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Original article

A Repository for Publications on Basic Occupational Health Services and Similar Health Care Innovations

Frank J. van Dijk [1,*], Suvarna Moti [2]

[1] Foundation Learning and Developing Occupational Health (LDOH), Leiden, the Netherlands
[2] Consultant Public Health Specialist, Mumbai, India

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ABSTRACT

Background: Occupational health services are not available for more than 80% of the global workforce. This pertains especially to informal workers, workers in agriculture and in small enterprises, and self-employed. Many are working in hazardous conditions. The World Health Organization, the International Labor Organization, the International Commission on Occupational Health, and the World Organization of Family Doctors promote as part of a solution, basic occupational health services (BOHS) integrated in primary or community health care. Quality information on this topic is difficult to find. The objective of this study is to develop an open access bibliography, a repository, referring to publications on BOHS and similar innovations, to support progress and research.

Methods: The database design and sustaining literature searches (PubMed, Google Scholar, SciELO) are described. For each publication selected, basic bibliographic data, a brief content description considering copyright restrictions, and a hyperlink are included.

Results: Searches resulted in a database containing 189 references to publications on BOHS such as articles in scientific journals, reports, policy documents, and abstracts of lectures. A global perspective is applied in 43 publications, a national or regional perspective is applied in 146 publications. Operational and evaluative research material is still scarce. Examples of references to publications are shown.

Conclusion: The repository can inspire pioneers by showing practices in different countries and can be used for reviews and in-depth analyses. Missing publications such as from China, Russia, Japan, Republic of Korea, and Spanish/Portuguese speaking countries, can be added in the future, and translated. Search functions can be developed. International collaboration for the promotion of occupational health coverage for all workers must be intensified.

1. Introduction

1.1. An urgent public and occupational health question

A large majority of workers in the world, often working in hazardous working conditions facing accidents and serious diseases, do not have access to occupational health care. The estimated coverage of expert-based occupational health services (OHS) in the world is less than one-fifth of the global workforce [1]. This lack of access pertains especially to informal workers, workers in agriculture and in small enterprises, and self-employed. The problem is more pronounced in low- and middle-income countries—but is also on the rise in high-income countries. A disproportionate number of female workers and migrant workers are underserved.

1.2. Basic occupational health services

OHS are the dominant arrangement in most countries. In this study, the spotlight is on BOHS and similar innovations [6–9]. The main reason is the recognition of the unfeasibility, in the next decades, to cover the global worker population by traditional expert-based OHS.

In contrast, basic occupational health services (BOHS) may contribute substantially to the coverage. A great advantage of primary health care (PHC) is the reaching of about 80% of the

Frank J. van Dijk: https://orcid.org/0000-0002-2526-7276; Suvarna Moti: https://orcid.org/0000-0002-5549-068X
* Corresponding author. Learning and Developing Occupational Health Foundation, Nachtegaallaan 15, 2333 XT, Leiden, the Netherlands.
E-mail address: v.dijk.workandhealth@gmail.com (F.J. van Dijk).

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BOX text:

Occupational health care is the part of the health care system engaged with workers' health [2–5]. Main aims are:

- Prevention of work-related and occupational diseases, and accidents
- Improvement of working conditions
- Good functioning at work, prevention of sickness absence and work disability
- Promotion of health and well-being

In general, three service provision arrangements can be distinguished.

- *Basic occupational services (BOHS)* integrated in primary or community health care, especially caring for informal workers, self-employed, workers in agriculture and in small enterprises, future, disabled, and retired workers
- *Expert-based (comprehensive) occupational health services (OHS),* in-company or offered by external providers, caring for workers in large and moderate-size enterprises
- *Specialized clinical occupational health care* by clinical professionals educated in occupational health, caring for workers' health issues when a patient visits a hospital, sometimes after referral.

world population including large numbers of workers and many working communities. Another strength is the competence in diagnostics, treatment, and prevention of diseases and injuries. A skill that must be enhanced is the support of patients in coping with chronic health conditions that threaten health and safety at work, productivity, and fitness for work. Lacunae in recognition and advising about health hazards at work must be addressed by education, training, and expert support. Close connections with workers and workers' organizations, and with enterprises, are fundamental.

The term 'basic occupational health services' used by many pioneers has been promoted since 2003 by the World Health Organization (WHO), the International Labor Organization (ILO), and the International Commission on Occupational Health (ICOH) [6]. The World Organization of Family Doctors (WONCA), the WHO, and other organizations can define similar health care activities in other terms. A fundamental characteristic of BOHS, in our opinion, is the systematic organization of health care focused on workers' health issues, within the primary, community, or public health care system.

In BOHS, attention is especially directed to informal workers, self-employed, and workers in small enterprises. Agricultural workers and migrant workers can form a substantial proportion of the population. In coastal regions, fishermen can be the dominant worker population; in urban regions, industrial or health care workers can be the dominant worker population [10,11]. BOHS is mostly financed by public health resources or by social security programs and can be developed by the Ministry of Health already responsible for primary and community health care. The same ministry is often covering hospital departments specialized in work-related diseases and injuries. This 'specialized clinical occupational health care', when available, can offer dedicated diagnostics, therapy, and rehabilitation and is a referral facility for PHC, BOHS, and OHS.

1.3. Difficulties in finding studies and policy documents

Good quality information is needed for BOHS development and education. However, such information is not always easy to find. First difficulty emerges in the terminology. Many authors use the term 'basic occupational health services' (BOHS), others terms as 'interventions for workers' health'. The second problem is where to search for information. Reviews and other syntheses are scarce. Scientific studies in English can be found in PubMed/MEDLINE, but books, reports, and most national journals must be found elsewhere. SciELO and LILACS, free accessible literature databases, are needed for Spanish and Portuguese studies. What about studies in Russia, China, or Africa? Policy documents can be retrieved via websites. However, archives are often missing or incomplete, searching therein can be difficult. Internet exploring can be personalized, generalization is impossible. What to do when gaining numerous, often outdated, or poor-quality sources? Experts can have collections of publications, but where to find? Another complication is a paywall hindering access to books, guidelines, reviews, and articles [12].

