

## Basic occupational health services—their structure, content and objectives

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In response to the global challenges to develop occupational health services, the WHO/ILO/ICOH Joint Effort on the Development of Basic Occupational Health Services (BOHS) was launched. A model framework providing guidance in the principles, content, models, and resources of BOHS was drawn up. The ultimate objective of the BOHS initiative is to provide occupational health services for all working people in the world, regardless of the sector of economy, mode of employment, size of the workplace, or geographic location. In this paper, the background for BOHS with respect to policy and public health theory is described, the model infrastructure is elucidated, and the stepwise development, as well as the necessary human resources, are discussed.

**Key terms** developing countries; health; infrastructure; safety; small scale enterprises; universal services.

Occupational health services are available only to 10–15% of the workers of the world. In industrialized countries the coverage varies between 15% and 90%, and in developing countries it ranges between a few percent and 20%. Even where such services are available, their quality and relevance may be low (1–3). The needs for occupational health services are growing continuously, however, and new challenges are continually being set by new developments in the globalization of worklife. To provide a response to such a global challenge, the WHO/ILO/ICOH Joint Effort on the Development of Basic Occupational Health Services (BOHS) was launched (4). A guideline for a model framework has been published jointly by the World Health Organization (WHO), the International Labour Office (ILO), the International Commission for Occupational Health (ICOH), and the Finnish Institute of Occupational Health (FIOH); it provides guidance in the principles, content, models, and resources of BOHS.

The ultimate objective of the BOHS initiative is to provide occupational health services for all working people in the world, regardless of the sector of economy, mode of employment, size of the workplace, or geographic location (ie, according to the principle of universal services provision) (5).

In this paper, the background for BOHS with respect to policy and public health theory is described, the model infrastructure is elucidated, and the stepwise

development, as well as the necessary human resources, is discussed.

### ***Development of policy background for basic occupational health services***

BOHS policy is founded in both the former and current policies of WHO and ILO. WHO started to shape global public health policy by launching the “Health for All” (HFA) strategy in 1977. This strategy spelled out the key target for a global health policy for the rest of the 20th century as follows: “by the year 2000 *all* people in *all* countries should have a level of health that will permit them to lead a socially and economically productive life [p 31]” (6).

In 1978, the policy was further endorsed by the WHO Alma Ata Declaration, which describes primary health care in article VI as follows: “Primary health care is essential health care based on practical scientifically sound and socially acceptable methods. . . . It is the first level of contact of individuals, the family and community with the national health system bringing health care as close as possible to where people live and work. . . . [p 4]” (7).

The WHO global strategy of Health for All by 2000 included several targets for the development of health

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infrastructures and, particularly, primary health care as part of the health system (6). Developing the health system has since been a key element in the strategies. "A health system consists of interrelated components in homes, educational institutions, workplaces, communities, the health sector and other related sectors; action taken within any one component affects the action to be taken within the others [p 39]" (6).

The workplace has been considered an important arena, and occupational health is implicitly the key instrument in the implementation of policies and strategies for health for all in several contexts, in the further development of health systems (7–9), in health promotion (10), in tobacco control (11), in cancer prevention and control (12), in chemical safety (13), and, first of all, in the global strategy on occupational health for all (14).

The objective "for all" has been considered important at all times. In spite of substantial changes in global environments and the new health challenges, the implementation of the Alma Ata principles, the health-for-all objectives of WHO, and the principles and practices of primary health care, universality and equity have remained valid goals for WHO strategies for "Health for All 21" (HFA 21), and for the 11th General Programme of Work for 2006–2011 (15). Furthermore, in the control of new global epidemics, the public health principles proposed by WHO HFA and HFA 21 strategies were found to be the most effective (16).

ILO has paid much attention to the development of international instruments for occupational health services. The first ILO/WHO Joint Committee on Occupational Health in 1950 defined occupational health services and called for actions to develop them for workers. Since then, the Joint Committee has dealt with issues of occupational health services (17) in several meetings. The 13th Joint Committee in 2003 discussed the needs, structures, and content of basic occupational health services as a strategy to expand substantially the global coverage of services, particularly to underserved sectors. BOHS was adopted as a priority for collaboration between ILO and WHO (18).

