective responsibilities of all concerned, to consider the need for legislation, to train personnel, to ensure effective teamwork and to make certain that appropriate health education is carried out.

19. Those involved in industrialization programmes must think in terms of providing adequate general medical and occupational health services. These are closely connected and entail important social considerations. Many different types of personnel, with different disciplines, training and levels of administrative responsibilities, are needed.

Staffing considerations

20. It is beyond the scope of this paper to consider such matters in detail; the required staff will range from public health administrators to hospital managers, nurses, maintenance staff, governmental medical inspectors of factories, occupational hygienists, safety engineers etc. In some instances, specialized training, including study tours overseas and post-graduate study, is essential.

^{2/} United Nations. Economic Commission for Africa and Centre for Industrial Development. "Development of small-scale industry in Africa", document prepared for Symposium on Industrial Development in Africa.
(E/CN.14/AS/111/25)

21. A doctor nearly always considers problems primarily in human terms; an occupational health physician with his knowledge of industry is able to equate these terms to the needs of the factory. The effectiveness of any senior public health official depends not only on whether he is supplied with the necessary assistance and facilities (such as an in-plant physician, a good medical centre, adequate staff etc.), but also on whether the administrative organization is such that he has an opportunity to express his views on relevant matters. The plant's medical personnel should have access to the top management, should serve on certain committees and maintain liaison with universities, occupational health institutes, and health and safety associations.

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II. THE PROVISION OF ADEQUATE GENERAL MEDICAL SERVICES

22. Although the provision of general medical services is primarily the responsibility of Governments, many organizations and sectors of the community may be involved. The role of some of these sectors, including industry, is discussed below.
23. The extent to which industrialists play a part depends on several factors. The responsibilities of a large organization that is building a dam, costing millions of pounds, in an undeveloped area differ completely from those of the owner of a small factory. Nevertheless, both have legal, social and moral responsibilities; if possible, these should be defined before either begins to build. If companies and industrial combines are not suitably informed of such responsibilities, they cannot be wholly blamed if they fail to play a satisfactory role in community affairs.
24. In many countries, trade union organizations increasingly realize that they must concern themselves with matters other than those directly related to improvements in the situation of wages; for example, they may enter into negotiations with individual employers, aimed at securing better provisions relating to occupational health. They may also become involved in similar matters outside the factory. From the occupational health viewpoint, there is considerable merit in bringing local and/or national unions into industrialization discussions. Trade union organizations look at a problem in the light of their own experience and requirements; their views on ways and means of preventing conditions which endanger health can be useful.
25. Trade union officials can also initiate an inquiry into such conditions and, if necessary, can influence Government authorities, including labour and health departments, to make an investigation.
26. The importance of the health education of the general public should not be overlooked. History is full of examples where a non-medical person has played a very large part in achieving the introduction of a far-sighted public health measure.
27. There will be many advantages if, at the national and/or the regional level, the general medical services and the occupational health services are planned as an integral whole and, where possible, are developed simultaneously.

28. One of these services may be more advanced and thus can stimulate development of the other services. A large overseas corporation, for instance, may construct a dam in a remote, undeveloped area; it usually brings the work standards and practices of its home country to the new location, including a comprehensive in-plant occupational health programme which the management may extend to provide medical services for the dependents of workers. This may focus attention immediately on any local deficiencies, thereby leading to general improvement.

29. A report of the International Labour Office (ILO) emphasizes that "the hasty and badly or inadequately prepared organization of occupational health services in countries where considerable public health problems exist, and medical and hospital equipment are still insufficient, leads in the end to those services being entrusted with ordinary medical treatment, which is certainly of great value but which very quickly monopolizes the physicians' time, leaving them without the time to really practise occupational medicine".^{8/}

30. Many of the environmental health aspects of metropolitan planning and development have been described in detail in a WHO Technical Report.^{9/}

^{8/} International Labour Office. "Adaptation of work to man and occupational health problems in countries undergoing industrial development." Occupational Safety and Health Series No. 3. Geneva. 1964.

