Development of first and second versions of a framework of themes on BOHS.

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On page 4 a short addition has been added (1 November 2025) explaining the relation of the second version of the framework (2024) with the final list of 14 themes and 61 topics applied in the second edition of the Repository for Publications on Basic Occupational Health Services and similar initiatives (2025). See https://ldoh.net/ .

On page 27 a concise addition has been added (1 November 2025) referring to the second edition of the Repository for Publications on Basic Occupational Health Services and similar initiatives (2025) to facilitate access to descriptions and links to publications used in a pilot study. See https://ldoh.net/ .

Content

1. Background

Information on key factors for the development of BOHS

For the future development of BOH, a clear vision is needed and an outlined policy. Reliable information on key factors or levers for the development should not be missed. Apart from that, it is important to know the status quo in different countries and to learn from analyses in studies. In countries where BOHS and similar innovations started as experiments, pilot-study, or as a nation-wide innovation, we can learn from monitoring systems and evaluation studies. Other publications can inform us by international comparisons.

Information on BOHS development can be found in a large variety of publications such as in reports published by individual experts or (inter)national institutes, abstracts or summaries of lectures, contributions in proceedings, or chapters in a book, or even in websites. Of course, valuable information can come from scientific studies, mostly focusing on specific questions.

However, information on the development of BOHS is often difficult to find, among others caused by different names given to innovations in primary of public health care promoting workers' health. Using different search strategies, we could find almost 200 publications about BOHS or on topics directly of interest for the promotion of BOHS and similar innovations in health care. These publications were included in a free accessible repository of records including descriptions and references to publications on BOHS. The repository has been published in 2022 (first edition).[1, 2]

Still, many questions cannot be answered caused by the low number of studies. Universities, institutes, governments and (inter)national organizations should invest more in studies dealing with the problem of poor occupational health care coverage for vulnerable worker populations.

Classification of information

A collection of almost 200 publications is not easily accessible for a user. Classification or arranging the information found in publications has several advantages. One is the creation of better accessibility to a collection when a user is interested in one or a few aspects, e.g. how to finance BOHS, or how to educate occupational health nurses. The user can be an international organization, a government or NGO eager to learn from experiences in other countries. Another user can be a scientist looking for adequate methodologies. But also, students and policy developers interested in an overview of BOHS development in various countries can benefit from a classification e.g. offering access to publications dealing with one country. In conclusion, a framework of themes can facilitate better understanding of BOHS policies and practice.

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[1] Van Dijk FJ, Moti S. **A Repository for Publications on Basic Occupational Health Services and Similar Health Care Innovations.** Saf Health Work. 2023; 14:50-58. Free article. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10024225/.

[2] Van Dijk FJ, Moti S. **Repository for publications on basic occupational health services and similar innovations in the world.** Leiden: LDOH Foundation; 2022.
The free concise (Index) version is to download from
https://ldoh.net/wp-content/uploads/2022/10/Index-of-Repository-BOHS.-14-Sept-2022-df.pdf
The free complete version is to download from
https://ldoh.net/wp-content/uploads/2022/10/Repository-BOHS.-14-Sept-2022-df.pdf.

2. Framework of themes on BOHS, short history of the development

A first version of a framework of themes

We are especially interested in information on themes that are vital for the progress of BOHS. For a classification of information relevant for the development of BOHS, we created in 2024 a first version of a framework of 17 themes, based on our knowledge of the publications in the repository for BOHS representing a large variety of countries and the most authorative international organizations. We used for these themes first a scheme of **four development stages** for BOHS:

1. Start of BOHS from needs to solutions in **experiments, plans and discussions** about new national policies, new regulations and legislation, etc. There is a **need for basic data/information** e.g. on risks and health consequences showing the need for new solutions as awareness can be raised much easier when sufficient information is available.

2. Development of new structures, legislation, implementation. From poor to wide coverage, from limited tasks to a more comprehensive package of tasks.

3. Good quality of input (e.g. service package, staff composition, competencies**), processes** (e.g. appropriate health care activities delivered, good quality of the activities)**, output** (e.g. satisfaction with care, number of risk assessments) and **outcomes** (e.g. improved working conditions, better health of workers, fewer or shorter sickness absences and less personnel turnover).

4. Good supporting infrastructure: education, online support, support by regional or national OH or OSH expertise and reference centres. A referral system for complex diseases or worksite situations.

We also tried to specify for each theme what *frequent challenges* are in practice, noted in the publication, and which (if any) *recommendations and solutions* were proposed. See for this scheme A**ppendix 1**: First steps, development of the first version framework of themes on BOHS.

In a pilot study, described in **Appendix 2,** we tested five of the 17 themes (sometimes subthemes) from the draft first version with the question if sufficient publications could be found fitting within these 5 themes, which could produce useful information for the development of BOHS. In a quick non-exhaustive search, we could find easily 22 publications fitting in at least one of the selected five (sub)themes. We concluded exploratively that the draft framework is applicable and apparently useful.

Later, to improve feasibility, we reduced the number of themes from the original 17 themes in the draft version to 9 themes in the definitive first framework of themes (*Ch. 3, Box 1*). In Ch. 3 the development of the first version is presented in more detail.

A second version of a framework of themes, after integration with a WHO framework

In a next step, we compared this first framework with an existing framework tailor-made for the development of integrated primary health care, published by WHO in 2020 *(Ch. 4 and 5)*. The comparison was considered an opportunity to improve our framework, and to explore options for aligning our framework with that of WHO. We improved our framework by adopting and modifying four so-called strategic themes from the WHO framework. Several so-called operational levers of the WHO framework were adopted as well as themes, after modification. Many themes of the framework of themes for BOHS were maintained although several titles and parts of the descriptions were adapted. The definite second version of the framework of themes contains 11 themes *(Ch. 6).*

Addition added on 1 November 2025, derived from the second edition of the Repository (2025) (chapter 5).

"However, this framework (second version, 11 themes, 2024) was not developed for a more detailed search in a large collection of sources. Therefore, in addition, a list of 61 more detailed topics has been developed in a reiterative process based on an exploration of 140 publications in the repository stemming from different sections and publication years. See List D and List E in chapter 7.2 (second edition of the repository)."