The 73rd International Labour Conference adopted International Convention No 161 (19) and the related Recommendation No 171 (20). In the 91st and 93rd ILO conferences (2003 and 2005), the Committee on Occupational Safety and Health, in its discussion of the new Framework Convention for Occupational Safety and Health, called for the development of occupational health services as a part of the national program for occupational safety and health (21, 22). ILO emphasizes the development of occupational health services as part of the national occupational safety and health system. The Committee particularly welcomed the idea of BOHS as a starting point for implementing ILO Convention No 161.

WHO and ILO have also developed occupational health services together. The 13th ILO/WHO Joint Decision on BOHS has been jointly implemented at both the regional and country levels in China, Europe, Africa, and Latin America.

The former political decisions constituted a good basis for this action, as BOHS were considered to be an application of the WHO Alma Ata principles on primary health care services in the implementation of the WHO Global Strategy on Occupational Health. Likewise BOHS were recognized as a step towards implementing ILO conventions no 161, on occupational health services, and no 155, on occupational safety and health, and the new ILO Global Strategy on Safety and Health at Work, which was adopted by the 92nd ILO conference in 2004 (21). To provide a response to such a global challenge, *Basic Occupational Health Services: a WHO/ILO/ICOH/FIOH Guideline* was published (4).

### ***Theoretical background of basic occupational health services***

As in the case of primary health care, the theoretical basis for BOHS content lies in the general theory of public health, including health services research (23–26). The main focus is on the elimination, prevention, and control of factors that are hazardous to health in the work environment. The traditional monocausal and mono-outcome settings are still effective in solving several problems, such as diseases caused by microbial agents or by solitary chemical or physical agents. This has also been the traditional approach in occupational health: prevention of contact between the hazardous factor and the worker either through the elimination of the factor or through the protection of the worker against exposure (27).

In the past two decades, the settings in occupational health have become more complex as multifactorial, multimechanism and multioutcome occupational health challenges have been faced (28, 29). A wide spectrum of environmental, organizational, social, and behavioral determinants of workers' health have been recognized and taken as targets of risk management. In addition, promotion of health, work ability, safety and quality of worklife have been included in occupational health programs (30).

In the past few years, social theory has also been applied to public health practices, particularly in view of preventing inequities in both health and occupational health. It has been concluded that both the traditional causal approach and the promotion and development approach need to be considered in modern occupational health (27–29). Basic occupational health, however,

has limited resources and technologies to manage highly complex determinants. Therefore, it needs to concentrate on the most important and critical determinants of health and safety at the workplace (4).

### ***Basic occupational health services as a system for universal service provision***

In line with the principles for universal service provision (USP), the objective of BOHS is to ensure the provision of services for all workplaces in the world (in both industrialized and developing countries) that have not had such services available or the services have not met existing occupational health needs (21). Coverage is needed in all sectors of the economy, including small and medium-size enterprises, the informal sector, agriculture, and the self-employed. BOHS should be provided to all working people irrespective of occupation, type of work contract, or mode of employment and location of workplace (4).

In spite of growing needs of occupational health services as a consequence of rapid changes in worklife and the emergence of new hazards and problems, the coverage is far from complete, and even where services are available their quality and relevance may be low. The most urgent need for the development of occupational health services is particularly in developing countries and in countries in socioeconomic transition. A particular challenge is the growing fragmentation of worklife due to outsourcing, downsizing of production, and fixed- and short-term employment patterns. The number of self-employed workers and workers in micro-enterprises and in the informal sector is growing. In many countries, they constitute the vast majority of the total workforce.

The provision of services to such scattered and often highly mobile clients requires the development of new service provision models, which are adaptable to local conditions, are low in cost, widely cover the workforce, and still meet the quality requirements of occupational health services.

The principle of universality is widely applied in the provision of socially important services related to the satisfaction of basic needs and in ensuring the basic rights of citizens (5). Occupational safety and health constitutes an important part of the basic rights of working people. In modern democratic society, basic rights are ensured equally for each and everyone. The principle of equity can be considered as equity within the whole population if it is the question of services needed by each citizen or within a special subpopulation, as in the case of occupational health services, which are relevant only for the sector of the population that participates in worklife. The principle of USP in the case of occupational health services can be defined as the

following (4): (i) available to all workers during workhours, (ii) accessible to all working people when needed, (iii) equitable in access and availability, (iv) relevant in content in view of needs, (v) acceptable for clients, (vi) effective in the provision of health, (vii) free of charge to workers, (viii) cost-effective in service provision, (ix) guaranteed by public authority, (x) an integrated part of the health system, and (xi) an integrated part of the social policy of worklife. As mentioned, the current global coverage of services is still far from universal. The objective of occupational health services for all implies the expansion of such services from the estimated current coverage of about 600 million workers to 2.8 billion.