Accessibility of information can be improved by an open access bibliographic database. Everyone can access, availability is round-the-clock, digital databases can store much information requiring little physical space [13]. The objective of this study and project is the formation of a digital bibliographic database, a repository, for publications on BOHS and similar activities. The aim is to support capability building in starting and improving BOHS and to stimulate research. For every publication, a bibliographic record is needed to support the users with at least key bibliographic data, a brief content description, and a hyperlink. The repository can be used while developing overviews and analyses.

2. Materials and methods

A custom-made repository in the form of an online bibliographic database for a collection of BOHS publications is developed. Next, a selection of publications from an existing collection is used to incorporate in the repository. To create a more complete collection, searches are organized, comparable with developing a scoping review because new healthcare concepts and practices are explored. Even the naming of similar concepts differs in distinctive countries, continents, and time periods. We did not perform a systematic review.

Phases in the repository's development are the collection and selection of publications, identification of the accessibility and other characteristics, identification or writing a concise content description while considering copyright instructions, and finding a hyperlink.

2.1. Collection and selection of publications, criteria for inclusion and exclusion

As a start, a selection is made of publications collected for a scoping review on BOHS and for preparing lectures on BOHS at workshops and congresses (2009–2022) [14]. Next, a number of literature searches are organized.

Publications using the terms 'basic occupational health services', and publications using other terms describing a similar system or health care activity, are included. Publications on systematic BOHS approaches have priority but a few small-scale projects having a great value for BOHS development, are included as well. The main inclusion criterion is that a publication offers information on basic occupational healthcare related to primary or community/public health care or similar innovations. Aspects can be the need for BOHS care, forms, activities, tools, quality, or effectiveness; on system

level: healthcare concepts, policies, programs, systems, disciplines. A second inclusion criterion is information on the infrastructure enabling BOHS activities such as education and training, referral facilities, and OSH advice and support centers. A limited number of publications only expressing the need for basic occupational health care are accepted when illustrating the urgent need for a healthcare reform. Publications describing regular PHC physicians dealing with workers' health are included when a noteworthy usefulness for BOHS development was perceived. Excluded are publications not written in English, German, French, Spanish, or Dutch. As exception, publications on Brazil written in Portuguese are accepted if an English abstract was available. Publications describing interventions by expert-based OHS, or by organizations at the labor side, are excluded unless involving primary or community healthcare.

2.2. Searches

The flow chart in Fig. 1 provides an overview of the searches and the number of publications added to the repository in each step.

See the Appendix 1 for details of the searches. From an existing collection, 114 publications were selected for the repository. Next, a first PubMed/MEDLINE search was completed using "basic occupational" as search terms, resulting in 65 publications of which 9 were added to the repository as relevant new publications. A