"Finally, the list of 11 themes has been adapted slightly, resulting in a final list of 14 themes, see List C and List E (second edition of the repository)."

For the second edition of the repository (2025) see https://ldoh.net/ .

3. First version framework of themes on BOHS

For the classification of findings in publications we created a framework of themes that can have a key significance for the development of basic occupational health services.

The first draft version was based on knowledge of the international literature on basic occupational health care needs and solutions collected in our repository for BOHS publications (almost 200 publications). Four stages in BOHS development were used for the classification: a first stage before the start of a BOHS innovation, followed by the stage of BOHS development and implementation, next the stage with a main accent on quality development, and finally a stage accentuating the infrastructure needed. Within these stages we distinguished 17 themes (**Appendix 1).**

From this draft framework we tested the feasibility and usefulness of five of the 17 themes in 20 publications. The test confirmed the feasibility and usefulness (**Appendix 2)**. All 22 selected publications could be assigned to one or two themes. Even when admitting that the selection of the publications was not random, the test showed in an explorative way the feasibility and usefulness of a selected number of themes in this framework.

On the other hand, the number of 17 themes was considered too large in retrospection, so we decided to reduce this number. A second consideration was to decrease the complexity of the draft framework through departing from the concept of four development stages because many themes were considered valid in different phases of development.

So, we simplified the framework by reducing the number of themes from 17 to 9 ‘key themes’ and left out the concept of development stages as an ordering concept. The resulting framework (version 1) is presented In box 1.

1. **Availability of reliable information**
   Reliable information for workers, enterprises and general public, about risks and injuries/adverse health effects in vulnerable populations (e.g. informal workers), and availability of forms of occupational health care. A good overview of publications can show shortcomings in availability of crucial information.
2. **Public and stakeholders' awareness**
   Public and stakeholders' awareness about (1) risks and injuries/adverse health effects e.g. for informal workers, and (2) poor or lacking availability of adequate health care. More awareness is needed to boost innovation in primary and occupational health care.
3. **Experiments and discussion on legislation, innovation, and financing**
   Experiments in BOHS are described in reports and studies. Papers show discussions and plans for new legislation, regulations, a national policy and strategy, also including financing.
4. **Tasks for BOHS and options for BOHS organization**
   Tasks and models for BOHS organization are described and discussed. A participatory approach is essential, involving workers' communities and regional enterprises.
5. **Legislation and regulations, financing structures**
   New legislation and regulations are developed and functioning, including financial structures.
6. **BOHS staff and volunteers**
   The need for a custom-made variety of professional disciplines and volunteers, with good competences and engagement with occupational health. Important is education and training of staff and volunteers, and good management.
7. **Coverage**
   Coverage of underserved workers' populations. There is a lack of adequate health care facilities resulting in low coverage of informal workers, workers in agriculture and fishery, workers in small enterprises, remote workers, self-employed, illegal workers, sex workers, artisanal miners, female, migrant and indigenous workers.
8. **Quality of care**
   Quality on the level of input, process, output and outcomes. Aspects are effectiveness, safety, people-centeredness, timely actions, and an equitable, integrated and efficient performance.[1]
9. **Adequate infrastructure**
   Key aspects are:
   - Good education and training facilities for all practitioners, students, volunteers
   - National and regional expertise centers and online facilities supporting BOHS
   - A referral system to diverse OSH experts (hazard and risk assessment, preventive solutions), and to medical specialists/technical/laboratory experts with expertise in occupational health.
   - Research and development support

Box 1. First version of the Framework with nine (key) themes for the development of BOHS.

After finishing the first version of a framework, a new perspective was opened by the finding of an existing framework of themes focused on the development of primary health care, established by the WHO in 2020 (chapter 4). In chapter 5 is the integration explained of this WHO framework in our draft framework on BOHS, with the aim to align both approaches without losing attention for the added value of our explorations mainly based on the literature for BOHS.

4. WHO framework for development of primary health care (2020)

WHO developed a framework for the development of primary health care (2020).[3] The development of an integrated primary health care is considered necessary for the realization of universal health care coverage. Primary health care should be adequate, effective, high-quality, and well-accessible for all, without financial hardship. We agree with this vision.

WHO described first four so called **core strategic levers**. We present quotations from this WHO report.

1. **Political commitment and leadership**
   Political commitment and leadership that place PHC at the heart of efforts to achieve universal health coverage and recognize the broad contribution of PHC to the SDGs.
2. **Governance and policy frameworks**
   Governance structures, policy frameworks and regulations in support of PHC that build partnerships within and across sectors, and promote community leadership and mutual accountability.
3. **Funding and allocation of resources**
   Adequate funding for PHC that is mobilized and allocated to promote equity in access, providing a platform and incentive environment to enable high-quality care and services and to minimize financial hardship.
4. **Engagement of community and other stakeholders**
   Engagement of communities and other stakeholders from all sectors to define problems and solutions and prioritize actions through policy dialogue.

In addition, WHO defined another ten so-called **operational levers** (quotations from WHO report).

5. **Models of care.**
   Models of care that promote high-quality, people-centered primary care and essential public health functions as the core of integrated health services throughout the course of life.
6. **Primary health care workforce**.
   Adequate quantity, competency levels and distribution of a committed multidisciplinary primary health care workforce that includes facility-, outreach- and community-based health workers supported through effective management supervision and appropriate compensation.
7. **Physical infrastructure.**
   Secure and accessible health facilities provide effective services with reliable water, sanitation and waste disposal/recycling, telecommunications connectivity and a power supply, as well as transport systems that can connect patients to other care providers.
8. **Medicines and other health products.**
   Availability and affordability of appropriate, safe, effective, high-quality medicines and other health products through transparent processes to improve health.