A sustainable occupational health service requires an infrastructure. Many countries have not developed a service infrastructure for the whole working population, and it may be difficult, if not impossible, to widen the coverage quickly to all workers. According to the BOHS guideline, every country should analyze its prevailing situation in occupational health services. On the basis of such an analysis, a national strategy and an action program need to be drawn up. To lower the threshold for countries and workplaces to start the development of occupational health services for underserved sectors, a stepwise development program has been proposed by ILO and WHO. The following four stages have been proposed for the program (4); the starting level, basic occupational health services, an international standard service, and, finally, comprehensive occupational health services.

#### *Stage I: starting level*

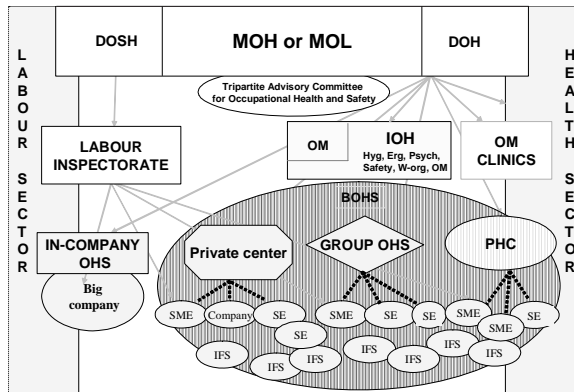
For workers and workplaces without any occupational health services at all, stage I is a reasonable starting point. It comprises services provided by occupational health professionals (if possible, a nurse and a safety expert) who have had some training in occupational health services and who work for a primary health care unit or for a respective grassroots-level facility. The content of service focuses on the most important and most severe health hazards and on their prevention and control.

#### *Stage II: basic occupational health services*

BOHS (stage II) are comprised of infrastructure-based services that work as close as possible with workplaces and communities. The service provision model varies according to local circumstances and needs. The personnel providing these services have been given special training for this purpose.

#### *Stage III: international standard services*

Stage III, comprising international standard services, is the minimum objective for each country, as stipulated



**Figure 1.** The infrastructure system for national occupational health services. The main field of operation for basic occupational health services (BOHS) is indicated by the shadowed circle. [DOH = Department of (public) Health, DOHS = Department of Occupational Safety and Health, Erg = ergonomics, IFS = informal sector, IOH = Institute of Occupational Health, Hyg = hygiene, MOH = Ministry of Health, MOL = Ministry of Labor, OHS = occupational health services, OSH = occupational safety and health, OM = occupational medicine, PHC = primary health care, Psych = psychology, SME = small and medium-size enterprises, SSE = small enterprises, SE = self-employed, W-org = work organization]

in ILO Convention No 161. The service infrastructure has several optional forms and the content is primarily preventive, although also curative services are appropriately provided. The service staff should be led by a specially trained expert (usually a trained occupational health physician), and the team should preferably be multidisciplinary.

*Stage IV: comprehensive occupational health services*

Comprehensive occupational health services, which comprise stage IV, are usually found in big companies of industrialized countries or may be provided by large occupational health centers. The staff works as a multidisciplinary team, often including several specialists (eg, a specialist physician, an occupational health nurse, an occupational hygienist, an ergonomist, a psychologist, a safety engineer, etc). The content of the services is comprehensive, covering all relevant aspects of occupational health.

Stages I and II are primarily designed for the smallest enterprises and micro-enterprises, the self-employed, and the informal sector, none of which have possibilities to start immediately at the international standard level.

**Strategic framework of basic occupational health services as a part of the health and safety system**

Occupational health activities are often implemented as projects with a limited time span. Such projects focus

on one or a limited number of specific problems, such as lead, ergonomics, solvents, and the like. In such projects the impact is also limited to the specific target, while other problems of health and safety or new problems appearing after the project has been completed may remain unaddressed. In order to provide a sustainable occupational health activity for the workplace, the services need to be developed as an infrastructure and as part of the health and safety system. The infrastructure comprises service provision units, facilities for service provision, necessary human resources, and support systems such as secondary level services and information systems.

The systems approach has been emphasized by both WHO and ILO (5–8, 21, 22). Occupational health services are considered a subsystem that is generally integrated into the health and labor sectors. They can be located within the jurisdiction of either health or labor, depending on national law and practice. Both sectors are nevertheless needed in the practical implementation of the services.

