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Global occupational health research methods education



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A B S T R A C T

Occupational and Public Health Research has been developed gradually over the last century, unfortunately not to the same levels in all continental parts of the globe. The aim is to supply an open modular educational program in Occupational- and Public Health research methodology for research of the risk indicators for the prevention of workers' health and safety globally. The modular educational program in research methodology is based on the Humboldtian university model with unity of research and teaching. Research data for the students comes from the research part of the "Maritime Education and Research Network" for all types of industries. The modules constitute the basic education in occupational health science research methodology. The proposal for Master of Science for medical doctor's specialization in occupational medicine with an emphasis on research includes 3 theoretical and a clinical module. The huge difference in research methodology globally indicates inequity in relation to the UN17 goals that need to be taken hand on. Global collaboration in teaching health research methodology is needed to reach the goals of equity in health science education. The aim is to reduce the inequity in global health by strengthening the education in health science research methodology.

- Open access educational program for health science research methodology to reach the UN17 goals.
- The modules constitute the education in research methodology for Public- and Occupational health.
- Global education in health research methodology is needed to eliminate the inequity in global health.

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Method details

[Cohort protocols standard](#)

[Google Forms Questionnaires](#)

[Diploma 1: Basic Education in Health Research Methodology](#)

[Diploma 2: Education in Occupational Health Research Methodology](#)

[Diploma 3: Education in Writing a Scientific Article/Thesis](#)

[Theoretical research education modules](#)

[Cohort protocols standard](#)

Introduction

Historically, the universities serve to create and disseminate new knowledge based on scientific principles and to teach the students to continue the research and teaching. While the scientific methods globally differ according to culture, religion, geographic area, and time, the intention here is to follow the modern 'Humboldtian' university model that for two hundred years has generally been admired as the best in the world with the unity of free research and teaching [1]. University professors are obligated to teach half of the time and to do research the rest of the time. In contrast to this, university professors in developing countries mainly teach without researching. The challenge and intention here are to help to minimize the inequality of access to the 'Humboldtian' university model with basic training in research methodology that allows the students to see how the scientific principles are used to create new knowledge of value for the communities.

The 'Humboldtian' university model with the combination of research and university teaching is seen in the developed countries and less in the developing countries. An important basis for the preventive activities is the epidemiological research methodology in the public health and occupational health specialties. For example, while public health and occupational health research was developed in the European countries in the last decennia this did not happen in Latin America and other developing countries with negative implications for public health and occupational health prevention. Occupational Medicine as a recognized medical specialty was poorly developed in Panama until recently and well-organized scientific research activity in occupational medicine is absent. A study on the Panamanian health research System by Romero et al. characterizes the system as insufficient to accomplish its operative role of generating knowledge for new health interventions and input for innovations [11]. Another study by Romero et al illustrates an approach to the context of the Panamanian Health Research System, which characterizes the system as insufficient to accomplish its operative role of generating knowledge for new health interventions and input for innovations [10].

The European Bologna Process aims to bring coherence to higher education systems by introducing a three-cycle higher education system consisting of bachelor's, master's, and Ph.D. (Doctor of Philosophy) studies and to ensure the mutual recognition of qualifications completed at other universities [4,8] The Initiative to create the European Bologna Process was proposed by the University of Bologna in 1986 to adopt the Great Charter of Universities. A document proclaiming universal and eternal values of university education was signed by the rectors of 80 universities.

Similar efforts to introduce the three-cycle higher education system consisting of bachelor's, master's, and Ph.D. studies was never or only sparsely implemented in the developing countries. Probably because of a combination of resistance to new education systems, lack of scientific interest, lack of knowledge about this system but also because of lack of infrastructure, lack of political interest, and lack of sufficient financial background. It is our challenge to seek to overcome the resistance to include the 'Humboldtian' university model by inviting groups of open-minded students who are willing to use their own time, interested to learn and use English as a second language. At the same time, it is our intention to create interest and offer research methodological education courses for the students in interested universities as part of their health science education.

The aim of the paper is to implement education in health research methodology and thereby as the expected outcome to help to improve wellbeing and safety at work and at home and to help to reduce inequity in global health.