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[3] WHO and UNICEF. **Operational framework for primary health care: transforming vision into action.** Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2020. https://www.who.int/publications/i/item/9789240017832 (open access, free accessible)

9. **Engagement with private sector providers**.
   Sound partnership between public and private sectors for the delivery of integrated health services.
10. **Purchasing and payment systems**.
    Purchasing and payment systems that foster reorientation in models of care for the delivery of integrated health services with primary care and public health at the core.
11. **Digital technologies for health.**
    Use of digital technologies for health in ways that facilitate access to care and service delivery, improve effectiveness and efficiency, and promote accountability.
12. **Systems for improving quality of care.**
    Systems at the local, subnational and national levels to continuously assess and improve the quality of integrated health services.
13. **Primary health care-oriented research.**
    Research and knowledge management, including dissemination of lessons learned, as well as the use of knowledge to accelerate the scale-up of successful strategies to strengthen PHC-oriented systems.
14. **Monitoring and evaluation.** Monitoring and evaluation through well-functioning health information systems that generate reliable data and support the use of information for improved decision-making and learning by local, national and global actors.

We consider the framework of WHO as an important source of inspiration. At the same time, it would be not wise to disregard unique aspects of the development of BOHS found in our explorations, for an important part based on the publications found and on experiences in own studies, lectures and discussions. Chapter 5 shows how we integrated the WHO approach in our work for a framework of themes on BOHS, without losing due attention for the unique aspects found for BOHS.

5. Developing second version framework of themes on BOHS, integration of levers (themes) from WHO

5.1 Four strategic levers (themes) of WHO framework integrated into second version framework

We consider the four core strategic levers for the development of primary health care described by WHO as equally valid for the development of BOHS. We added for each of these four levers first a short comparison with the framework of themes for BOHS, and next we created a new description aligning with the WHO description and with development-specifics of BOHS.

Lever 1 Political commitment and leadership
This lever corresponds only partly with theme 2 Public and stakeholders' awareness, as the accent in the WHO paper on political commitment is clear. We agree with accentuating the political commitment and developed accordingly a new strategic theme in the BOHS framework.

New strategic theme 1 'Political commitment and leadership'.
Political commitment and leadership placing BOHS as part of primary health care, at the heart of efforts to achieve universal occupational health coverage. BOHS provisions are needed to supplement expert-based occupational health services and specialized occupational health care in hospitals.

Lever 2 Governance and policy frameworks
This lever corresponds partly with three themes described to foster BOHS: *theme 3* including plans for new legislation, regulations and innovations, *theme 4* describing tasks and options for BOHS organization, and *theme 5* on legislation, regulations and financial structures.
We decided to add lever 2 as a *new strategic theme 2* to the framework for BOHS. We added the topic 'legislation and regulations' to this theme based on the strong ties between funding and new legislation or regulations.

New strategic theme 2 'Governance and policy frameworks inclusive legislation and regulations'
Governance structures, policy frameworks, legislation and regulations in support of BOHS that build partnerships within and across sectors such as the health, labor, agriculture and education sectors, and promote community leadership and mutual accountability in health care, workers' communities and enterprises. Public health or social security legislation and financing are needed given the lack of awareness, capacities, and financial resources in most underserved workers' populations

Lever 3 Funding and allocation of resources
This lever corresponds partly with theme 5 on legislation and regulations, financial structures. Nevertheless, we decided to add this strategic lever to the framework as a new strategic theme because funding is an essential issue.

New strategic theme 3 'Funding and allocation of resources'
Adequate funding for BOHS should be mobilized and allocated to promote equity in access, to provide a platform and incentive environment enabling high-quality care and services and minimizing financial hardship. Funding might come from several resources: labor (social security contributions, high-risk branches of industry, enterprises, unions), health care (health care insurance contributions), national and local government. A good balance between horizontal and vertical integration is needed.

Lever 4 engagement of community and other stakeholders
This lever corresponds largely with BOHS theme 2 on public and stakeholders' awareness. We adopted this lever as a new strategic theme.

New strategic theme 4 'Engagement of community and other stakeholders'

Engagement of communities and stakeholders from all sectors involved to define problems and solutions and prioritize actions through policy dialogue. Health care organizations such as expert-based occupational health services, and 'labor' organizations such as social security bodies and labor inspection should be involved in the development of BOHS. Further, depending on local conditions, commitment of stakeholders such as government, enterprises, workers. And engagement of sectors such as agriculture, mining, health care, and education. In this way WHO **lever 9** on engagement with the private sector has been integrated as well.

5.2 Ten operational levers (themes) of WHO framework integrated into second version framework

When the new four strategic themes are incorporated in a renewed framework for BOHS, the first next step is to screen the other themes in the draft framework BOHS on redundancy. The new strategic theme 2 on 'governance and policy frameworks inclusive legislation and regulations' will lead to a reduction in content of old theme 3. Next, a merger of the old themes 3 and 4 seems logical. The title of the new theme 3 is 'Experiments, tasks and activities in BOHS'.

The old theme 5 'Legislation and regulations, financing structures', can be taken out as new legislation and regulations were added to the new strategic theme 2. The old theme 2 can be taken away, given the overlap with the new strategic theme 4.

In summary, the old themes 2, 4 and 5 are taken off.

The **old theme 1** Availability of key information on risks, health effects and lack of care for vulnerable (workers') populations is not mentioned as (part of) a WHO lever. However, good information is needed for the creation of public and political awareness. In primary health care in general, sufficient information may already exist, although such might not be true in all cases. Information about hazards and risks and related solutions is surely not common in many countries and relations between health and work are very often missed in general health care. Occupational health is still missing in many medical curricula. We decided to maintain this theme for BOHS development as the new theme 5.

The **old theme 3** Experiments, discussions on legislation, innovation, and financing, overlaps partly with the new strategic themes and has been restructured and renamed as 'Experiments, tasks and activities in BOHS', now also including most of old theme 4. The terminology in **lever 5** Models of care can be used for a wider description in the new theme 6. The need to stimulate experiments in BOHS is missing in the WHO list. However, lack of visibility in primary health care and in medical curricula can be a good reason to organize experiments for occupational health such as known from the BOHS literature. We decided to maintain the topic of experiments as the new theme 6.

The **old theme 6** BOHS staff and volunteers, corresponds well with WHO **lever 6** Primary health care workforces. Terminology has been updated using parts of WHO terminology. The new theme has the number 7.

The **old theme 7** Coverage. Achieving universal health coverage is the central aim in WHO strategic lever 1 on political commitment and leadership. In strategic **lever 3** the theme of accessibility is addressed. We added the topic accessibility to the maintained old theme 7, changing the number in theme 9.