The principle of participation is important in any activity concerning health and safety at work. A special tripartite national advisory committee on safety and health is recommended by ILO as a coordinating body for occupational safety and health activities. The committee usually includes the ministry of health, labor, the social partners, employers, trade unions, and possibly several other ministries and sectors. The involvement of all relevant partners in planning and steering occupational health services ensures the effective implementation of programs at the workplace level. An example of a national system for occupational safety and health is given in figure 1. If a sustainable, competent, and continuously developing service infrastructure can be established, BOHS can be given any relevant current or future task at the workplace, and they can also implement projects for specific targets. In most countries of the world, public service will play the most central role in provision of services since market models are not able to ensure universal coverage.

**Content and activities of basic occupational health services**

The content of BOHS has been drawn up with the aforementioned primary health care principles in mind, along with the objective of universal coverage, the WHO Global Strategy on Occupational Health for All, and ILO Convention No 161 and Recommendation 171 (14, 19, 20). The BOHS guideline provides a framework that needs to be adjusted to local conditions and available resources. The document defines BOHS as follows (4): “The Basic Occupational Health Services are an essential service for protection of people’s health at work, for



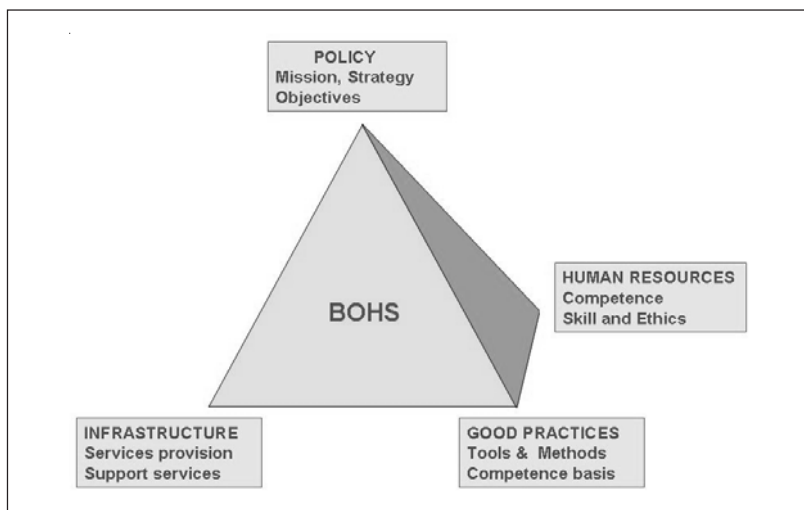


Figure 2. WHO strategy for basic occupational health services.

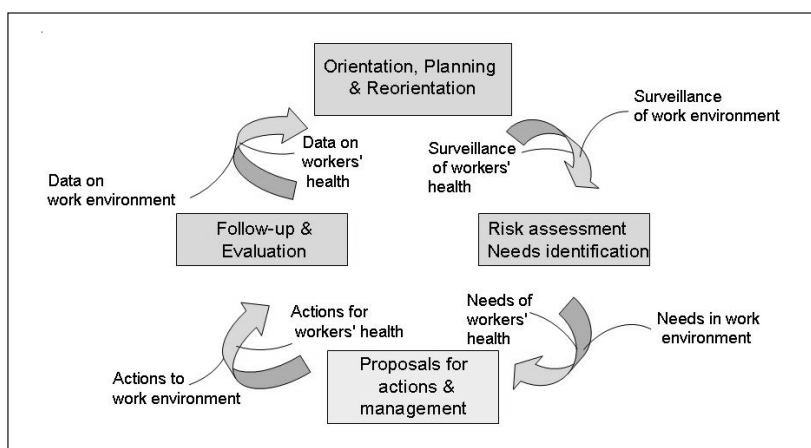


Figure 3. Logical flow scheme for basic occupational health activities [the BOHS (basic occupational health services) cycle].

promotion of health, well-being and work ability, as well as for prevention of ill-health and accidents. The BOHS provide services by using scientifically sound and socially acceptable occupational health methods through primary health care approach [p 5]". [See figure 2.]

In spite of local adjustment, the principles of low costs, and core content, it is important to maintain the competence and scope of occupational health services and to see that they are not compromised. BOHS should be understood as a step towards the development of more comprehensive occupational health services through continuous improvement and development. To reconcile the conflicting principles of parsimony on one hand and competence on the other, prioritization and a focus on the most important problems of health and safety are needed.