^{9/} "Environmental health aspects of metropolitan planning and development: Report of WHO expert committee". WHO technical report series No. 297. Geneva. 1965

III. THE PROVISION OF OCCUPATIONAL HEALTH SERVICES

31. The rate of technological developments is now so rapid that it is often difficult to keep well-informed on the details of manufacturing processes and their effect on industrial relations and safety. Before any occupational health service is planned, it is important to know not only the extent and types of industry but also any specific hazards involved. Are the hazards mainly of a mechanical, chemical or physical nature? How many people are involved? Is engineering control possible and economically feasible? Does control mainly depend on human factors, such as discipline and education? Is there need for medical examinations? The type of data required is not necessarily the same in the case of planning on a national basis as when advising a specific industry or a trade.
- Personnel and organizations with specialized knowledge
32. Many people and organizations may be involved in a specific situation concerning occupational health and safety. For example, in an engineering factory using radio-active isotopes, the medical and the safety departments are both involved; however, they may have to obtain detailed technical advice, either locally — for example, from the physics department of a university — or from outside the country, before they can recommend measures of control to their top management. At the international level, the WHO and the International Atomic Energy Agency (IAEA) may be of assistance.
33. Advice may also be important at the planning stage. Safety associations, professional institutions (such as those for chemical engineers or architects, and schools of business administration) and personnel practice may help in the solution of individual problems. Certain in-plant medical and safety considerations have such wide implications that international associations in this field, such as the Permanent Commission and the International Association on Occupational Health or the International Ergonomics Association, have been formed.
34. Factory inspectors, whether they are medical or non-medical personnel, have a wide knowledge of industry. Many have had specialized post-graduate training. Such knowledge should be drawn upon. The governmental medical officer of health should also be consulted on community health matters.

Occupational health services for all employees

35. If possible, the occupational health service should cover all workers. As an ideal, the occupational health and safety services should protect against any hazard in any industry or work situation; the period of time at which this becomes necessary, in the evaluation of the services, depends on many factors.
36. Though in some instances the health hazards may affect only a small number of employees and other persons, they should not be overlooked. For example, at a huge cement works, the labour force in the main buildings may be exposed to many hazards; however, the few who are working with explosives at a remote quarry face may have a much higher accident rate. Furthermore, the safety of visitors to the factory must not be overlooked. Similarly, while the high degree of noise caused by a stone crusher operating almost automatically may not present an in-plant hazard, this may be a definite public nuisance to nearby homes. Lorries taking cement to industries may create a road traffic accident hazard to children. Inadequate dust control devices may result in severe air pollution locally.
37. The number of hazards to which many farmers are exposed may be much greater than in the case of the "average" factory worker; this is not widely known. The farmer may impair his hearing by driving a noisy tractor; he may be poisoned by the sprays used to protect his crops; he may develop a hernia from incorrect methods of lifting; contract dermatitis from handling flower bulbs or suffer from excessive temperatures while working on the land. In addition, his non-occupational environment often compares unfavourably with that of the city dweller.
38. Industrialization hazards involve many categories of employees. The wharf labourer may be poisoned by damaged cargoes; the health of the truck driver may be affected by long night journeys; the clerk may develop tuberculosis as a result of working in a small unventilated office and sitting beside an undetected case; the bank typist may develop inflamed tendons of the wrist from poor posture while using various types of office machinery. To think only in terms of protecting the factory worker is not enough.

Occupational health services in agricultural undertakings

39. Agriculture is important to most countries of the world; it is not surprising, therefore, that there are a number of international agreements dealing with the social, economic and employment conditions of agricultural workers; these include various conventions and Recommendations of the International Labour Organization (ILO).