Methods

The objective of this program is to learn how to conduct independent research and to use the international research outcome for teaching and prevention of occupational health risks. The methodological learning courses is based on the epidemiological learning resources that have been developed for the international research for all industrial branches.

The background for the proposal is the authors' own experiences as teachers in master's programs in occupational and public health in Europe, Latin America, the Philippines, and Africa. In a global context, all students must make a scientific dissertation a thesis as a final part of their education. Thousands of dissertations for graduation are produced in Latin America and globally every year. The dissertations are to our best knowledge usually not designed as academic work on an international scientific level. The reason is partly the traditions where the professors are not educated to teach the scientific methods required for international peer-review publishing. These dissertations could be of great benefit to society if they were structured and published as scientific articles. However, the construction of these dissertations is based on specific different scientific systems, as for example using website references instead of using the latest scientific references.

The aim is to provide a foundation for the evidence base for the identification of health risks to foster safe and healthy preventive strategies and policies in all industrial branches. The examples of questionnaires and research protocols are for the maritime industry and can easily be adapted for the students and workers in any industry. For a start, the program includes the monitoring of four main topics of the Global Occupational Health strategy: Mental health, Ergonomics, Safety, and chemical exposure. In the cohort design strategy, we will follow and support the young people from their professional schools in their careers. Other methods of data collection in collaboration with the unions. The method is that we ask the classes of maritime university students to fill out a short questionnaire about their health and wellbeing at the beginning of their studies.

When they start their work practices, they are asked to answer the same questions to identify the workplace influences on their well-being. It is intended to suggest and assist in the implementation of preventive measures based on the results. Later, we can continue to ask them at some year intervals with the same questionnaires to assess whether the efforts have helped. Data will be collected with questionnaires to be answered electronically by interview or contained via their mobiles: The standard questionnaires available include 1. General Health Questionnaire (GHQ-12) 2. Nordic Musculoskeletal Questionnaire (NMQ) 3. Nordic Safety Climate Scheme (NOSACQ-50) 3) Nordic Occupational Skin Questionnaire (NOSQ-2002) [Google Forms Questionnaires](#). The analysis and further procedures and ethical issues in the studies are described in detail in the standard protocols in the four areas, that

Table 1

Diploma and MSc Occupational health research method educations.

<p>Modules 1-3 to be offered by the universities as independent Diplomas for all health professionals</p> <p>Module 1: Diploma in Health research methodology 3-6 months</p> <p>Module 2: Diploma in Occupational Health research methodology 6-9 months</p> <p>Module 3: Diploma in writing a scientific article/Thesis in occupational health 6-12 months</p> <p>MSc Occupational Medical Research Methodology Residency*</p> <p>Module 1: Education in Health research methodology 3-6 months</p> <p>Module 2: Education in Occupational Health research methodology 6-9 months</p> <p>Module 3: Education in writing a scientific article /Thesis n occupational health 9-12 months</p> <p>Module 4: Clinical education diagnostics and management of occupational diseases 18 months</p>
<p>* Module 1-3 for medical occupational specialist residency equal to Module 1-3 above After completing Modules 1-3, the postgraduate students are competent to matriculate for a Doctor of Philosophy PhD study 3-4 years</p>

Table 2

Study subjects in Diploma 1.

<p>How to start and complete research projects</p> <p>Authors guidelines for scientific Publications</p> <p>Guidelines for scientific literature: PRISMA, CONSORT, STROBE, and IMRAD</p> <p>Review of a Cochrane study on "smoking cessation"</p> <p>Occupational Health Risk Surveillance program</p> <p>Electronic Research tools 1 and 2</p> <p>Install and use Endnote / Zotero</p> <p>"Boolean" type of literature search</p> <p>Midterm exam</p> <p>Data analysis in Excel, Epi-info, SPSS, Stata</p> <p>Research protocol for GHQ12</p> <p>Reading and review of literature for the protocol</p> <p>Theoretical epidemiology and biostatistics</p> <p>Create Google drive</p> <p>Practical management of Google Forms</p> <p>Statistical calculations in Open-Epi</p> <p>Prepare data collection</p> <p><i>Final exam</i></p>
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can also be used for applications of funding and to get national permissions to perform the studies. [Research Cohort Protocols](#).