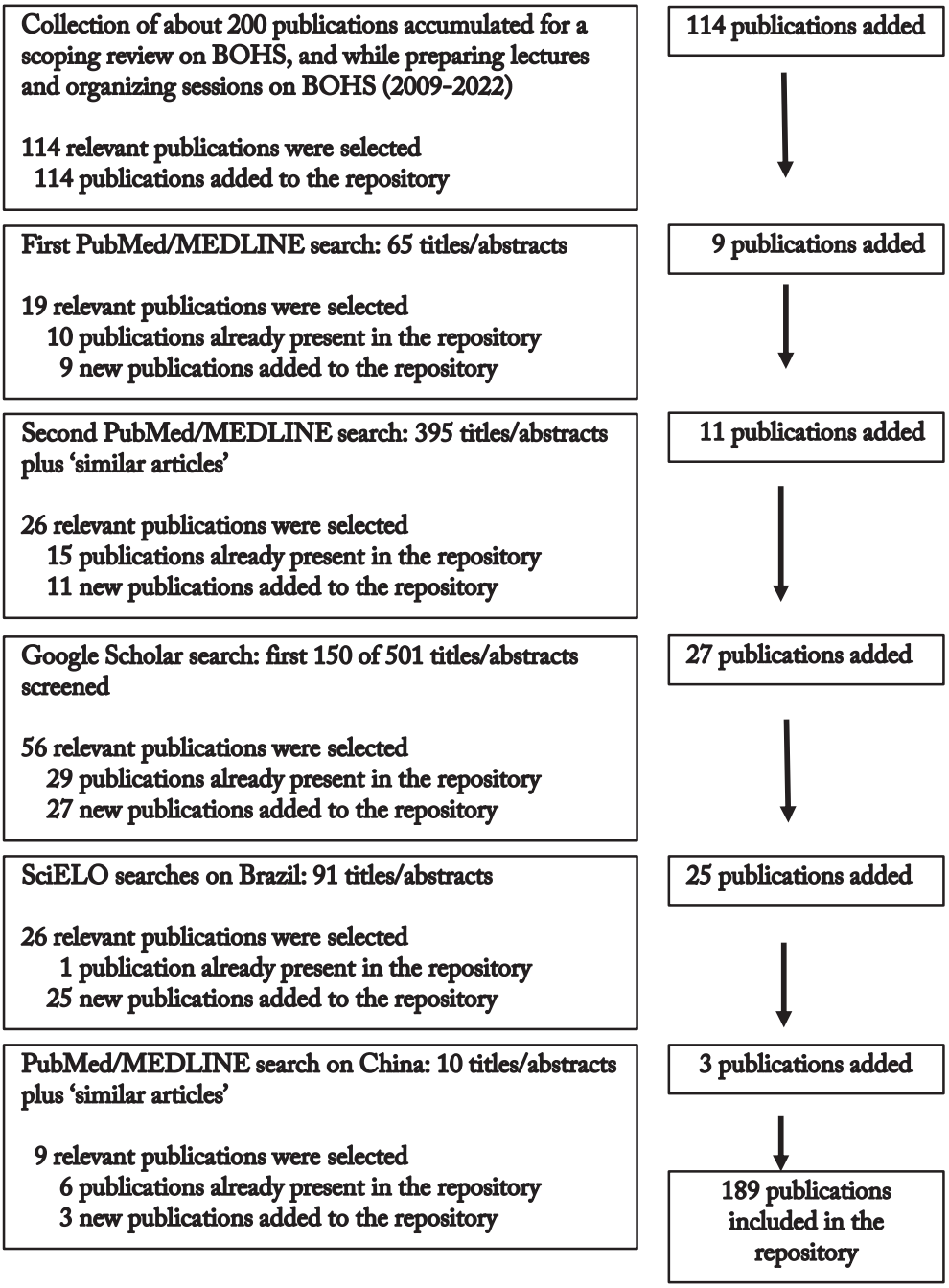

Fig. 1. Flow chart of searches adding selected publications to the repository.

second, wider search in PubMed/MEDLINE resulted in 395 titles. After selection, 11 new relevant publications were added. An additional Google Scholar search performed to look for reports, presentations, and articles outside the scope of MEDLINE, resulted in 501 titles/abstracts. Screening on relevance was stopped after the first 150 titles/abstracts, as the yield gradually became zero. We included 27 new relevant publications. In Brazil, PHC is responsible for workers' health. A search in the database of SciELO, including scientific literature from Brazil, resulted in 25 new relevant publications on Brazil. A concise PubMed/MEDLINE search on China resulted in three new relevant publications. Thirteen other articles on BOHS were found, written in Chinese, without English abstract that could not be included.

2.3. Information on the publications

MS Excel has been used to organize the data. For all publications, authors, year of publication, publication type, Open Access instructions, and copyright license information were noted. Bibliographic data are presented using the Vancouver citation style [15]. The perspective is recorded: global or national/regional. A brief description of the content is presented, using—when allowed—text (parts) of the abstract or summary. In case of copyright restrictions, a summary has been written, often presenting (shortened) citations from the publication, or a short characteristic text part, using the Dutch 'citaatrecht' (right to quote; limitations to copyright) [16]. Finally, a hyperlink is given to the publication or abstract.

2.4. Content description and copyright restrictions

Half of the publications (97 out of 189) were published under a Creative Commons or similar license, permitting copying parts of the publication, under feasible conditions. Most frequent prescriptions were 'Attribution International', 'Attribution-Non-commercial International', and 'Attribution-Non-commercial-Share Alike International' [17]. In such cases, (parts of) the original abstract or summary were used as a brief content description. Reproduction of ILO material is authorized free of charge and without formal written permission for non-commercial purposes within limits, such as for a text extract not exceeding 400 words [18]. Although WHO supports open access, restrictions still exist in WHO reports [19]. The global WONCA website offers no information [20]. We considered that the public function of international associations, governmental and UN-connected institutions would allow reuse of limited parts of their publications, under conditions.

The Dutch Copyright Law (Auteurswet) covers the right of the author to publish and copy own work, while the Dutch 'citaatrecht' (right to quote) formulated in article 15a of this law allows using citations for the announcement, criticism, or scientific treatise, when conforming to prescriptions such as that the number and size of the citations are justified given the aim (of the repository) and that reference should be made to the author and title of the work [16]. We conformed to these prescriptions. Copyright exceptions in the EU InfoSoc Directive can be relevant for consideration, especially Art. 5.3 (d) "Quotation for criticism or review" (restricted implementation in The Netherlands) [21].

3. Results

We designed, completed, and published a free-of-charge digital bibliography containing 189 references to publications on BOHS and similar initiatives in the world [22]. In Table 1, information on type and period of publication, open access, and copyright directions are presented.

Table 1
Characteristics of the 189 publications in the repository: type of publication, period of publication, accessibility, and copyright regulations

Basic characteristics of publications		Number of publications (total 189)
Type of publication	Article in a scientific journal	131
	Report or proceedings*	18
	Lecture (abstract of lecture(s)/session)	16
	Editorial, Book review, or Letter to Editor	8
	Policy document or statement	6
	Book, doctoral thesis, or guide	6
	Newsletter or interview	4
Period of publication	Before 1990	3
	1990–1999	0
	2000–2009	27
	2010–2019	124
	2020–2022	35
Accessibility	Open access	165
	Not open access	24
Copyright regulations	Copyright	83
	Creative commons (CC)**	84
	Not-restrictive copyright regulations***	13
	Copyright regulation uncertain	9

* Reports can be accounts of workshops, congresses, conferences, meetings, or projects.
** Creative Commons regulations are not restrictive for non-commercial reuse [17].
*** No or limited copyright regulations, but not using Creative Commons; e.g., ILO publications [18].

Articles in scientific journals are dominant in the repository, 131 publications (70%). Other publications are 'reports' e.g., reporting contributions in international meetings, lectures, or a session on BOHS inclusive all lectures. A few publications are expressing an individual expert opinion. Most publications are published after 2010. A large majority is open access, so the full text is available and downloadable. However, other publications are still locked behind a paywall. Publications under Creative Commons are offering feasible conditions for reuse e.g., for scientific purposes. Still, about half of the sources are strict copyright protected including journal articles and publications of international organizations. A large majority of the sources is of academic origin, so basically paid by public funds. The collection has an international character but almost all publications are written in English. The studies on Brazil are mostly written in Portuguese. One article written in Korean language and writing is included given that abstract, table, figures, and references were presented in English (Roman script). One publication written in Indonesian (English abstract) is included after translating the conclusion in English.