40. Some aspects of conditions of work for rural workers have been considered at Joint ILO/WHO meetings.^{10/} At a WHO inter-regional seminar held in Moscow and Kiev in 1965, health in agriculture was especially emphasized. It was pointed out by the seminar that "there is a need to balance the possible risks to human health from the use of pesticides, against the economic advantages of increased food production".^{11/} The WHO Regional Office for Europe has also held a symposium on occupational hazards in agriculture.^{12/}

Some of the functions of the occupational medical officer

41. The functions of any occupational health service, which should be essentially preventive, have been set forth in ILO Recommendation 112.^{13/} After defining the "occupational health service" and discussing methods of implementation and organization, the Recommendation lists a series of functions, all of which may not be possible, or necessary, to implement in a particular factory:

- "(a) Surveillance, within the undertaking, of all factors which may affect the health of the workers, and advice in this respect to management and to workers or their representatives in the undertaking;

^{10/} Occupational health problems in agriculture: fourth report of Joint ILO/WHO Committee on Occupational Health. WHO technical report series No. 246. Geneva.1962.

^{11/} World Health Organization. Report on the inter-regional seminar on occupational health emphasizing especially health in agriculture. Moscow and Kiev. 16-28 August 1965. Geneva. 1966.

^{12/} Occupational hazards in agriculture. Milan. 7-12 December 1964. WHO. 1965.

^{13/} International Labour Office. Recommendation 112: Occupational health services in places of employment. Geneva. 1959.

- "(b) Job analysis or participation therein in the light of hygienic, physiological and psychological considerations, and advice to management and workers on the best possible adaptation of the job to the worker, having regard to these considerations;
- "(c) Participation, with the other appropriate departments and bodies in the undertaking, in the prevention of accidents and occupational diseases and in the supervision of personal protective equipment and of its use, and advice to management and workers in this respect;
- "(d) Surveillance of the hygiene of sanitary installations and all other facilities for the welfare of the workers of the undertaking, such as kitchens, canteens, day nurseries and rest homes and, as necessary, surveillance of any dietetic arrangements made for the workers;
- "(e) Pre-employment, periodic and special medical examinations - including, where necessary, biological and radiological examinations - prescribed by national laws or regulations, or by agreements between the parties or organizations concerned, or considered advisable for preventive purposes by the industrial physician; such examinations should ensure particular surveillance over certain classes of workers, such as women, young persons, workers exposed to special risks, and handicapped persons;
- "(f) Surveillance of the adaptation of jobs to workers, in particular handicapped workers, in accordance with their physical abilities, participation in the rehabilitation and retraining of such workers and advice in this respect;
- "(g) Advice to management and workers on the occasion of the placing or reassignment of workers;
- "(h) Advice to individual workers, at their request, regarding any disorders that may occur or be aggravated in the course of work;
- "(i) Emergency treatment in case of accident or indisposition and also, in certain circumstances and in agreement with those concerned (including the worker's own physician), ambulatory treatment of workers who have not been absent from work or who have returned after absence;
- "(j) Initial and regular subsequent training of first-aid personnel, and supervision and maintenance of first-aid equipment in co-operation, where appropriate, with other departments and bodies concerned;
- "(k) Education of the personnel of the undertaking in health and hygiene;
- "(l) Compilation and periodic review of statistics concerning health conditions in the undertaking;

"(m) Research in occupational health or participation in such research in association with specialized services or institutions."

42. Unfortunately, some occupational health services leave much to be desired. One important reason is that in the training given at some medical schools, the main emphasis is still on curative medicine, while preventive medicine receives comparatively little attention. One of the results is that few physicians visit the place of employment; this is a pity as such visits often result in poor working conditions being improved.

Medical services for small industries

43. Organizing medical services for small industries is a difficult task, mainly as a result of their size and lack of capital. This is unfortunate, since the statistics in many countries show that workers in these factories have a high rate of occupational disease and accident. There is need for doctors, nurses, safety engineers and hygienists to develop programmes in this respect.

44. The difficulties of establishing medical services are much greater in the case of factories that are geographically isolated.