Results

Table 1 gives an overview of the education modules from the basic course in occupational health research methodology to the more advanced MSc Occupational Medical Research Methodology for Occupational Medicine Residency program and the 4 years Ph.D. education. The Diploma of well-done in health research methodology is handed out after having passed the Midterm and final test exams in the modules.

Module 1: Diploma in health research methodology 3-6 months, 150-300 hours

The purpose of Diploma 1 in 3-6 months, depending on other tasks to provide the students with the necessary tools to understand and apply health research results in daily life in order to maintain a high professional level and ensure an updated and evidence-based prevention and treatment. The is also the basis for learning evidence-based in the next step and for their thesis. Further, the aim is to train the students to carry out independent research projects to be internationally published and to inspire the students to actively engage in health research and teaching. The Diploma is focused on epidemiological occupational health research, but as the same research method is used in other health specialties, the course is useful for all other students and professionals in health. As the literature background in health research is quite voluminous, the students have to select the reading after their own personal interest. **Table 2**. Shows the study subjects in Diploma 1 and **Table 3**: Examples of study content in the course Week 3-4

Table 3

Examples of study content in Week 3–4, Diploma 1.

 Week 3 Lecture, questions and preparation for the next week (45 min.)

1. Experience from last week
 2. Info about various 'guidelines' for scientific literature: PRISMA, STROBE, and IMRAD
- Self-study in the weekdays 5 hours

1. <https://www.equator-network.org/>
2. <https://en.wikipedia.org/wiki/IMRAD>
3. Review of a Cochrane study smoking cessation
<https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD013272/full>

Week 4 Lecture, questions and preparation for the next week (45 min.)

1. Experience from last week self-study
 2. Preparation for next week: The Occupational Health Risk Surveillance Program
- Self-study in the next weekdays 5 hours

1. https://en.wikiversity.org/wiki/Occupational_Health_Risk_Surveillance
 2. Identify a health problem at your school/workplace, formulate a research problem and write an abstract for a research project (100–200 words)
-

Open → [DIPLOMA 1](#)**Module 2: Diploma in Occupational health research methodology 6–12 months**

6–12 months, 300–600 h work the students have to work with the scientific method they have learned to do in Diploma 1. The program includes the presentation and scientific article-based self-study of the main topics of the Occupational Health strategy: Mental health, Ergonomics, Safety climate, exposure to chemicals, early diagnosis of diabetes 2, hypertension, and other chronic diseases as the preparation for their studies in Module 3.

Every week the students will do the following:

1. Receive a lecture on the weekly topic and instructions for the next week Zoom
2. Self-study 5–6 hours in the following weekdays:
 - a. Search new scientific literature on the subject for that week
 - b. Organize and enter the references in the Zotero/ Endnote reference program
 - c. Produce a short review with literature references present in the next tutor meeting.

The mid-term and the final exam include a 15 min presentation and oral examination. [Table 4](#) shows the program contents on the main topics in Diploma 2

Open → [DIPLOMA 2](#)**Module 3: Diploma in writing scientific articles /Thesis 6–12 months 600–900 h**

Writing a thesis is the compulsory final part of all postgraduate educations for candidates or postgraduate master's degrees. Diploma 3 is relevant also for those who want to start health research independent of postgraduate education. This step runs over 6–12 months and having completed Diploma 1–2, the students are well trained in using the literature and writing a thesis that can possibly be structured like a scientific article and published. It is based on their own data from their research project or secondary data from the MAHRE-Net. The thesis can be either structured as a scientific article or as the traditional thesis structure. By using the traditional thesis template in developing countries a lot of valuable scientific work is wasted because the thesis cannot be used as a scientific reference like peer-reviewed articles. There must, of course, be support from the institution that the finished study work can consist of a scientific article manuscript. Now the students can benefit from the possibilities to get data from The Maritime Health Research and Education-NET (MAHRE-Net) and other sources. Projects with pooling of data from many countries and trends analysis and combining of different questionnaires will require experienced researchers and significant financial funding support.