The 189 publications are subdivided in those using a global (n = 43) or a national/regional perspective (n = 146). The national/regional publications are sorted by continent and country (Table 2).

The distribution over the continents and countries is partly reflecting choices and limitations in the searches and selections. Inclusion of more studies on how regular PHC is dealing with work-related diseases would have increased the number of publications from Europe. From the Americas, more publications could have been included showing public health interventions on workers' health problems encountered by migrant workers. The large number of publications on Brazil is partly the consequence of special search activities.

3.1. Examples

In Table 3, an example is shown of a publication using a global perspective. In this publication ICOH, International Occupational Hygiene Association (IOHA) and International Ergonomics Association (IEA) express their support for Universal Health Coverage in a

Table 2
Number of publications in the repository using a national or regional perspective, subdivided per continent, country or region (total 146 publications)

Africa 11	Southern Africa region 4	Other countries or regions 7				
America 52	Brazil 37	USA 10	Other countries or regions 5			
Asia 63	China 19	India 18	Indonesia 6	Iran 7	Thailand 7	Other countries or regions 6
Australia 4						
Europe 16	UK 11	Other countries or regions 5				

Table 3
Example of a reference to a publication using a global perspective

ICOH, IOHA and IEA Joint Statement at 72nd World Health Assembly (WHO) on Universal Occupational Health Coverage. May 2019. Pg. 1. Open Access, Presumably no copyright restrictions	*Citations of the Joint Statement.* " … text parts are omitted … about 85% of the global workforce lack access to occupational health services and the coverage of the existing services do not correspond the most striking needs. Extension of the coverage and development of the content of occupational health services is needed. The ICOH, IOHA and IEA welcome the initiative for Universal Health Coverage and proposes it to be complemented by *Universal Occupational Health Coverage (UOHC)*, providing specialized or basic occupational health services for all working people including occupational hygiene and human factors/ergonomic design services. Such services should be provided for all sectors of working life, cover all working people; the organized work life plus the self-employed and informal sector workers in line with the WHO strategy on universal health coverage, UHC, and the UN Sustainable Development Goals No. 3 and 8 … text parts are omitted … The ICOH, IOHA and IEA want to encourage the WHO to undertake following actions: (1) establish a global programme for universal occupational health coverage, UOHC, by guiding the governments to organize specialized or basic occupational health services for all working people, starting from those most in need and most vulnerable. (2) Provide technical support and guidance for training and education of multidisciplinary human resources and experts (health, occupational hygiene, ergonomics, and psychology) for occupational health services."	https://www.icohweb.org//site/news.asp?page=7&order=entrydate

joint statement at the World Health Assembly of WHO in 2019. They propose that Universal Health Coverage will be "complemented by Universal Occupational Health Coverage providing specialized or basic occupational health services for all working people including occupational hygiene and human factors/ergonomic design services."

In total, 43 global perspective publications are presented. Principal documents are the WHO Global Plan of Action (2007), the guideline on BOHS (Rantanen and Lehtinen, 2007), and the joint WONCA/ICOH statement on workers and their families (2014) [7–9]. A report on the BOHS session in Seoul, Republic of Korea (ICOH congress, 2015) is included and links to abstracts of all lectures in BOHS sessions at ICOH triennial congresses in Dublin (2018) and Australia/Rome (2022). Part of these congress collections were developed for the repository.

In Table 4, four examples are given of publications using a national perspective.

The situation differs from country to country, but the publications illustrate similarities as well. The absence of occupational health care for informal and agricultural workers working in hazardous conditions is reported in many countries. Authors address the urgent need for suitable solutions and indicate the need for health system development, adequate legislation, appropriate education, and tangible support for primary or community care. Concrete activities described show feasible solutions that can inspire others. However, with a few exceptions, we are still missing good evaluation studies, as already concluded in 2014 [14].

4. Discussion

4.1. Brief description of the process and results

After explaining the motivation for developing a repository on BOHS and similar activities, a database has been designed, searches were completed, publications were selected, and references were added. The development of BOHS from the conceptual level to realistic practices shows the influence of global organizations on the process. The commitment of organizations, such as WHO, ILO, ICOH, and WONCA to the promotion of BOHS and similar innovations, is visible in about 25 publications stemming from these organizations, from 2001 until today. This outcome does not exclude comments on the intensity of the efforts or on the quality of the collaboration between organizations. The impact of the global organizations on national efforts is visible in national publications such as the support given by ILO to a comprehensive BOHS development program in Thailand (2006, 2009) [23,24]. Reference is made to the BOHS strategy first promoted by WHO and ILO in 2003, in a comprehensive Chinese BOHS study (2010) [25]. ICOH and WONCA presidents supported the efforts in India through forewords in the book 'BOHS for Informal Industry Manual for Primary Care Providers' (2016) [26]. WHO is often mentioned in publications as a source of inspiration. However, the Brazilian publications are strongly oriented on the national public health system, not on global organizations. Garrido et al. from Latin American countries and Germany refer to WHO and Pan American Health Organization (PAHO) but add that "To the best of our knowledge, concrete actions have only been taken in a few Latin American countries." (2020) [27]. There is a clear interest in BOHS in e.g., Nigeria, and Southern Africa [28,29]. The concept is not well-rooted in Europe, Australia, and Northern America.