45. Many different schemes for such services have been tried in various countries. In some cases, legislation requires that medical services be provided on the basis of a sliding time scale, which varies according to the size of the plant. There are examples of factories, situated close together, which co-operate administratively and financially in sharing the facilities of a medical centre and its services. In some countries, when a decision has been taken to set up an industrial estate, the Government has allocated a suitable and centrally located piece of land as the eventual site of a medical service. There are many cases where several small factories exist in the immediate vicinity of a large industry. It may be feasible for these small establishments which have no medical facilities of their own to utilize those of the large factory.

46. Despite the difficulties, the principle that medical services must be partly curative and partly preventive still applies; this was stressed at the 1961 Joint

WHO/ILO Seminar on Health Services in Small Factories. 14/

Legislation

47. While there are limits to the usefulness and value of health legislation by itself, the importance of such measures must not be underestimated.
48. Unfortunately, in certain developing countries, some of the laws dealing with occupational health and safety have been copied almost word for word from legislation in force and in a highly industrialized country; and neither the act nor the regulations are appropriate or relevant to the local conditions. In other instances, the legislation cannot be enforced, for lack of inspectors. Every effort must be made to avoid such mistakes.
49. Legislation should be considered in all cases where significant occupational hazards exist. There is a tendency to think mainly in terms of secondary industries; in view of the potential hazards in the primary industries, this is not sufficient.
50. It is preferable that legal provisions should cover all important aspects of the work environment: the standards of building construction, the installation of local exhaust systems, the provision of adequate wash-rooms, first-aid facilities, etc. In some countries, legislation includes requirements for medical examinations; by means of blood tests, for example, it is possible to prevent injury to health by some chemical.

Reports of Joint ILO/WHO Committees

Occupational health

51. The Joint ILO/WHO Committee on Occupational Health has had five sessions, the most recent one being held in August/September 1966. The agenda were as follows:

14/ Joint WHO/ILO Seminar on Health Services in Small Factories. Dun Laoghaire (Ireland). 8-16 May 1961. WHO Regional Office for Europe. Copenhagen. 1963.

(i) Agenda of first session (1950)^{15/}

Review of the activities of ILO and WHO in the field of industrial hygiene.

Memorandum submitted by the American Federation of Labour suggesting a Joint ILO/WHO investigation of the effects of modern industrial methods on the health and life expectancy of the workers, with a view to the recommendation of preventive measures.

Training in occupational medicine of doctors and auxiliary medical personnel.

Preliminary examination of the possibilities of Joint ILO/WHO action in the field of co-operation between industrial medical services and public health services.

The aims of occupational health were defined by the Committee as follows:

"the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological equipment and, to summarize, the adaptation of work to man and of each man to his job."

(ii) Agenda of second session (1953)^{16/}

Measures of general health protection of workers in places of employment.

Notification of occupational diseases.

Organization of comprehensive health service programmes in large and small plants, and in agricultural enterprises.

Methods of co-operation between public health and industrial health services and of implementation of existing industrial health legislation and standards.

^{15/} The report of this session was not published.

^{16/} World Health Organisation. Second report of Joint ILO/WHO Committee on Occupational Health. Technical report series No. 66. Geneva. 1953.

(iii) Agenda of third session (1957)^{17/}

Training of physicians in the field of occupational health:

- (a) Special knowledge required for occupational health practice;
- (b) Teaching of occupational health.

Scope and organization of occupational health institutes.

Criteria for the recording of medial causes of absenteeism by occupational health services.

(iv) Agenda of fourth session (1962)^{18/}

Public health problems related to agricultural work.

Protection of agricultural workers against toxic hazards.

Protection of agricultural workers against occupational diseases arising from viruses, rickettsiae, bacteria, fungi and parasites.

Organization of occupational health in agriculture.

(v) Agenda of fifth session (1966)¹⁹⁾

Review of existing resources in the field of protection of workers' health in the developing countries.

Consideration of the basic needs and special problems of the developing countries in the field of occupational health.

Characteristics and functions of occupational health services in these countries.

Practical guidance with respect to the organization of such services, with special reference to the role of paramedical and auxiliary personnel.