BOHS activities are implemented in a logical order, starting with basic orientation and proceeding to the identification of needs, the assessment of risks, proposals for preventive and control actions to employers

and workers, support to employers' and workers' specific actions, and the evaluation of activities on the basis of information collected on the work environment, workers' health, and occupational health activities themselves. The logical BOHS activity model is a modified Deming cycle (4, 31). The logical steps are planning and orientation, identification of health and safety needs with respect to workers' health and the work environment, risk assessment, dissemination of information, initiatives for control and management actions for employers and workers, expert assistance in implementing actions to improve the work environment and workers' health, collection of data, evaluation of occupational health activities and their impact, and, when necessary, actions involving re-planning, development, and correction of services on the basis of evaluation results (figure 3).

Adjusting to the conditions and needs of the workplace may affect the individual steps of the scheme, but the principal logic remains valid everywhere. To ensure

the minimum content of occupational health services, the following core activities are included in the BOHS guideline: (i) orientation to the workplace and the planning of occupational health services, (ii) surveillance of the work environment, (iii) surveillance of workers' health, (iv) assessment of health and safety risks, (v) information and education on risks and advice on the need for preventive and control actions, (vi) accident prevention, (vii) maintenance of first-aid preparedness and participation in emergency preparedness, (viii) diagnosis of occupational and work-related diseases, (ix) general health care, curative and rehabilitation services, (x) record keeping by BOHS on occupational risks, diseases and injuries, (xi) evaluation of occupational health services' own effects and impacts, and (xii) re-planning and necessary actions for the development of services.

Each of these steps needs to be specially guided by well-designed and user-friendly practical guides

(toolboxes) that are produced by the international occupational health community (WHO, ILO, ICOH). The key activities of the individual core steps are given in table 1.

### Service provision models

In general, numerous models for the provision of occupational health services are available, for example, primary health care services, services for big companies, occupational health services for a special sector or trade (agriculture, construction, etc), group services organized jointly by several small and medium-size enterprises, services provided by the social security institution, private health centers, services provided by a private physician with special competence in occupational health,

**Table 1.** Activities of basic occupational health services (BOHS) according to the systematic logic model for occupational health services.

Type of activity	Measures applied and goals
Orientation and planning	<ul style="list-style-type: none"> <li>Analysis of the type of production to indicate the risks and problems typical of the branch or occupation in question</li> <li>Review of problems identified previously in the company</li> <li>Review of the characteristics of the workforce of the company</li> <li>Review of available data on occupational diseases and accidents</li> <li>Collection of data on work methods, chemical substances, and the like</li> <li>Assessment of the knowledge of employers and employees about occupational health problems</li> <li>Planning for changes in production systems (eg, installation of new facilities, machinery and equipment)</li> </ul>
Surveillance of the work environment	<ul style="list-style-type: none"> <li>Identification and evaluation of ergonomic factors that may affect workers' health</li> <li>Assessment of conditions of occupational hygiene and factors, such as physical, chemical, and biological exposures that may generate risks to the health of workers</li> <li>Assessment, where appropriate, of workers' exposure to adverse psychological factors and aspects of work organization</li> <li>Risk assessment of occupational accidents and major hazards</li> <li>Assessment of collective and personal protective equipment</li> <li>Assessment of control systems designed to eliminate, prevent, or reduce exposure</li> <li>Assessment of general hygiene and sanitary facilities</li> </ul>
Surveillance of worker's health	<ul style="list-style-type: none"> <li>Pre-assignment (pre-employment) health examinations</li> <li>Periodic health examinations</li> <li>Return-to-work health examinations</li> <li>General health examinations</li> <li>Health examinations at termination or after ending of service</li> </ul>
Assessment of health and safety risks	<ul style="list-style-type: none"> <li>Identification of occupational health hazards (as a result of surveillances)</li> <li>Identification of workers or groups of workers exposed to specific hazards</li> <li>Analysis of the effects of a hazard on workers (ways of entry, type of exposure, threshold limit values, dose-response relationships, adverse health effects, etc)</li> <li>Determination of intensity (level) and magnitude (volume) of risk</li> <li>Identification of workers and groups with special vulnerabilities</li> <li>Evaluation of available hazard prevention and control measures</li> <li>Drawing of conclusions about and making recommendations for the management and control of risks</li> <li>Documentation of the findings of the assessment</li> <li>Periodic review and, if necessary, reassessment of risks</li> <li>Documentation of the results of risk assessments</li> </ul>
Information and education on risks and advice on need for preventive and control actions	<ul style="list-style-type: none"> <li>Ensuring that employers and self-employed persons are aware of their obligation to know the hazards of the workplace and works in question</li> <li>Provision of information so that workers are aware of their right to know about and continuously receive information on hazards related to their own work and the workplace</li> <li>Ensuring that employers are aware of their responsibility to train workers in safe and healthy work practices</li> <li>Ensuring that workers are aware of their duty to follow safety instructions and safe and healthy work practices</li> <li>Ensuring that special legislation is followed with respect to confidential health information on individual workers and informed consent</li> <li>Ensuring that advice provided by occupational health personnel is given in a form easily understood by employers and workers</li> </ul>