The **old theme 8** Quality in performance, corresponds with the aims of WHO **lever 12 '**Systems for improving the quality of care'. In the new theme 6 'Experiments, tasks and activities in BOHS', we added the need for a structural periodic evaluation of BOHS e.g. on completeness of tasks, quality, coverage, benefits & costs. We maintained the theme on quality as the new theme 10.

The **old theme 9** Adequate infrastructure is not present as topic in the framework of WHO. Similarly, there is no attention for a referral system, possibly because referral options were regarded self-evident in health care. However, referral systems to medical specialists educated in occupational health are only available in few, mostly high-income countries, and even there, medical specialists educated in occupational health are scarcely available. The same holds for support of BOHS by OSH experts. We decided to maintain the theme on infrastructure as the new theme 11.

5.3 Operational WHO levers for PHC still missing in the BOHS framework of themes

Seven operational levers of WHO are not or only partly present in the framework of themes for BOHS so we need to decide if we would like to include these levers as new themes, or as a topic within an existing theme, and how to do so.

Lever 7 on Physical infrastructure was not or hardly present in the BOHS literature. The reason might be that the physical infrastructure is mostly already present in the existing PHC facilities. Still, as physical infrastructure is always needed, we decided to adopt this theme in the new framework as the new theme 8. We extended the new theme 8 by adding the related topics of three other WHO framework levers that were not yet present in the framework of BOHS themes. This regards **lever 8** 'Medicines and other health products', **lever 10** 'Purchasing and payment systems' and **lever 11** 'Digital technologies for health'.

Lever 9 'Engagement with private sector providers' also including not-for-profit partners, is missing in the BOHS framework. Fortunately, in the new strategic theme 4, involvement of occupational health services, mostly working in the private sector, and collaboration with enterprises has been recommended. We decided that this lever has been covered in the new framework BOHS.

Still missing in the framework for BOHS is WHO **lever 14** 'Monitoring and evaluation through well-functioning health information systems that generate reliable data and support the use of information for improved decision-making and learning by local, national and global actors'. This important topic has been added to the new theme 5 'Availability, production and dissemination of key information'.

Lever 13 Primary health care-oriented research deals with research and knowledge management, including dissemination of lessons learned, as well as the use of knowledge to accelerate the scale-up of successful strategies to strengthen PHC-oriented systems. This issue will get emphasis within the new theme 11 on infrastructure.

6. Second version framework of themes on BOHS, final comprehensive description

Themes in the second framework for the development of BOHS (3 Sept 2024) include 4 strategic and 7 operational themes:

Strategic themes:

1. Political commitment and leadership
2. Governance and policy frameworks inclusive legislation and regulations
3. Funding and allocation of resources
4. Engagement of community and other stakeholders in BOHS development

Operational themes:

5. Availability, production and dissemination of key information
6. Experiments, tasks and activities in BOHS
7. BOHS staff and volunteers
8. Physical facilities, health products, financial systems and digital technologies
9. Coverage and accessibility
10. Quality of care
11. Infrastructure

Descriptions of the new draft framework themes for BOHS (second version, 3 Sept 2024)

The descriptions are the basis for the data extraction.

Strategic theme 1 Political commitment and leadership

Political commitment and leadership promoting BOHS and similar primary and public health care innovations, with the aim to achieve occupational health care coverage for all workers. BOHS provisions can supplement expert-based occupational health services and specialized occupational health care in hospitals. Given the complexities related to the involvement of different sectors, clear political and governance leadership is needed.

Strategic theme 2 Governance and policy frameworks inclusive legislation and regulations

Governance structures, policy frameworks, legislation and regulations for BOHS provisions must be developed within the existing health care system. Partnerships are needed across the health, labor, agriculture and education sectors. Public health and social security legislation must be adapted. Community leadership and mutual accountability must be supported involving health care organizations, workers' communities and enterprises. A good balance between horizontal and vertical integration is needed.

Strategic theme 3 Funding and allocation of resources

Given the lack of financial resources in most underserved workers' populations, adequate funding for BOHS is needed, allocated to enable good quality care, good coverage and accessibility, and to minimize financial hardship for workers. Funding resources can be

mentioned such as coming from the labor sector (e.g. social security, contributions of high-risk branches of industry, local enterprises, unions), health care sector (e.g. health care insurance), or from local and national government.

Strategic theme 4 Engagement of community and other stakeholders in BOHS development

Engagement of communities and stakeholders to define problems and solutions and prioritize actions. Occupational health care organizations such as expert-based occupational health services, and 'labor' organizations e.g. social security bodies and labor inspection should be committed in BOHS development. Commitment of stakeholders such as government, enterprises, workers. And engagement of sectors such as health care, agriculture, mining, and education.

Theme 5 Availability, production and dissemination of key information

Availability and dissemination of key information on hazards, risks, health effects and the state-of-the art of legislation, support and care for underserved vulnerable workers' populations. Good information is essential for the creation of public commitment. Health information systems are needed generating reliable information and supporting use of information in learning and decision-making.

Theme 6 Experiments, tasks and activities in BOHS

Underrepresentation of 'occupational health' in health care facilities and medical education can stimulate the organization of experiments. Models of care can promote BOHS performing or supporting essential primary and public health functions. Tasks and activities for BOHS must be decided, planned, and supported. One task is a structural periodic evaluation of BOHS e.g. on completeness of tasks, quality, coverage, accessibility, and costs.

Theme 7 BOHS staff and volunteers

The theme is about numbers of primary or community health staff members educated in BOHS knowledge and skills and engaged with workers' health issues. Education and training of staff and volunteers, and encouraging support through effective management supervision are essential, and appropriate payment.

Theme 8 Physical facilities, health products, financial systems and digital technologies

Secure and accessible facilities are needed with reliable water, sanitation and waste disposal/recycling, telecommunications connectivity and a power supply. Medicines and vaccines might be available and samples of personal protective devices like various protective gloves, personal respiratory protection, hearing protection, etc. Purchasing and payment systems must promote a reorientation in primary health care toward the delivery of integrated health services including basic occupational health care. Digital technologies can facilitate access to care and service delivery.