52. The section in the fifth report dealing with "practical guidance" contains a discussion of such matters as available resources, committees, the role of Government and industries, finance, training and the importance of occupational health laboratories and institutions.

53. While stressing "the need to give due consideration to the numerous social and cultural problems which frequently accompany rapid urbanization and industrialization", the report also emphasizes that occupational health services "must not

^{17/} Ibid. Third report. Technical report series No. 135. Geneva. 1957.

^{18/} Ibid. Fourth report. Technical report series No. 246. Geneva. 1962.

^{19/} Ibid. Fifth report. Technical report series No. 354. Geneva. 1967.

limit themselves only to prevention and treatment of occupational diseases and injuries".

54. Many practical recommendations were made by the Committee with regard to the organization of occupational health services, including the role of paramedical and auxiliary personnel. Attention will be drawn to two recommendations (below).

55. Local Committees: Even when there is an apparent lack of available resources, there are usually a few people who are sufficiently interested in occupational health to endeavour to promote it. If it is possible to set up a committee with these individuals as members, then this group can survey the existing organizations to contact and stimulate other individuals likely to support such efforts. From this modest beginning, which requires little in the way of finance or office accommodation, the committee could retain an advisory role over projects which it has encouraged and perhaps take the initial steps leading towards the establishment of an occupational health institute.

56. Occupational Health Institutes: The vital role of institutes of occupational health was stressed in the Committee. These national establishments are not only the centre and focus of activity, but are also equipped to carry out analyses of the industrial environment. Such analyses are important in extending the scope of inspection. The institutes also enable training to be carried out nationally; they undertake research and provide the knowledge and stimulus for further developments.

57. With the assistance of the Special Fund component of the United Nations Development Programme, the Institute of Occupational Health and Air Pollution Research has been established in Santiago, Chile. The project for equipment of the Central Mining Research Station, Dhanhad, India, was one of the first institutes; the ILO was the agency which executed this project.

Seafarers

58. A similar committee exists for consideration of the health problems of seafarers; four sessions have been held.^{20/}

59. The "health and welfare" of seafarers also constituted the subject of a conference organized in Marseilles by the WHO Regional Office for Europe.^{21/}

The Value of Ergonomics in Occupational Health Programmes

60. Ergonomics - - sometimes called "human engineering" - - first came into prominence 50 years ago; later, during World War II, considerable emphasis was placed on human factors by many military agencies.

61. A main aim of ergonomics is to foster respect for the users of equipment and the operators of processes by defining some of the characteristics of the human being. Ergonomics may thus be described as the systematic study of the design of equipment, processes and environments so that the tasks required of man are within his limitations and make the best use of his abilities. There is much common ground between ergonomics and occupational health.

62. "Human engineering" links technology with the sciences of physiology, anatomy and psychology. The salient feature is the acceptance of the human operator as the frame of reference; any engineering activity will be more healthful, safer and more effective if adequate consideration is given to the human links in man-made systems.

63. It must not be assumed that ergonomics is only, or even mainly, of concern to large industries or highly industrialized countries. In 1963, an ILO Symposium on the Medical Inspection of Labour was held;^{22/} one of its objectives was

^{20/} World Health Organization. Joint ILO/WHO Committee on the Hygiene of Seafarers. Reports on first, second and third sessions. Technical report series Nos. 20, 92 and 224. Geneva. 1950, 1955, 1961.

^{21/} Health and Welfare of Seafarers. Marseilles. 16-21 February 1959. Regional Office for Europe. Copenhagen. 1959.

^{22/} International Labour Office. Report on the International Symposium on the Medical Inspection of Labour, organized by ILO with collaboration of WHO. 19-29 April. Geneva. 1963.

to produce a reference manual which could be used by developing countries in organizing their inspectorate of factories. The Symposium considered that medical inspectorates of factories should concern themselves with human engineering. This recommendation could apply equally to industrialists and planners who should at least ask themselves whether ergonomics can be of assistance either in planning or in the solution of day-to-day problems. Many examples could be given; for one thing, there is no use in importing machines from overseas if their size and design are unsuitable in view of significant differences in the physical stature of the workers who will operate them.