Highlighting the national practices and debates indicates the involvement of national stakeholders and differences in the national and local conditions. Differences between countries in legislation and regulations have a great impact on the health care provisions. In Brazil, 'the greatest achievement accomplished to date in the area of workers' health in Brazil was its enshrinement as an area within the sphere of public health by the 1988 Constitution' (2018) [30]. Similarly, the Ministry of Public Health in Thailand supported by ILO, took in 2004 the initiative to integrate OSH services into existing Primary Care Units [24]. In contrast, in the

Table 4
Examples of references to a publication using a national or regional perspective. Only part of the information available in the repository is presented in this table. In the repository, hyperlinks are present accessing to full texts or abstracts

Siriruttanapruk S, Wada K, Kawakami T. **Promoting occupational health services for workers in the informal economy through primary care units**. ILO Subregional Office for East Asia. Bangkok: ILO, 2009. 20 pg. Report, Open Access. Copyright ILO, 2009. Short text extracts permitted for non-commercial purposes.	Description including (shortened) citations from the abstract (shortened for this table). In **Thailand,** the Ministry of Public Health has been conducting a pilot project, funded by the ILO, to provide occupational health services at Primary Care Units (PCUS) for workers in the informal economy. Aim: review progress of OH services by PCUs and propose policy recommendations. Good practices were identified: 1. Intensive follow-ups to PCUs by the Ministry; 2. Good support to PCUs by provincial public health offices; 3. Promoting self-initiative of workers and employers; 4. Identifying and supporting local needs; and 5. Combining OH issues with other priorities. PCUs targeted workplaces to reduce risks, visited the target workplaces once or twice a month for risk assessment and advice, health surveillance, basic occupational health education, provision of safety equipment. Recommendations for actions: see the Report.
Muralidhar V, Ahasan MF, Khan AM, Alam MS. **Basic occupational health services (BOHS) in community primary care: the MSF (Dhaka) model.** BMJ Case Rep. 2017; 2017: bcr2016218293. Article, Open Access. Copyright BMJ Publ. Group Ltd. 2017.	Description including (shortened) citations from the abstract. Médecins Sans Frontiérs (MSF) started basic occupational health services for workers in industries in **Dhaka, Bangladesh**, for the prevention and treatment of work-related and occupational diseases. More than 3000 workers came to the center for one or more consultations. About one in seven of these workers were diagnosed with suspected work-related diseases. Follow-up interventions were organized. Risk inventories were arranged in the industries. This project demonstrates the urgent need for and the feasibility and usefulness of a well-developed innovative expert-based initiative in an urban industrial area where no expert-based occupational health services existed.
Zhou AY, Dodman J, Hussey L, Sen D, Rayner C, Zarin N, Agius R. **EELAB: an innovative educational resource in occupational medicine.** Occup Med (Lond). 2017; 67:363–370. Article, Open Access. Copyright The Author 2017. Oxford Univ. Press/Society of Occupational Medicine.	Description including (shortened) citations from the abstract. The study had the aim to evaluate an online resource (EELAB) helping physicians in **UK** in developing their occupational medicine skills through using their own cases. General practitioners (GPs) in The Health and Occupation Research (THOR) network, registered prevalent occupational health problems in practice, potential causes and interventions. They tried to find evidence. A web portal has been developed, EELAB (Electronic, Experiential, Learning, Audit and Benchmarking) offering disease-specific information and feedback. The web portal could be accessed by 250 GPs and 224 occupational physicians and postgraduate OM students. The evaluation was very positive. This new tool (EELAB) promoted education and feedback and has been the base for a comprehensive research database.
Silvério ACP, Martins I, Nogueira DA, Mello MAS, Loyola EAC, Graciano MMC. **Assessment of Primary Health Care for rural workers exposed to pesticides.** Revista de Saúde Pública. 2020; 54: elocation 09. Article, Open Access. Creative Commons Attribution 4.0 International.	Abstract (shortened for this table). Study from **Brazil.** Objective. To evaluate the attributes of Primary Health Care (PHC) for rural workers; to analyze sociodemographic conditions, history of poisoning/hospitalizations for pesticides, use of personal protective equipment (PPE); to verify exposure to pesticides. Methods. Cross-sectional, descriptive-analytical study (1,027 rural workers, Southern Minas Gerais). PHC is governed by the Family Health Strategy model. Results. Intense contact of workers with pesticides. Frequent use of PPE and history of poisoning/hospitalizations for pesticides. Rates of 20% poisoning, 15% liver disease and 2% nephropathy. None of poisoning cases detected 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 essential attributes. Need for immediate and effective adaptation of public policies regarding the health of rural workers, adequate training of teams and review of the portfolio of PHC services offered.

Southern Africa region, apart from South Africa and Zambia, most ministries of health do not play a significant role in the provision of 'occupational medical services' (2021) [31].

At the same time, we see similar developments in different countries such as the development and evaluation of facilities/centers offering support to BOHS activities in primary care and education. A study in Brazil concluded that the results suggested the need to expand and strengthen education and team support by the Reference Center for Occupational Health (Cerest) [32]. Another study confirmed the support as a powerful strategy to strengthen occupational health in the Brazilian Unified Health System (SUS) [33]. A study in Indonesia demonstrated that occupational health was promoted through the support by a center for occupational health referral services (BKKM) [34]. Universities play an important role in occupational health care in various countries (Brazil, Chile, Iran, UK) which can be a topic for a comparative study.

Finally, we like to emphasize the scarcity of operational and evaluative research material. Good access to occupational health care can be shown by describing numbers of BOHS interventions for certain target groups in a period. We need more and detailed evaluation studies on the quality of care on the level of input, process, output and outcome, also including effectiveness. In an ICOH survey study on global coverage by OHS, one question was which of 14 specified functions are practiced [1]. In the description and evaluation of BOHS activities in China are distinguished: occupational health training and education, surveillance of the health of workers, surveillance of the working environment, and risk assessment and control [25].