(continued)

Table 1. Continued.

Type of activity	Measures applied and goals
Preventive actions for the management and control of health and safety hazards and risks	Control of hazards at the source Ventilation or control technology Dust control Ergonomic measures Use of personal protective equipment Regulation of thermal conditions and the like
Prevention of accidents	Safe planning of facilities, machinery, and the like Good housekeeping, order and cleanliness Construction of walkways and other structures safe (eg, scaffolds, fences) Guarding dangerous machines Technical aids for moving and lifting heavy loads Safe tools and safety equipment for workers Analysis of major hazard risks and provision of "redundant safety"
Maintaining first-aid preparedness and participation in emergency preparedness	Provision of first-aid services at the workplace when appropriate Introduction to and training in first-aid practices for workers and supervisors Maintenance and periodic inspection of first-aid readiness and facilities Participation from the health point of view in emergency planning and in organizing the health elements of emergency response
Diagnosis of occupational and work-related diseases	Identification of exposure that may cause the disease Examination of clinical findings known to be associated with the specific exposure Exclusion of nonoccupational factors as a possible cause of disease Conclusion on existence or nonexistence of occupational disease (diagnosis) Statement on occupational disease for workmen's compensation Proposals for preventive actions to the workplace of the worker in question Notification of occupational diseases to authorities
General health care, curative and rehabilitation services	Immunizations and other preventive measures Participation in public health actions and programs General-practitioner level of general health services Inspection and advice on canteens and sanitary facilities Advice and education in general hygiene for personnel and the work community General health promotion and introduction of a healthy lifestyle Rehabilitation and advice on return to work
Record keeping	Maintenance of general health records if workers are treated as patients or health service clients Collection of data on surveyed, detected, and measured occupational exposures and risk assessments Collection of statistics on occupational diseases and injuries Collection of data on health examinations Preparation of documents on proposals for preventive and control measures
Evaluation	Self-auditing of content of the services Analysis of data on work environment surveillance, exposures, results of health examinations, statistics on occupational diseases and accidents Analysis of trends of key indicators (exposures, accidents, diseases, sickness absenteeism) Analysis of performance of services (in view of preset objectives) Identification of needs to modify and develop services

and services provided by local or regional outpatient clinics of hospitals.

Different types of enterprises and various groups of workers need to be provided with different models of service provision. For example, big enterprises are served by totally different mechanisms than self-employed people are. Some typical characteristics of various models are presented in table 2. There may, however, be remarkable deviations from this assessment in individual cases. For example, services provided by universities or regional hospitals for small and medium-size enterprises in Sweden are multidisciplinary, competent, and highly effective in both their prevention and curative activities. Due to the need for services to be as close as possible to the widely scattered client workplaces, which cannot necessarily cover the costs of their services, only a few of the models can be applied in

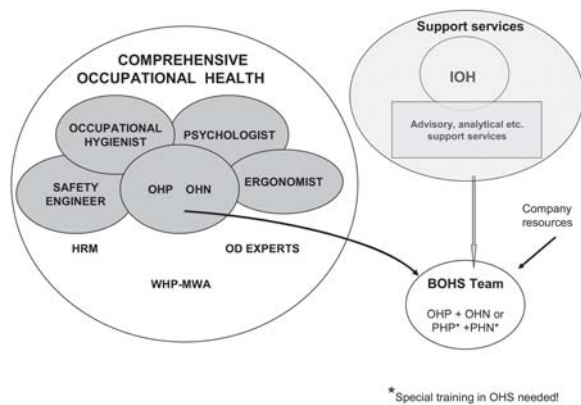
providing BOHS. The challenge is due to the increasing fragmentation of enterprises, the growing mobility of workers, and the growth in the number of small-scale enterprises and the self-employed. Agriculture and the informal sector have always provided a great challenge to service organization. As no country has thus far solved the problem of serving such a fragmented field, new innovative models need to be developed for service provision.