64. Some of the investigation techniques used in ergonomics are also useful in solving certain medical problems; for example, when considering dietary matters in regions where food is not plentiful and where heavy work is also required, it is comparatively easy to measure the "caloric expenditure in oxygen consumption required to perform a given piece of work ... the data ... can be compared with the normal human caloric value which depends on the energy value of the diet". It is thus possible to obtain useful information as to the suitability of work.^{23/}

IV. HEALTH AND SAFETY EDUCATION

65. Few people would question the importance of education in raising the standard of living in any nation. Regardless of whether the general medical services are being set up for a large geographical area or for a factory, due consideration must be given to the education of all concerned.

66. There is merit in educating the general public in the matter of the work environment. The likelihood of a person developing occupational dermatitis is reduced by personal cleanliness; a mother can thus help to "educate" her apprentice son about such matters.

^{23/} International Labour Office. Adaptation of work to man and occupational health problems in countries undergoing industrial development. Occupational Safety and Health Series No. 3. Geneva. 1964.

67. The occupational educational requirements of different trade groups are varied; it requires considerable effort, time and money to formulate and put into practice a good educational programme in this respect. Nevertheless, occupational health and safety methods must be widely taught. Above all, instructing the teachers of tomorrow is important; in the context of occupational health and safety, the word "teacher" must be widely interpreted.

68. Since everybody should be interested in safety and health, the top management, foremen, senior trade union organizers and shop stewards, in addition to individual workers and apprentices, must be actively involved.

69. It is not always possible for a particular nation to have all the experts it needs in this field. In some cases, it may be feasible for several nations to pool their resources, both financial and human, to mutual advantage. This may be the only way to train a nucleus of personnel to be employed locally.

Universities

70. In the future, additional universities will probably be established in many developing countries, and these will probably include specialized departments such as chemical engineering. This is necessary if engineers and other technicians are to be trained not only to operate existing plants but also to assume their role in the future industrial development of their country. Plant, process, production and control engineers, as well as similar personnel, must have a sound knowledge and appreciation of basic health and safety considerations if they are to exert an important influence when a plant is at the drawing-board stage. Safety provisions can be incorporated most effectively, and generally at least cost, at that stage.

71. Similarly, many developing countries will undoubtedly set up, as part of their over-all industrialization programme, engineering colleges and technical institutes; the staffs of these institutions should have an adequate appreciation of the importance of health, safety and welfare. Workers must be given sufficient instruction in safe working methods, not only for their own protection

but as a means of helping to educate their fellow workers. Consciousness of the safety factor must be developed as part of any educational programme, and the earlier the better. Convincing arguments can be advanced for a certain amount of such training as part of the general school curriculum.

Other educational facilities and activities

72. The main functions of small service institutes and industrial development and advisory centres are economic and technical, but the importance of health and safety must be recognized. When advice is being given to actual or potential managers, the opportunity should be taken to stress their responsibilities to both workers and the community. Similar advice should be given to government departments so that health and safety will be taken into account when policies are being framed and programmes drawn up.
73. It is only possible to discuss some of the other available types of occupational health and educational activities and facilities which may be useful in certain circumstances.
74. Such personnel as industrial medical officers, occupational health nurses and industrial hygienists should be enabled, through study tours and attendance at national and international meetings, to see what is occurring in this field in other countries. Even in highly industrialized countries, the number of people actively engaged in occupational health work is not relatively great. Accordingly, it is important to facilitate the interchange of ideas, views and opinions; this requires travel, which involves a considerable sum of money.
75. Many national organizations concerned with industrial standards have been responsible for the preparation of guides and standards on such technical matters as quality control.
76. The value of standards on occupational health matters - for example, on the production of items of personal protective equipment or the recording of data relating to industrial injuries - is also very great. However, drawing up standards is not an easy task; in the case of a "code of practice", the difficulties are