4.2. Limitations

This repository is not complete. Nevertheless, the substantial overlap in publications found in the searches, shows that a large majority of relevant publications today accessible via PubMed, and via internet has been covered. A critical note is the over-representation of publications from USA and Canada and from parts of Western Europe. The repository is missing (part of the) publications from China and other areas of the world such as Russia, Japan, Republic of Korea, and Spanish/Portuguese speaking countries. The exploratory searches on Brazil and China show that many key sources are missed when following too succinct literature search traditions.

In the selection process, we focused on new forms of health care targeted on workers' health, embedded in primary or community health care. Only a few studies were included evaluating PHC activities when workers visit regular office hours with work-related

problems. Likewise, publications on interventions for small companies by OHS or by organizations in the labor sector were not included. The reason not to refer to such publications was the aim for this repository to highlight experiences in the context of primary and community health care. Still, when developing such interventions, it is a 'must' to learn for example from experiences of OHS, the labor inspection, and progressive sectoral organizations such as for agriculture, construction work, and health care.

The selection of sources has been based on relevance for BOHS development. However, the quality of the information presented is equally important for the users of the database. We could not assess the quality of information in the sources as such is a complex task diligently related to the precise question or interest of the repository user. So, the quality of the information offered still needs due attention of the user.

Finally, a weak point is that only one author did the searches and selections. We planned to start an international group of practitioners/scientists to work on voluntary basis as developers, peer-reviewers, and educators.

4.3. Advantages for the users

The repository can be useful for those who have limited time, inadequate facilities, or insufficient expertise to perform searches in PubMed/MEDLINE, SciELO, or other search engine/database combinations giving access to scientific articles and reviews. The repository is also useful to retrieve international policy statements, summaries of discussions, and reports of national developments. Using search engines, exploring the internet yourself is a good alternative for using the repository when you are trained and supported in search strategies. Unfortunately, for example, occupational physicians are often confronted with barriers such as lack of time, language difficulties, lack of support, and lack of skills [35].

A particular reason to use a repository is the experience that links to sources can disappear as some institutions ended public accessibility to their archives. Sometimes, we could find new links. We consider establishing a collection of digital full text files to safeguard key documents. Positive developments are that WHO is running the Institutional Repository for Information Sharing for WHO documents [36]. ICOH established the ICOH Heritage Repository containing abstracts of all triennial global ICOH congresses [37].

4.4. Future

The repository itself is not analyzing the information in the publications, but it is the intention that the database will be used for making reviews and in-depth analyses.

To develop a more complete repository, new searches for publications are needed, focusing on specific aspects of BOHS, or on the disclosure of new regional and national sources. An international group of practitioners/scientists may be prepared to work on the repository. Small regional groups can collect and evaluate publications per region/country, often written in the main national language and writing, while being connected to regional OSH organizations. Investments may be needed for the translation of publications and for software.

Studies and reports from the 'labor' side such as from sector and branch organizations, and studies showing feasibility and effectiveness of custom-made interventions for small enterprises developed by expert-based OHS, information from NGOs, and (Cochrane) reviews evaluating interventions may be connected to the repository. Search functions may be added to select easily on aspects of the content. Other areas for innovation are the inclusion of blogs and audiovisual materials, or a digital forum. Existing facilities can be explored for inspiration such as ProMed (infectious diseases), Modernet (work-related diseases), and the e-library of LDOH (OSH education for professionals) [38–40].

More international collaboration is needed to stimulate the promotion and implementation of good occupational health care for all workers.

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Conflicts of interest

The authors have no conflicts of interests to declare.

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Appendix 1

Overview of searches for publications on BOHS and similar innovations

The inclusion and exclusion criteria, valid for all searches, and the flow chart (Fig. 1), are presented in Materials and Methods.

The aim of the repository on BOHS is to focus on publications dealing with forms of basic occupational health care in the world contributing to universal occupational health coverage. We decided to organize new searches to update and complement an existing collection.

Our choice for PubMed/MEDLINE, Google Scholar and SciELO for the scoping-review-like searches is based on our long-term experience with these search engines/databases. Support for the choices made could be found in publications of Rollin et al [41] and Bramer et al [42]. Rollin et al showed that the recall ratio using MEDLINE alone, for high-quality intervention studies in Occupational Health, was close to 90%. Bramer et al state that "the skills and experience of the searcher are one of the most important aspects in the effectiveness of systematic review search strategies". The authors are positive on using Google Scholar, but quote studies showing uncertainties on using the abstract and citation database Scopus. Scopus may show the same results as Embase. We decided not to use the research database Embase being more biomedical of nature while the repository focuses on health services research. An additional argument for our choices is related to paid subscriptions for Scopus and Embase potentially hindering future international collaboration with low-resources countries.

As a start, publications were selected from an existing collection developed by one of the authors (FvD), consisting of about 200 international publications. This collection included results of searches for a scoping review on BOHS published in 2014, partly targeted at publications on regular PHC practitioners dealing with workers' health problems [14]. Other publications were gathered while preparing international sessions and lectures on BOHS (2009 – 2022).

After explorations of the best terms and search strategies, *'basic occupational'* was used as search terms in a first PubMed/MEDLINE search (February 2022). No filters were used, no time limits. The search resulted in 65 publications of which 19 were selected as relevant based on the inclusion and exclusion criteria. Nine new relevant publications were added to the repository. For a second

search in PubMed/MEDLINE (July 2022), a wider scope has been used selecting as search terms and search period: *basic AND ("occupational health" OR "occupational safety and health" OR "workers health" OR "occupational diseases") AND (services OR care) AND (2014/1/1:2022/7/1[pdat])*. In addition, the tools 'Similar articles' (first five articles) and 'Cited by' were applied. This search resulted in 395 titles/abstracts, supplemented by 'similar articles'. After selection, 11 new relevant publications could be added. Fifteen relevant publications found were already present in the repository.