Experience on the national level speaks in favor of applying several models in providing occupational health services in general. BOHS are the most likely to be provided by primary health care units or some kind of group services that are likely to operate in a defined geographic area (27, 28).

The WHO/ILO/ICOH/FIOH guideline (4) emphasizes the need for the public sector in steering the use

**Table 2.** Feasibility of the various occupational health service models for various types of clients (29). (- = not available, weak; + = available, modest; ++ = well available, good; +++ = very well available, very good; +/- = in major part of units +, in smaller part -; +/-+ = in major part of units +, in small part ++; ++++ = in major part of units ++, in smaller part +; IS = informal sector; SE = small enterprises; SEE = self-employed; SME = small and medium-size enterprises)

Model	Typical field of application	Size category of enterprise	Multi-disciplinary staff	Specific competence in occupational health services	Capacity to make an impact	Integration with safety services	Integration with health sector	Cost-effectiveness
In-plant services	One company	>500 employees	+++	+++	+++	+++	+/-	+++
Trade or branch services	One sector or branch of economy	All sizes	+++	+++	+++	+++	+/-	+++
Group services	Numerous enterprises with various types of activities	SME, SE	++/+	+++	++	++	+/-	+++
Primary health care unit	Numerous types of SME or nonenterprise workers	SME, SE, SEE, IS	+/-	++/+	+	+/-	+++	+
Private occupational health centers or "chains"	Numerous types of enterprises	SE, SME, big enterprises("chains")	++	++	+	+	+/-	+++
Private physicians or family doctors	Numerous types of enterprises	SME	-	+/-	+/-	-	+/-	-
Local or regional hospitals	Numerous types of enterprises	SME, SE	-	+//+	+/-	-	+++	+



**Figure 4.** Model for organizing human resources for basic occupational health services (BOHS). (HRM = human resources management, IOH = institute of occupational health, OD = organization development, OHN = occupational health nurse, OHP= occupational health physician, OHS = occupational health services, PHN = primary health care nurse, PHP = primary health care physician, WHP-MWA = workers' health promotion-maintenance of work ability).

of various models and in the provision of services for underserved sectors, particularly for small enterprises, agriculture, the informal sector, and the self-employed.

**Human resources for basic occupational health services**

Optimally, occupational health services are provided by a multidisciplinary team (figure 4). In most countries, the availability of specialists in occupational health and occupational health nursing cannot be guaranteed in the near future. Even less available are other members of

the multidisciplinary team. If available, specially trained occupational health experts should be used. Often specialists are not available, however. BOHS cannot be provided without sufficient professional competence in occupational health. Therefore the genuine implementation of BOHS needs an extensive training program for the personnel providing such services. A postgraduate course of 10 weeks has been proposed in some countries as a minimum for achieving such competence. The more versatile and the larger enterprise being served, the more specialized the occupational health competence should be. An experience-based estimate speaks for a minimum need of one physician and two nurses per 5000 workers, the number varying greatly depending on the branch of industry, the size of the workplaces, and the geographic distribution. Public authorities are responsible for ensuring that such a resource is available, and its competence is regularly updated in every country. A multidisciplinary approach in occupational health services is emphasized in international guidance, as practical problems cannot be solved with the competence of one profession only. As BOHS staff is more monodisciplinary than the optimal multidisciplinary team, the services provided should be supported by second-level support with respect to analyses, measurements, special advice, and the diagnosis of occupational diseases (figure 4).

Such support can be provided by institutes of occupational health, universities, insurance companies, hospitals, private consultancies, and the like. In Finland, municipal health centers are responsible by legislation for providing occupational health services for enterprises and self-employed persons operating within the jurisdiction of the municipality (32). The municipal



health centers' occupational health units provide services for 600 000 workers (32% of the workforce and 61% of the enterprises). The content of such services is stipulated in the Occupational Health Services Act and varies substantially according to the nature of the workplace (eg, agriculture versus construction site versus office work).