- often less, and sometimes its value is considerable.
77. Because some standards, guide-lines and codes of practice may be suitable for one country but not for another, each nation should consider whether or not it should attempt to produce its own.
78. Field and research workers must keep in touch with appropriate organizations; for example, it is advisable for the industrial doctor to be a member of the local industrial safety association.
79. The value of committees is well known; bringing together, around the conference table, people with different viewpoints often makes it possible to find solutions to difficult industrial safety and health problems.
80. National administrations should be fully aware of the activities of WHO and ILO, since both have contributed a great deal to occupational health.
81. Unfortunately, the cost of technical books and journals has risen greatly, often making it difficult to provide adequate library facilities. An occupational medical officer may be required to advise management or planners on a wide range of hazards in many industries, and the number of chemicals used in factories, on farms and elsewhere is increasing at a rapid rate; easy access to medical and technical reference material is therefore essential.
82. An ILO publication summarizes details on various national courses in occupational safety and health, given in twenty eight countries.^{24/} Training courses in industrial health have been held; for example, one was given in Alexandria in 1959.^{25/}

^{24/} International Labour Office. Directory of courses in occupational safety and health. 1965-1966. Geneva, 1965.

^{25/} World Health Organization. Proceedings of the training course on industrial health. Sponsored by WHO Regional Office for the Eastern Mediterranean in collaboration with Government of United Arab Republic. Alexandria. 27 June-6 August 1959.

83. WHO has arranged several study tours; in fact, its regional office for Europe organized a tour to study the pattern of occupational health in Czechoslovakia.^{26/}

Conferences and meetings

84. Regional conferences have also been organized; for example, such a conference was held in Calcutta, India, in 1958 to discuss the development and organization of occupational health services in South-East Asia.^{27/}

85. Specific aspects of the problem are discussed at symposia. The International Symposium on the Medical Inspection of Labour, which was organized by ILO in collaboration with WHO in 1963, was of particular importance.^{28/} The agenda included:

- (a) The role, functions and responsibilities of the medical labour inspectorate;
- (b) Problems associated with the medical supervision of special groups of workers;
- (c) The training of doctors responsible for medical labour inspection, and the necessary requirements for such training.

86. In addition, many seminars have been arranged to consider various aspects of occupational health. Some have been jointly sponsored by WHO regional offices and ILO; for example, in 1957, the functions of the "nurse in industry" were discussed at a seminar held in London.^{29/}

^{26/} Study Tour on Occupational Health in Czechoslovakia. 23 May-11 June 1960. Regional Office for Europe. Copenhagen. 1961.

^{27/} World Health Organization and International Labour Organisation. Report on Regional Conference on Industrial and Occupational Health. Calcutta, India. 24 November-5 December 1958. (SEA/Occ.Health/2) WHO Regional Office for South-East Asia, New Delhi.

^{28/} International Labour Office. Report on International Symposium on Medical Inspection of Labour. 19-29 April 1963. Geneva.

^{29/} Joint ILO/WHO Seminar on the nurse in industry. London, 25 April-4 May 1957. WHO Regional Office for Europe. Copenhagen. 1957.

87. In 1958, the WHO Regional Office for Europe organized a travelling seminar in England and France.^{30/} In 1962 an inter-regional travelling seminar on occupational health was held in Yugoslavia, the Soviet Union, Finland and Sweden.^{31/}

88. Several WHO publications are of direct interest to industrialists, industrial medical officer, planners etc. The following Public Health Papers come into this category, as shown below.

Public Health Paper No.	Date	Title
6	1961	Ionizing Radiation and Health
13	1962	Aspects of Water Pollution Control
15	1962	Epidemiology of Air Pollution
30	1966	Noise - An Occupational Hazard and Public Nuisance

89. Treatises on health subjects are published in the WHO Monograph Series, and description of health activities appear monthly in the Chronicle. The International Digest of Health Legislation provides details on national laws.