For an additional search in Google Scholar (July 2022) the search terms were: *"basic occupational health services"* and '*PDF*'. Filters were 'sorted on relevance', 'not inclusive patents or quotes', 'every language', and 'each period'. Only the first 150 of the 501 titles/abstracts as result, were screened on relevancy as the yield of relevant sources became zero above 150 results. In one extra Google Scholar search the search terms '*basic occupational health care*' were used, resulting in two new relevant sources selected from 42 titles/abstracts. In total, 27 new relevant publications were added to the repository using Google Scholar searches, 29 relevant publications found were already in the collection.

For a first search on Brazil (February 2022) in the journal database SciELO (Portuguese, Spanish, English) search terms were *occupational "primary health care"*. Filters: abstract, Brazil. Search terms in a second search were *"occupational health" AND ("public health" or community) AND NOT "primary health care"*. Filters: abstract, Brazil. In total 91 titles/abstracts were screened, 25 selected new relevant publications were added to the repository. In a concise search on China in PubMed/MEDLINE (Augustus 2022) applying the tools 'Similar articles' (first five articles) and 'Cited by', search terms were *China "basic occupational"*. This resulted in 10 titles/abstracts plus 'similar publications'. Three new relevant articles were added to the repository. The findings contained 13 titles of articles on BOHS written in Chinese (without English abstract) that were not added to the repository.

References

[1] Rantanen J, Lehtinen S, Valenti A, Iavicoli S. Occupational health services for all. A global survey on OHS in selected countries of ICOH members. Rome: ICOH. 2018. 93 p. Report. [cited on 2022 May 22]. Available from: https://www.icohweb.org/site/icoh-publications.asp.

[2] International Labour Organization. Occupational health services convention (No. 161). Geneva: ILO – International Labour Organization. 1985 [cited on 2022 July 29]. Available from: https://www.ilo.org/dyn/normlex/en/f?p=1000:12100:0::NO::P12100_INSTRUMENT_ID:312306.

[3] International Labour Organization. Occupational health services recommendation (No. 171). Geneva: ILO – International Labour Organization. 1985 [cited on 2022 July 29]. Available from: http://www.ilo.org/dyn/normlex/en/f?p=1000:12100:0::NO:12100:P12100_INSTRUMENT_ID:312509.

[4] World Health Organization. WHO website definition 'Occupational Health'. [cited on 2022 July 27]. Available from: https://www.who.int/health-topics/occupational-health.

[5] Rantanen J, Lehtinen S, Valenti A, Iavicoli S. A global survey on occupational health services in selected international commission on occupational health (ICOH) member countries. BMC Public Health 2017;17:787.

[6] International Labour Organization. Report of the thirteenth session of the joint ILO/WHO committee on occupational health. Geneva: ILO. 2003. 17 p [cited on 2022 July 29]. Available from: http://www.ilo.org/safework/info/publications/WCMS_110478/lang%2D-en/index.htm.

[7] World Health Organization Resolution WHA60.26. WHO global plan of action on workers' health [cited 2022 Sept 17]. 2007. [available in English, Russian, French, Arabic, Spanish and Chinese] Available from:https://apps.who.int/iris/handle/10665/22603.

[8] Rantanen J, Lehtinen S. Basic occupational health services. Third revised edition. Helsinki: Finnish Institute of Occupational Health. 2007. 22 p [cited on 2022 Sept 16]. Available from: http://docplayer.net/23917017-Basic-occupational-health-services.html.

[9] World Organization of Family Doctors (WONCA). WONCA and ICOH statement on workers and their families. Pledge announced during WONCA Europe Conference in Lisbon, July 2014. WONCA News 2014;40(7):15. August 2014. [cited on 2022 Sept 16]. Available from: https://www.globalfamilydoctor.com/News/Archive.

[10] Muralidhar V, Ahasan MF, Khan AM, Alam MS. Basic occupational health services (BOHS) in community primary care: the MSF (Dhaka) model. BMJ Case Rep 2017;2017 bcr2016218293.

[11] Balakrishnan K, Arasi DS, Ayyappan R, Jayachandran P, Yamini R, Thangavel G, Venkatesan D, Sambandam S. Basic Occupational Health Services (BOHS) for health care workers in public health systems in Tamil Nadu, India: scoping a framework for risk management. In: Proceedings OH&S Forum 20-22 June 2011, Espoo, Finland. Helsinki: Finnish Institute of Occupational Health; 2012. p. 136–9.

[12] Van Dijk F, Hoving J, Radon K, Smits P, Solis-Soto MT, Van der Laan G, Pal T, Parra M, Paudel D, Caraballo-Arias Y. Open Access is showing responsibility. ICOH Newsletter. April 2018. p. 20–2 [cited 2022 Sept 16]. Available from: http://www.icohweb.org/site/pdf-viewer/viewer.asp?newsletter=icoh_newsletter_vol16_no1.pdf.

[13] Wikipedia, Digital library, history. [cited 2022 Sept 17]. Available from: https://en.wikipedia.org/wiki/Digital_library#History.

[14] Buijs P., Van Dijk F. Essential interventions on workers' health by primary health care. A scoping review of the literature: a technical report. Report for WHO. Leiden: TNO Work, Health and Care; 2014. 65 p [cited 2022 Sept 16]. Available from: https://repository.tno.nl/islandora/object/uuid:66de1083-c262-4ac6-aaab-50ec6a64817a.

[15] Universiteitsbibliotheek, University of Utrecht. LibGuides. Citing Vancouver style. [cited 2022 Sept 17]. Available from:: https://libguides.library.uu.nl/citing/Vancouver.