Theme 9 Coverage and accessibility

All patients visiting a health center who are potentially workers will be asked about their work, high work demands and exposures. For outreaching functions such as workplace visits, health surveillance or education projects, special attention will be paid to frequently

underserved workers' populations such as informal workers, workers in agriculture and fishery, workers in small enterprises, remote workers, self-employed, female, child-, migrant and indigenous workers. Online facilities can help with coverage problems but are not equally accessible for every worker. Accessibility can be hindered by financial barriers, distance and health illiteracy.

Theme 10 Quality of care

Quality of care can be distinguished in quality by the level of input (educated and supported staff, available guidelines and other tools), process (activities for workers' health), output (recommendations and advice given) and outcomes: less hazards and risks, fewer work-related diseases and injuries, better well-being. General aspects are effectiveness, safety, people-centeredness, timely actions, and an equitable, integrated and efficient performance.[4]

Theme 11 Infrastructure

Without supportive infrastructure no health care provision can be productive in a sustainable way while maintaining a good quality. Significant infrastructure facilities are:

- Good education and training facilities for all involved professional practitioners, students and volunteers. 'Work and health' or occupational health needs to be present in all medical curricula.
- National and regional expertise centers and online facilities to support staff and workers
- A referral system to diverse OSH experts (hazard and risk assessment, preventive solutions), and to medical specialists/technical/laboratory experts with expertise in occupational health.
- Research and development support. Research and knowledge management, including dissemination of lessons learned and use of knowledge to accelerate the scale-up of successful strategies to strengthen BOHS-oriented health care.

[4] Formulated at the **WHO website** https://www.who.int/health-topics/quality-of-care#tab=tab (Accessed 20 August 2024).

Appendix 1. First steps, development of the first version framework of themes on BOHS

September 2024, edits 1 November 2025

In the first steps on the development of the first version of a framework, a model is used of four stages in BOHS development: (1) BOHS still as concept, the start of BOHS, (2) Development of new structures, (3) Focus on quality of BOHS, and (4) A good infrastructure supporting BOHS. Seventeen themes that are developed are assigned to one of the four stages most in line with a specific theme.

Examples of frequent challenges, recommendations and solutions are given in the next table (scheme) for all **17 themes**.

Stage 1: Start, needs & solutions, BOHS as concept, experiments

Themes	Frequent challenges	Recommendations & solutions
General description of status quo in legislation, actors and actions, awareness	Stagnation without legislation, lack of actors, low public awareness and debate	New legislation, decisive actors and actions, public debate, role media
Good information about hazards/risks, adverse health effects in e.g. informal workers, lack of health care	No data, no research, no information on adverse work-related health effects in informal workers	Financing of studies; combining education with research by PHC professionals
Awareness of risks, accidents, health effects	Low awareness in workers, professionals, politicians	Start educational programs. BOHS promotion activities
Starting experiments in BOHS and evaluation	Lack of funds for experiments or continuation after a promising start	Promising BOHS experiments completed and broadcasted
Development of a national policy/strategy promoting BOHS	Lack of policy and strategy	Start of a new policy, a new strategy, BOHS or similar model is chosen as standard model

Stage 2: Development of new structures, implementation

Themes	Frequent challenges	Recommendations & solutions
Legislation, regulations & financing	Poor legislation, regulations, and financing	Legislation, regulations, and financing are promoting BOHS
Coverage	Poor coverage of e.g. formal, informal workers, self-employed, migrant workers or female workers; rural and remote areas	Wide coverage

Tasks of BOHS	Only limited tasks are planned for BOHS	Comprehensive package of tasks is planned

Stage 3: Quality of BOHS

Themes	**Frequent challenges**	**Recommendations & solutions**
Quality of package of activities	Incomplete services package, missing high-relevant activities, ineffectiveness, inaccessibility, poor networking, out-of-pocket costs for users	Complete package, relevant and effective activities, good accessible, no out-of-pocket costs, good collaborations
Good mix of disciplines in practitioners	Unbalanced mix causes ineffectiveness e.g. only medical doctors & nurses, only professionals, no gender balance	Good mix of well-educated multidisciplinary professionals and volunteers; good gender balance
Good competencies and engagement of various professional disciplines and volunteers; education and training	Poor OSH competencies of practitioners & volunteers cause feelings of failure and demotivation	Organization of start qualifications, good professional education, and continuous education in OSH
Good management of health center, engagement with occupational health, participatory approach	Poor implementation by imbalance between curative and preventive activities. Lack of participatory approach	Collegiate management in PHC centers cares for a better balance. Participatory approach.
Structural evaluation of BOHS on output and outcome level, cost-benefit analysis	Marginal or no evaluation is realized	Good evaluation is organized and reported

Stage 4: Infrastructure supporting BOHS

Themes	**Frequent challenges**	**Recommendations & solutions**
Good education and training facilities for students, physicians, OH nurses, Comm. Health Workers, other practitioners, volunteers	Lack of training facilities	Good facilities
Support by online facilities	No or poor online facilities for information, education or e.g. PPE promotion	Online educational projects and Q&A for all workers

Support for BOHS by national and regional expertise centers	Lack of support causes demotivation in BOHS/PHC; lack of tool development/selection for BOHS	Support centers are evaluated as stimulating good practice
Referral system to OSH experts, clinical and laboratory experts	Lack of referral options is demotivating BOHS activities	Referral options have positive effects on quality of care and competence development

Appendix 2. Pilot study on applicability and usefulness of five (sub)themes from the first version framework of themes on BOHS

September 2024, edits 1 November 2025

Five (sub)themes were selected from the first draft Framework to explore the applicability to classify information from several publications in the repository with the aim to order useful information for the development of BOHS. For quick exploration we used a purposeful selection of 22 publications. Nineteen publications were part of the first repository; three more recent publications that we found preparing for a webinar will be added to the second edition of the repository. See the comprehensive overview of the results of the pilot study in Table 2.

Almost all information found in the 22 publications is focused on recommendations and solutions. We found scarcely information on frequent challenges. Challenges were sometimes mentioned, but only briefly. An explanation could be that most challenges are regarded self-evident such as a lack of manpower, time and financial resources.