90. Details on ILO publications dealing with occupational safety and health are given in a 1964 booklet.^{32/} Others are listed in a 1965 publication, "Safety and Health of Workers". Past issues of the ILO Panorama have discussed such topics as industrialization and automation. A useful reference document contains a world survey of national law and practice in labour inspection.^{33/}

^{30/} Occupational health in England and France: Report of a travelling seminar. 19 May-7 June 1958. Regional Office for Europe. Copenhagen. 1958.

^{31/} Report of inter-regional travelling seminar on occupational health in Yugoslavia, Soviet Union, Finland, Sweden. September-October 1962. Geneva. 1963.

^{32/} International Labour Office. Publications dealing with occupational safety and health. (D 10, 1964) Geneva. 1964.

^{33/} International Labour Office. Labour inspection: a world survey of national law and practice. Geneva. 1966.

V. RESEARCH IN OCCUPATIONAL HEALTH

91. Although considerable knowledge is available on the effects of work and leisure on man's health, much remains to be determined. While the experience of various countries in regard to this factor can be useful, it must not be forgotten that the findings of one country may not always be applicable to another.

92. An ILO publication stresses that certain industrial medical research might need be carried out when industrialization programmes are being established and that such activities "might even influence the choice of industries to be introduced in a particular area or the choice of ethnic origin of the populations to be recruited."^{34/}

93. Research should be carried out, if possible, by national occupational health authorities. With respect to occupational health, it is best, perhaps, to conduct the research at a well-equipped institute. If there is no such institute, or if the demands on the time and skill of an existing institute are heavy, it may be necessary to enlist the services of a university or private organization.

94. Wherever possible, manufacturing processes should be designed in such a way that the worker is inherently safe regardless of his actions; however, it is not possible to control a hazard at source, and reliance must be placed on the use of personal protective devices. Development of suitable types which workers will use constantly is not always easy; for example, few employees wish to wear protective suits in a hot climate. Accordingly, there may be need for research to be carried out on such matters in various geographical regions.

^{34/} Adaptation of work to man and occupational health problems in countries undergoing industrial development. Occupational safety and health series No. 3. Geneva. 1964.

95. It may be useful if a national medical research council, or equivalent organization, is established to co-ordinate, as far as possible and desirable, the medical activities and to arrange for frequent meetings of individuals working in a particular field of public health to discuss matters of common interest.

Research in ergonomics

96. It is possible to classify ergonomics into two groups, namely, product and production ergonomics. Design of equipment such as machine tools, motor vehicles etc. would come under the first category. Human factors in the design of manufacturing processes where one is more specifically concerned with the relationship of the operator to his work space may be considered in the second category.

97. In the interest of efficiency and health, the anatomical, physiological and psychological abilities of the workers must be taken into account in designing machine tools. When importing or designing machines that will be used in establishing new industries, this equipment must be correctly selected.^{35/}

98. In many instances, a WHO expert committee has pointed out, this may not be possible, unless data is available "concerning the physiological constants of the population in question. These constants, which partly depend on local anthropometric and biotypic characteristics...may be widely different from those on which research has so far been based...It is not enough to transpose blindly data already compiled in the industrialized countries, but steps should be taken to verify...that these data are valid for the groups in question...This research may be further complicated by the fact that in a large number of countries in a formative stage...it will be necessary to enlist the services of workers from different regions belonging to quite dissimilar ethnic groups...These researches do not require costly technical equipment or complicated methods...studies should be made by specialists working in a team...including amongst others physiologists, sociologists, psychologists, engineers and occupational health physicians..."^{36/}

^{35/} United Nations. Economic Commission for Latin America. Report of Symposium on Industrial Development in Latin America. Santiago, Chile. 14-25 March 1966. (ID/CONF.1/R.R.3 - E/CN.12/755/Rev.1).

^{36/} Environmental health aspects of metropolitan planning and development: Report of WHO Expert Committee. Technical Report Series No. 297. Geneva. 1965.



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