[16] Wetboek online. Auteursrecht [Law on Copyright]. 6. De beperkingen van het auteursrecht [limitations of copyright]. Article 15a represents Dutch Citaatrecht [Right to Quote]. [cited 2022 Sept 17]. Available from: http://www.wetboek-online.nl/wet/Auteurswet/15a.html. [Dutch].

[17] Creative Commons. About CC licenses. [cited 2022 Sept 17]. Available from: https://creativecommons.org/about/cclicenses/.

[18] International Labour Organization. Permissions to reproduce ILO publications and data. [cited 2022 Sept 17]. Available from: https://www.ilo.org/global/copyright/request-for-permission/lang–en/index.htm.

[19] World Health Organization. Copyright, licensing and permissions. [cited 2022 Sept 17]. Available from: https://www.who.int/about/policies/publishing/copyright.

[20] World Organization of Family Doctors (WONCA). [cited 2022 Sept 17]. Available from: https://www.globalfamilydoctor.com/Home.aspx.

[21] EU InfoSoc Directive, Art. 5.3 (d) InfoSoc "Quotation for criticism or review". [cited 2022 Sept 17]. Available from: https://copyrightexceptions.eu/#info53d.

[22] Repository for publications on basic occupational health services and similar innovations in the world. Leiden: Learning and Developing Occupational Health (LDOH) Foundation; 2022 [cited 2022 Sept 17]. The repository is available at the website of the LDOH Foundation (https://shop.ldoh.net/), and at the website of the Indian Association of Occupational Health (https://iaohmumbai.org).

[23] Siriruttanapruk S. Integrating occupational health services into public health systems: a model developed with Thailand's primary care units. Bangkok: International Labour Office. 2006 [cited on 2022 December 8]. Available from: https://labordoc.ilo.org/discovery/fulldisplay/alma994272463402676/41ILO_INST:41ILO_V2.

[24] Siriruttanapruk S, Wada K, Kawakami T. Promoting occupational health services for workers in the informal economy through primary care units. ILO Subregional Office for East Asia. Bangkok: ILO. 2009 [cited on 2022 December 8]. Available from: https://www.ilo.org/asia/publications/WCMS_114237/lang–en/index.htm.

[25] Chen Y, Chen J, Sun Y, Liu Y, Wu L, Wang Y, Yu S. Basic occupational health services in Baoan, China. J Occup Health 2010;52:82–8.

[26] Indian Association of Occupational Health. In: Parekh R, Moti S, editors. BOHS for informal industry. Manual for primary care providers. Mumbai: IAOH. 2016 [cited: 2022 Dec 12] Available from: https://www.iaohindia.com/WebPage.

[27] Garrido MA, Encina V, Solis-Soto MT, Parra M, Bauleo MF, Meneses C, et al. Courses on basic occupational safety and health: a train-the-trainer educational program for rural areas of Latin America. Int J Environ Res Public Health 2020;17:1842.

[28] Balogun MO. Occupational health services for workers in the informal sector. Occup Environ Health J 2015;4:15–21.

[29] Masekameni MD, Moyo D, Khoza N, Chamdimba C. Accessing occupational health services in the Southern African Development Community region. Int J Environ Res Public Health 2020;17:6767.

[30] Gomez CM, Vasconcellos LCF, Machado JMH. A brief history of worker's health in Brazil's Unified Health System: progress and challenges. Cien Saude Colet 2018;23:1963–70.

[31] Moyo D. An overview of occupational medicine and health services and associated challenges in southern Africa. Occup Health Southern Afr 2021;27:51–4.

[32] Amorim LA, Silva TLE, Faria HP, Machado JMH, Dias EC. Worker's surveillance in the primary care: learning with family health team of João Pessoa, Paraíba, Brazil. Cien Saude Colet 2017;22:3403–13.

[33] Lazarino MSA, Silva TL, Días EC. Apoio matricial como estratégia para o fortalecimento da saúde do trabalhador na atenção básica (Matrix support as a strategy to strengthen workers' health in primary care). Rev Bras Saúde Ocup 2019;44:e23.

[34] Denny HM. Impact of occupational health interventions in Indonesia. Thesis University of South Florida USA. 2012. 136 p [cited: 2022 Dec 12]. Available from: https://digitalcommons.usf.edu/etd/4308/.

[35] Hugenholtz NI, Nieuwenhuijsen K, Sluiter JK, van Dijk FJ. Do knowledge infrastructure facilities support evidence-based practice in occupational health? An exploratory study across countries among occupational physicians enrolled on evidence-based medicine courses. BMC Health Serv Res 2009;9:18.
[36] World Health Organization. Institutional repository for information sharing (IRIS). [cited 2022 Sept 17]. Available from: https://apps.who.int/iris/.
[37] International Commission on Occupational Health. ICOH heritage repository. [cited 2022 Sept 17]. Available from: http://repository.icohweb.org/.
[38] Program for Monitoring Emerging Diseases (ProMED). International society for infectious diseases (ISID). [cited 2022 Sept 17]. Available from: https://promedmail.org/.
[39] MODERNET (Monitoring trends in Occupational Diseases and tracing new and Emerging Risks in a NETwork). [cited 2022 Sept 17]. Available from: https://www.modernet.info/.
[40] E-Library of Education in Occupational Safety and Health. Learning and developing occupational health (LDOH) foundation. [cited 2022 Sept 17]. Available from: https://library-education-osh.ldoh.net/.
[41] Rollin L, Darmoni S, Caillard JF, Gehanno JF. Searching for high-quality articles about intervention studies in occupational health. Scand J Work Environ Health 2010;36:484–7.
[42] Bramer WM, Rethlefsen ML, Kleijnen J, Franco OH. Optimal database combinations for literature searches in systematic reviews: a prospective exploratory study. Syst Rev 2017;6:245.