The five selected themes from the first version of the framework with 17 themes (Appendix 1) are presented in Table 1. The corresponding theme numbers in the second version framework are shown as well. All 11 themes in the second version are presented in chapter 6.

Table 1 Overview of the five selected (sub)themes for the pilot study, derived from the first version of a new framework.

Theme or subtheme of the first and second version of framework	Frequent challenges	Recommendations and solutions
Information on current legislation, hazards/risks and adverse health effects in vulnerable worker populations, and/or lack of health care ***Second version: theme 5*** ***Availability & production of key information***	Reports show a lack of information and present causes e.g. lack of data, of studies, or of monitoring reports; lack of leadership	Financing monitoring and studies. Developing new forms of monitoring and research. A national institute with a leading role. Lack of funding
Experiments, pilots and small-scale studies in BOHS ***Second version: theme 6*** ***Experiments, tasks, activities in BOHS***	Lack of funds and other resources to start an experiment, pilot or small study	Publication of BOHS experiments, pilots or small-scale studies
Legislation and regulations ***Second version: theme 2*** ***Governance and policy frameworks inclusive legislation and regulations***	Outdated or missing legislation and regulations	Development and implementation of legislation and regulations promoting forms of BOHS
Competencies in professional disciplines in BOHS: focus on Occupational Health Nurses ***Second version: theme 7*** ***BOHS staff and volunteers***	OSH competencies of staff personnel are poor. Reports on the negative effect of poor capacities on quality of care and on personal work experience	Development of a list of competencies and organization of start qualifications

Support for BOHS by regional or national expertise centers ***Second version: theme 11 Infrastructure***	Lack of BOHS support centers. Shortcomings in quality, coverage, financing and available expertise	A well-developed structure of BOHS support centers of good quality, being effective, and with good coverage

Relevant information corresponding with the five selected (sub)themes could easily be found in the selected publications by a quick exploration of 19 publications in the first edition of the repository. We also found 3 new relevant publications (2022- 2023) that will be added to the second edition of the repository (2025). In total 22 publications were included in the pilot.

The results of the pilot study are shown in Table 2.

Table 2. Pilot study, overview of findings in 22 publications referring to five (sub)themes. The references for the 22 publications are presented after table 2.

Theme or subtheme: Information on current legislation, hazards/risks and adverse health effects, vulnerable worker populations, and/or lack of health care. New forms of monitoring and research (theme 5 in the second version).

Parekh and Moti 2016 (India) In section III the book presents expert-based overviews of OSH risks, adverse health effects and occupational diseases in 22 different industries in which most informal workers are employed. Each chapter contains characteristics of the hazards and overviews of prevalent health effects. Also, the other way around: starting with medical complaints & diseases and searching for potential causal factors in the industry. The industries presented are Agriculture, Animal Husbandry, Toddy Tapping, Forestry, Commercial Fishing, Leather and Tanning, Weaving, Artisans, Work in Salt Pans, Work in Brick Kilns, Work in Stone Quarries, Work in Saw Mills, Work in Oil Mills, Building and Construction, Scavenging, Carrying of Head Loads, Loaders and Un-loaders, Driving of Animal-driven and Mechanized Vehicles, Midwifery and Village Health Work, Domestic Work, Barbers' Work, Vending on Pavements, Beedi Making.
Zhou et al. 2017 (UK) The study had the aim to evaluate an online resource (EELAB) helping general practitioners (GPs) and occupational physicians in The Health and Occupation Research (THOR) network (UK) in developing their occupational medicine skills through using their own cases. GPs registered prevalent occupational health problems in practice, potential causes and their interventions, and tried to find evidence. A web portal was developed, EELAB offering disease-specific information and feedback. The web portal could be accessed by 250 GPs and 224 occupational physicians and postgraduate OM students. Evaluation was very positive. This new tool (EELAB) has been the base for a comprehensive research database.
Carder et al. 2017 (UK) Vital to the prevention of work-related ill-health (WRIH) is the availability of good quality data regarding WRIH burden and risks. Physician-based surveillance systems such as The Health and Occupation Research (THOR) network in the UK are often established in response to limitations of statutory, compensation-based systems. To fulfil their purpose, THOR and others need to have methodological rigor in capturing and ascertaining cases. This article describes how data collected by THOR and analogous systems can inform WRIH incidence, trends, and other determinants. Data quantity/quality increased over time and the value of the outputs for informing policy makers.
Silvério 2020 (Brazil) Use of a small-scale study to find vital information on workers' health. Methods. 1,027 rural workers living in municipalities in a regional health department in Southern Minas Gerais, whose PHC is governed by the Family Health Strategy model *(responsible for workers' health).* Results. Low education was prevalent, as well as the intense contact of workers with pesticides. Rates of 20% poisoning, 15% liver disease and 2% nephropathy were detected. None of the poisoning cases detected in the study were previously diagnosed. Conclusions. Despite the high coverage of the Family Health Strategy, occupational risk and its consequences have not been detected by health services, which do not seem oriented to primary care, even lacking their essential attributes. There is a need for immediate and effective adaptation of public policies regarding the health of rural workers, with adequate training of teams and review of the portfolio of PHC services offered.

Theme or subtheme: BOHS experiments, pilots and small-scale studies in BOHS* (*theme 6 in the second version).