Open → [DIPLOMA 3](#)

Table 4

Program contents on the scientific study of the main topics Diploma 2

Mental health	Chemicals and biological agents
Stress and Depression, work-related	Chemical hypersensitivity
Post-traumatic stress disorder (PTSD)	Allergic alveolitis,
Burnout at the workplace	Asthma and rhinitis,
	Asbestos-related lung disease
	Hepatitis toxica,
	Work-related cancer
Ergonomics	Safety climate
Carpal tunnel syndrome,	Vibration injury,
Lateral and medial epicondylitis,	Hearing damage,
Low back pain,	Occupational injury report
Neck-shoulder pain,	Occupational diseases report
Shoulder tendinitis,	National data on injury and diseases
Tendovaginitis of the wrist,	
Other	
Occupational medical examination	
Social determinants of health	
International code of medical ethics	
Occupational medical patient record	

The MSc occupational medicine residency program for medical doctors

The program is divided into 4 phases, Diploma 1-4 to obtain the title of MSc and Specialist in Occupational Medicine in the residency programs as described in [Table 1](#). MSc Module 4 /Diploma 4: Clinical diagnostics of occupational diseases 18 months. The content of the clinical competencies the occupational medical specialist should possess on completion of education is presented:

Open→ [DIPLOMA 4](#)

Discussion

The article addresses the gaps and the differences of the basic research methodological education in Public- and Occupational health from a global perspective and how to implement relevant research methods training up to the level of Ph.D. It should be underscored those doctoral educations in developing countries are normally not focused on education in research methodology. The doctoral educations in the developing countries in Public Health cannot be compared to the Ph.D. educations in the developed countries that include 3 years of full-time research and methodological training where the Ph.D. students must publish at least three international peer-reviewed scientific articles as the first author.

A good indicator of the differences in research educations is seen in the number of scientific publications in Occupational and Public health in the countries with variations from nearly zero to hundreds of publications per million inhabitants. We do not address the developing countries only but support the intention behind the European Bologna process to harmonize the higher educations in Europe and globally.

Half of the authors of this paper comes from developed countries with the third cycle of the the Bologna Process academic education, post grade master's degrees, and graduate Ph.D. schools while the other authors are from the developing countries where there is a lack of offer for the research methodological education and no Ph.D. schools. The lack of international scientific publications in Public Health and the lack of research methodological schooling calls for implementing research methodological training programs globally. In the developed countries where a Ph.D. degree may be too challenging and modular programs like this may be more attractive for many students.

The three basic modules can be offered individually in a University Diploma program of 6- and 6- and 12-month duration. This gives a new opportunity for medical doctors and for all health professionals in the work environment to receive high-level training in research in Occupational Medicine and Public Health. In addition, it is proposed that well completion of Module 1-3

corresponding to Diploma 1-3 provides sufficient preparation to matriculate and complete 3–4 years Ph.D. program, most often outside one's own country. This is to our best knowledge, the first attempt to come up with a detailed open modular curriculum for education in research methodology for occupational health science. By changing of the content of Module 2 to Public Health-related items the program can be used for research methodological education in Public Health schools.

The educational modules are free to be used and developed to compose modules with scientific research training for educators, safety officers, nurses, workers, medical doctors, and all other health professionals. The occupational medical specialist residency is typically 3–4 years with 1–2 years of occupational medicine and 3–6 months stay in each of the departments for psychiatry, rheumatology, lung diseases, and other clinical departments while completing the theoretical modules [2,5,7]. The proposed model for a three-year MSc Occupational Medical Research Resident Education is intended to be used in combination with other clinical and theoretical modules.

The stakeholders interest

The aim is to provide a foundation for the evidence base for the identification of health risks to foster safe and healthy maritime preventive strategies and policies within the UN Global Sustainable Goals [3,9]. The program includes the permanent monitoring of the four main topics of the EU-Occupational Health strategy: Mental health, Ergonomics, Safety climate, and chemical-related Skin diseases. In the cohort design strategy, we give the same questionnaires to the maritime students in other countries for comparison and to learn from their proposals on how to get the best working conditions. Also, we ask what is needed of teaching to help the industry to give them the best conditions so they can stay safe in the job [6].