Rough estimates of the availability and density of various occupational health experts in occupational health units of Finnish municipal health centers is given in table 3 (32, 33). The questionnaire study on which these data are based found that, among municipal providers of occupational health services, resources were too limited and multidisciplinary experts were lacking.

### Financing

According to ILO Convention No 161 (19), on occupational health services, the financial responsibility for providing such services rests on the employer. As the ability of small enterprises, the self-employed, and, particularly, enterprises and workers in the informal sector to buy external services is poor or nonexistent, often the only possible provider of services is the public sector (ie, primary health care units, public polyclinics, or social security organizations). The ILO Strategies and Tools against social Exclusion and Poverty (STEP) program is currently experimenting with the provision of general health services on the basis of the insurance system in many developing countries. BOHS should be included as part of such development. For the currently large groups that are underserved, the only realistic possibility for service financing is the public sector (34).

In Finland, the costs of occupational health services provided by municipal health centers were USD 25 for preventive activities and USD 49.2 for curative activities per covered worker per year (ie, a total of 74.2 USD per covered worker a year in 2001) (33). Most of the costs consist of salaries of the occupational health personnel. As salary levels in most developing countries are substantially lower than in Finland, the costs per covered worker in developing countries may be on the order of 20 USD per year, and for preventive activities alone about USD 5 a year.

### Actors in the organization and development of basic occupational health services

Organizing occupational health services requires collaboration between numerous partners, even from several jurisdictions of administration. If any impact is to be attained in practice, collaboration is needed, along with participation by social partners at both the national and workplace levels. All of the partners have their special roles and responsibilities in organizing and implementing services or in providing support to service providers. Some of such partners are (i) special government agencies in occupational safety and health and the health sector, (ii) provincial and local municipal authorities, (iii) social partners, employers' organizations and trade unions, (iv) branch organizations and chambers of commerce, (v) associations of agricultural producers and small enterprises, (vi) associations of occupational health professionals, (vii) safety representatives of local workplaces and communities, (viii) the ministry

**Table 3.** Density of human resources available for occupational health services in Finnish primary health care units. (NA = data not available)

Profession	Total number	Availability (for % of served workforce)	Density	
			Number of workers per staff member	Number of workers per staff person-year
Physician	457	99	2 250	7 312
Nurse	646	100	823	1 253
Physiotherapist	253	97	2 765	3 721 <sup>a</sup>
Psychologist	93	47	6 602	NA
Occupational hygienist	6	5	- <sup>b</sup>	NA
Technical expert	28	20	-	NA
Agricultural expert	278	88	143 <sup>c</sup>	NA
Optician	16	13	-	NA
Nutrition therapist	16	13	-	NA
Assisting personnel	823	100	2 180	NA
Total	2 616	-	374	-

<sup>a</sup> Assuming 50% on full time basis and 50% on 1/3 part-time basis.

<sup>b</sup> Calculation of density not relevant due to low absolute numbers.

<sup>c</sup> Calculated for 40 000 farmer clients.

of agriculture and the ministry of industry, and (ix) universities and other educational settings.

The roles of the government, the employers, the workers and their organizations, and the service provision professionals are the most important among the actors. The ultimate responsibility to ensure that occupational health services are organized, funded, and provided rests on the government and its competent authority (19, 20).

### Concluding remarks

The need for occupational health services is greatest in countries and sectors that do not have services at all or that are seriously underserved. Particularly high-risk sectors such as agriculture, mining, fishery, forestry, and construction have the highest risks, but the least developed services, in developing and rapidly industrializing countries or those in transition.

Governments, in collaboration with social partners and with the support and guidance of international organizations such as WHO and ILO, should strengthen their policies and clarify priorities in the development of service infrastructures. To ensure balanced development, a long-term national program should be drawn up for occupational health services in each country, and the objective should be the stepwise development of services, starting with those whose needs are the most evident and gradually expanding to cover and develop the content to meet the requirements of ILO Convention No 161. Such a national program is also considered to be an important element in the overall social and economic development of every country.

The BOHS approach, launched by the 13th ILO/WHO Joint Committee on Occupational Health, is based on the principles of the long-term global strategies and underlying public health and prevention theories and policies of WHO and ILO, including the systems approach, the basic principles of public health, primary health care, primary prevention, and social partnership. Ultimately, it calls for the implementation of the principles of universal service provision and equity. The BOHS model is provided as a framework, and it will be equipped with appropriate good practice guidelines for the development of occupational health services for all working people, particularly for those with the most urgent needs.

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