Siriruttanapruk 2006 (Thailand) Thailand's Ministry of Public Health supported by ILO developed a model integrating OH services into public health systems. OSH services were integrated into Primary Care Units (PCU). The project included a five-day training course. Activities in the community and outpatient services were implemented with the help of agricultural work groups in seven and community workers in three villages. PCU staff now have the capacity to provide OSH services and health promotion activities to workers. Provincial health personnel provided better support to PCUs. Advocacy is necessary to create a national policy and support by sufficient budget and other resources. Local awareness raising is needed.
Chen Y (2010) (China) A new model of BOHS has been developed, supported by the Ministry of Health, in Baoan province, China in a newly industrialized district with more than ten thousand factories. Leading occupational hazards are shown. BOHS included capacity building, training and education, occupational health surveillance, risk assessment and control, and evaluation. Target groups included migrant workers in small- and medium-sized enterprises (< 2.000 workers). Recognition of occupational diseases improved, and the coverage of working places and workers. The rather large-scale innovative BOHS implementation was cost-effective and was well accepted by workers and enterprises. The system of health service centers inclusive BOHS is explained, showing task and responsibilities, and the system of training and education. Working environment surveillance was a key element. Figures illustrate the increase of awareness in workers and managers. Employers and government shared the financing of BOHS; government paid for self-employed and informal workers. In 2008 BOHS covered 1.9 million workers out of 2.3 million workers.
He 2010 (China) In China, Basic Occupational Health Services (BOHS) have been developed. However, the work was not satisfactory as in most of the informal sector stakeholder involvement was low. The participatory model might be an appropriate strategy for China and other developing countries. A public forum could be developed for several stakeholders. Building worker capacity is a key component. Local community health centers should be involved.
Zhang X 2010 (China) Occupational risks were transferred from the city to the countryside. There is a lack of occupational health services for migrant workers. Supervision and administration of small- and medium-scale enterprises needs improvement. In 2006 is a 3-year pilot study of BOHS is developed in six regions where many migrant workers are employed. Goals were to survey the basic situation in OH services, promote the capacity of OHS service building and training in the CDC (Center for Disease Control and prevention) of each district, making plans and develop work assessments. The pilot work was basically successful. Other interventions are described.
Garrido 2020 (Chili, Peru) Integrating basic occupational health services into primary care is encouraged by the Pan American Health Organization. However, concrete initiatives are still scarce. We aimed to develop a training program focusing on prevention of occupational risks for primary healthcare professionals. This train-the-trainer program was piloted at four universities in

Chile and Peru. Occupational health or primary healthcare lecturers formed a team with representative(s) of one rural primary healthcare center connected to their university (N participants = 15). Training started with a workshop on participatory diagnosis of working conditions. Once teams had conducted the participatory diagnosis in the rural communities, they designed in a second course an active teaching intervention. The intervention was targeted at the main occupational health problem of the community. After implementation of the intervention, teams evaluated the program. Evaluation results were very positive with an overall score of 9.7 out of 10. Teams reported that the methodology enabled them to visualize hazardous working conditions. They also stated that the training improved their abilities for problem analysis and preventive actions. Aspects like time constraints and difficult geographical access were mentioned as challenges. In summary, addressing occupational health in primary care through targeted training modules is feasible, but long-term health outcomes need to be evaluated.

***Theme or subtheme: Legislation and regulations promoting BOHS (theme 2 in the second version)*.**

He 2010 (China) In China, Basic Occupational Health Services (BOHS) have been developed for workers in small-scale enterprises or in the informal sector. In China, the Work Safety Law and the Prevention and Control of Occupational Disease Act, were enacted in 2002, forming the foundation for pursuing BOHS.
Amorim 2017 (Brazil) The 1988 constitution and the regulations of the Organic Healthcare Law, assigned to SUS (Unified Healthcare System) the responsibility of providing comprehensive occupational healthcare…. The PNSTT (National Occupational Health Policy) was published in 2012 in the context of the Healthcare Network (HN), and points the way how important worker care is within the scope of Primary Care, considered the coordinator of care and the ordering force of the network. …. In the day-to-day of the work performed by the Family Health Teams, many of the activities are still focused on care itself. As a rule, Health Surveillance practices… remain occasional activities generally linked to health emergencies (dengue, zika, chikungunya). Workers' surveillance practices as part of Primary Care are rare and sporadic.
Moyo 2021 (Southern Africa) Occupational health legislation is fragmented and not adequate. Adoption of the BOHS model will improve access to OHS. Donor-funded initiatives, such as those associated with the Global Fund, World Bank, and USAID have some impact. The same for the mobilization of OSHAfrica and other organisations. OSHAfrica is active in guidance on OSH legislation and in education of OSH professionals. A radical transformative approach by governments is needed challenging the status quo.
Siriruttanapruk 2022 (Thailand). *This study will be added to the repository, second edition.* "To be successfully implemented, PCUs' staff needed committed and continuous policy and support. Therefore, laws and legislation regarding OH services are preferred for strong and sustained national policy. Up to now, specific regulations under the Ministry of Labour about OH services have not been enacted. The Labour Protection Act. 1998,[23] the main labor laws relevant to OSH, only mentions that employers have to carry out a health assessment for their employees if employees work with specific high-risk jobs. Recently, the Department of Disease Control has established and enacted the Control of Occupational Diseases and Environmental Diseases Act. One main aim of the Act is to promote the quality of occupational and environmental medicine services among all OH facilities. The regulations also mention that informal workers can access OH services through PHC services in the country."

Theme or subtheme: Competencies or organization of start qualifications for professional disciplines in BOHS. Focus on Nurses and Occupational Health Nurses (theme 7 in the second version).

Kerdmuang 2014 (Thailand)
This study had the aim to develop and test the psychometric properties of the Occupational Health Service Competency Scale for nurses working at Thai primary care units. After a comprehensive literature review, in-depth interviews were organized. The Basic Occupational Health Service activity model has been used. Content validity was examined by five experts; the internal consistency was assessed by 30 nurses working at primary care units. Finally, a questionnaire was sent to 750 nurses in Thai primary care units, response was 68.1%.
The Occupational Health Service Competency Scale has three dimensions: occupational health service knowledge, skills, and service traits. Analysis identified 14 subscales. The Scale showed sound psychometric properties. Recommended to be used to assess the occupational health service competencies of nurses working at primary care units.

Mori 2016 (Brazil)
In a qualitative descriptive study, the recognition of occupational diseases by doctors and nurses in the municipally of Aparecida de Goiânia, Goiás, is studied. Only 3 of 16 professionals received professional training on occupational health. While Primary Care is considered priority for workers' health actions, practitioners reported inadequate training in knowledge and tools for workers' health. Inexperience in workers' health is causing difficulties and discomfort in practice. Recognition of occupational diseases is a problem. There is a need for professional training and continuous education.