The maritime workers, medical doctors, and the industry

For the maritime workers and the industry, the updated scientific evidence on the prevalent health risk exposures and health conditions on board will qualify the prioritization of the preventive actions in the Safety Committees on board, in the companies, and the worker's organizations. The workers will benefit from the updated maritime doctors to better understand their possible claims and symptoms that call for adequate clinical and laboratory diagnostics and possible notification as occupational diseases. For the maritime doctors, the outcomes of the cohort studies will be an important part of the continuing training of the Maritime Medical doctors and the safety training for fishermen and seafarers. https://en.wikiversity.org/wiki/Maritime_Health_Research_and_Education-NET/MARITIME_HEALTH_PORTAL. Without this knowledge, the medical doctors cannot perform their obligations adequately and give preventive advice for the seafarers and fishermen according to the ILO/IMO Guidelines on the Medical Examinations of Seafarers and act adequately with possible notification of occupational diseases. For the students Preferably we use our maritime health and safety research outcomes as the basis for our teaching for the MSc.Pub Health and the Maritime students. They learn the research methods in occupational maritime health with an assessment of reliability, generalizability, and different methodological types of bias in the scientific context including clearance of the ownership of the data. They learn how to apply the research methods in their coming professional tasks and search the scientific-based knowledge to solve practical problems in their professional life. The maritime students get interested in searching and using the scientific-based maritime knowledge for use in their professional positions as leaders on board.

Focus on the students and youngest workers

Our proposal focuses on the students and youngest workers because they can bring fresh perspectives and different ways of thinking to the responsible persons in the companies. The proposed survey method used is easy to implement on a low budget. It is a strength to use a method that immediately gives the main results to identify risk elements in the work environment that are not seen by the managers to be amended for the benefit of the workers and the companies. The result of

the surveys is ready immediately to be discussed in the class on occupational health and wellbeing in the schools. The studies identify actual risk indicators in the work environment that will not be learned from the register-based studies and neither from the large-scale and expensive national surveys. Among the weaknesses is that the response rate might be too low from the start, that they change their mail address, so we have no contact, and they are not willing to participate in the later rounds. Another weakness is that the cross-sectional design cannot identify the causal relations in the single studies. However, by comparison of different questionnaire rounds, the health risk hazards might be present in some cohort parts and not in others and thereby contribute to identifying the causal relations.

UNs 17 sustainable development goals

The program is intended to support the UN Sustainable development goals, especially Goal 3: Good health and well-being for all workers, Goal 4: Quality Education, Goal 5: Gender Equality, Goal 8: Decent Work and Economic Growth, Goal 10: Reduced Inequality, Goal 12: Responsible Consumption and Production, Goal 14: Life underwater observations on compliance with good waste management and Goal 17: Partnerships to achieve the Goals.

Prevention and education

The results of the studies should be widely disseminated in the relevant digital and printed fora. The updated scientific evidence on the prevalent health risk exposures and health conditions at work and in the schools will qualify the choice of preventive actions in the schools, the companies and in the workers' organizations. The students and workers will benefit from the updated health professional to better understand their health complaints and symptoms that call for adequate clinical and laboratory diagnostics and notification as occupational diseases.

For the occupational health doctors and GPs, the outcomes of the studies will be an important part of the continuing training of the medical doctors and the training of the workers. The students get interested and knowledge on how to search and use the scientific-based maritime knowledge for use in their professional positions as leaders at the workplaces. They learn how to apply the research methods in their coming professional tasks and how to search the scientific-based knowledge for solving practical health and safety problems in their professional life.

Conclusions

This is the first attempt to create a detailed global, open occupational and Public Health research methodological education curriculum for health professionals and students. The intention is to train students, health professionals including medical doctors in their specialization in research methodology to produce new valid knowledge on small budgets. The educational modules are intended to be used and further developed for free by the universities to compose educational modules in Occupational and Public Health research for the benefit of workers' health and safety. The results from the studies should be used by the health and safety educators, the workers, the safety committees, the management, and for those responsible for the updating of the safety and health policies in the workplaces.

Declaration of Competing Interest

The authors of this article declare that they have no conflict of interests.

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