Amorim 2017 (Brazil)
This study analyzed the Worker's Surveillance activities of Family Health teams, based on the perceptions of physicians and nurses in the city of João Pessoa. We used a 30-question questionnaire (n=179 professionals). Results show that Worker's Surveillance activities are not part of team day-to-day activities: 53% mapped productive activities and 30% related them to health hazards. Occupational risks are identified by 47%. Activities to eliminate/mitigate exposure to risk and vulnerabilities are mentioned by 24%. Involvement in occupational health training was mentioned by 24% of the professionals. Workers' surveillance practices are rare and sporadic. However, of the teams, 79% reported that they (almost) always try to find out the occupations of the users, 68% try to better understand the characteristics of these occupations.

Adams 2020 (Australia)
The agricultural health and medicine unit has the aim to empower rural professionals to support farming populations. The study reports of the use of knowledge and skills in their current occupations, by graduates of the agricultural health and medicine course (2010-2018). Forty-one graduates participated in the survey (31% response rate). The most represented occupations were nursing, medicine, and agriculture (farming). Three quarters of the responding graduates reported that the ability to diagnose, treat or prevent agricultural occupational illness or injury was improved. Positively, 42% use course content professionally at least weekly. Half of the respondents noticed barriers in implementation. A collaborative and multidisciplinary approach is essential in improving the health, well-being, and safety of farming populations. There is a need for a strategic prioritization of farmers' health across health, agriculture, and policy settings.

Metin and Yildiz 2023 (Türkiye). *This study will be added to the repository, second edition.*
A Delphi panel was composed of public health nursing academicians, occupational health nurses, other health professionals, faculty members of public health, and occupational physicians. A consensus-building approach using three rounds of e-Delphi technique were used with 45, later 4, and finally 36 participants. Data were collected in 2021 and 2022. Qualitative content analysis was performed. The experts reached a consensus on the definition of occupational health nurse by emphasizing professionalism, effective communication, record keeping, nursing knowledge, skills, equipment, and competence in the field. A consensus was reached on the qualifications: observation, examination, evaluation, research, health promotion, compliance with confidentiality and ethical rules, and working in harmony with the team. The responsibilities of occupational health nurses included to create a healthy and safe workplace, participate in periodic health examinations, maintain effective communication with employees, acting in accordance with ethical principles, provide continuous professional development, and perform health education and promotion, guidance, and counseling.
Experts specified that a specified number of themes need to be integrated into the content of certificate program with a maximum of 500 h for the total duration. The results could assist in initiating the infrastructure of education programs and in developing national and international collaborations.

Valencia-Contrera 2023 (Chile, Brazil, Colombia, Mexico). *This study will be added to the repository, second edition.*
The authors formulated the need to develop educational programs for occupational health nurses (OHNs) in Latin America, after a status-quo study in Chile, Brazil, Colombia and Mexico showing a lack of vision and structure. The study focuses on occupational health nurses in general, not specific on OHNs working in BOHS in primary health care.

Theme or subtheme: Support for BOHS by national or regional expertise centers (theme 11 in the second version).

Denny 2012 (Indonesia) West Java having a center for occupational health referral services (BKKM) has been compared to Central Java as a province without such as center. The study showed, among others, that interventions improved knowledge of and engagement in occupational health among workers and health officers. Local governments' political commitment to funding occupational health, improved. The BKKM promoted occupational health in West Java.
Silva 2014 (Brazil) One major problem for family health teams (PHC) in three Brazilian cities is lack of institutional support. Recommendations are central organizational support for the teams by Worker's Health Reference Center (CEREST) with pedagogical and technical support. Also support from other parts of the Brazilian National Health System. In one city the "Municipal Technical Reference in Worker's Health" has eased the achievement of giving continuity of care (including occupational health in PHC). Lack of support was a complaint in the other cities. Important is the sensitization of the PHC professionals for issues involving workers' health, and the definition of the actions to be developed. "We can't do everything alone". The Ministry of Health has taken two initiatives: an Information Panel in Environmental Health and Workers' Health, and an online National Network of Comprehensive Care to Workers' Health (RENAST).
Amorim 2017 (Brazil) This study analyzed the Worker's Surveillance activities of Family Health teams, based on the perceptions of physicians and nurses in the city of João Pessoa. The support of Family Health teams by the Reference Center for Occupational Health was mentioned by 45% of the participants. Results suggest the need to expand and strengthen continued education and team support.
Simmons 2018 (USA) Referral mechanisms for occupational medicine specialists and worker centers, would be useful. Clinicians would welcome two levels of referral capabilities. First, the ability to refer patients to occupational health specialists for formal evaluation or, at minimum, to obtain advice through curbside or telephone consultation. Second, they would like to refer patients to another member of the team such as a health outreach worker to help navigate legal, governmental, or community-based resources of assistance. Primary care physicians want access to occupational and environmental health specialists in the same way they utilize other subspecialists through telephone consultation and referral of complex patients. Also, referral of patients for non-clinical OSH services. Washington State and New York State have state-wide networks of centers that provide quality subsidized occupational health services for referred patients. OSHA, ACOEM, unions and several NGOs are active as well.
Lazarino 2019 (Brazil) Matrix support is a powerful strategy for the sustainability of care for workers' health. This study analyzes the matrix support practices adopted by a Occupational Health Reference Center (Cerest) with the aim to incorporate occupational health actions in primary care. Using a semi-structured interview with 41 health professionals. Technique of content analysis. The support allowed the expansion of practices recognizing a user as a worker and work as determinant of health. More resolution of cases and better contact between the Cerest professionals and the primary care network made, enabled a reduction in referrals to Cerest.

Challenges identified include training of supporters, health professionals' workload reduction, and more attention for surveillance actions. Conclusion: matrix support can operate as a powerful strategy to strengthen occupational health in the Brazilian Unified Health System (SUS).
Samsuddin 2019 (Malaysia) Referral options for more complicated workers/patients in BOHS are limited because of limited expertise in occupational health in curative health care (not oriented on prevention and health surveillance) and because many clinics are private and expensive. For the future, among others, a tertiary referral center for occupational disease and poisoning is proposed through cooperation of university training hospitals.

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Addition added 1 November 2025. You can use the second edition of the repository (2025) to find descriptions of the content and links to the original publications. See ***https://ldoh.net/*** **.**

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