HHS Public Access

Author manuscript

J Occup Environ Med. Author manuscript; available in PMC 2024 August 06.

Published in final edited form as:

J Occup Environ Med. 2024 August 01; 66(8): 673–681. doi:10.1097/JOM.0000000000003138.

Proposed Framework for Developing and Evaluating *Total Worker Health*® Education and Training Programs

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Abstract

Objective: Propose a framework for developing and evaluating *Total Worker Health*® education and training efforts by implementing institutions.

Methods: Review of *Total Worker Health* (TWH) information from symposia, workshops, academic offerings, and publications, along with a review of education and training development and evaluation resources applicable across various disciplines.

Results: Examples of knowledge, skills, and abilities (KSAs) are provided for each TWH core competency, and a framework for developing and evaluating a TWH competency-based education or training program.

Conclusions: The proposed set of KSAs and framework for developing and evaluating TWH education or training programs may inform future pilot testing of KSAs and framework by implementing institutions and help to standardize practices across the discipline. Academic,

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Specific Author Contributions of every Author listed: Tat'Yana A. Kenigsberg, Adele M. Childress, Donjanea Fletcher Williams, Maria Lioce, and L. Casey Chosewood contributed to the conceptualization and the writing and/or editing of the manuscript.

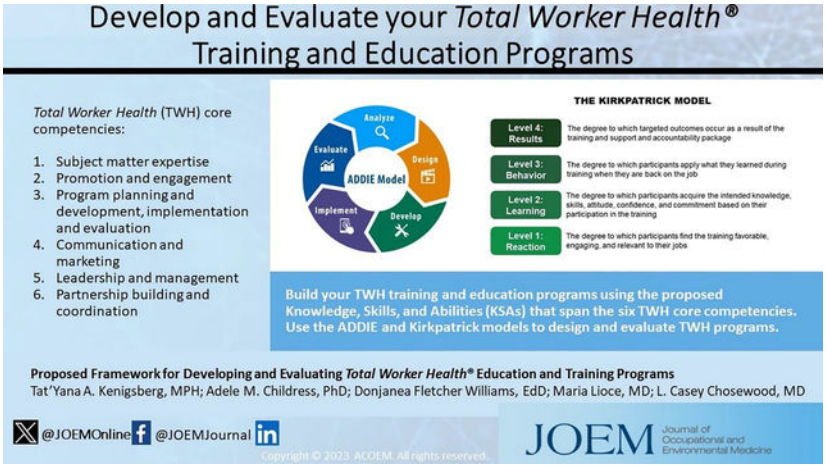
Conflict of Interest Disclosures for All Authors: None declared.

Specific Author Contributions and Data Availability Statement: All authors contributed to concept and content generation and review of manuscript drafts. Tat'Yana Kenigsberg, Adele Childress, Donjanea Fletcher Williams, and Maria Lioce

Ethical Considerations & Disclosures: None to disclose. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC. Mention of a product or company name is for identification purposes only and does not constitute endorsement by the CDC. *Total Worker Health*® is a registered trademark of the U.S. Department of Health and Human Services (HHS).

business, community, labor, and government stakeholders are encouraged to provide further input to assist in its maturation and uptake.

Graphical Abstract



Keywords

Total Worker Health®; education; training; Knowledge; Skills; Abilities (KSAs); evaluation framework

Introduction

The constantly changing work environment calls for occupational safety and health professionals (OSH) and other allied professionals to address not only traditional safety and health issues but also face novel challenges in the workplace.[1–2] Examples of these challenges have been described in general and related to specific industries.[3] In the future, employers will face not only a shortage of health care professionals, but OSH professionals will be called upon to perform roles they are not formally trained in or have expertise.[4–6] Billions of dollars each year are spent by government and private organizations in educating and training OSH professionals, to include those working in public health and allied professions.[7] To be successful in the future, these professionals will need to have an expanded set of knowledge, skills, and abilities (KSAs) that shifts expertise from only a specific discipline, to a cross-disciplinary set of KSAs that more effectively function in a transdisciplinary approach, to identify and develop sustainable interventions for new and multifaceted safety, health, and well-being issues. Occupational safety and health and allied professionals will be required to up-skill and re-skill.

In 2010, Frenk et.al., and a commission of 20 professional and educational world leaders called for a redesign of professional health education that involved major curricula modification.[8] These included addressing the ineffective match of competencies to address the health needs of the world population, improving teamwork, decreasing stratification of health professionals, broadening understanding of the cultural and diverse elements of comprehensive and continuous health care, reducing disparity, and developing strong

leadership. Their suggestion was a health systems approach that is global in nature, replacing a traditional siloed professional system, with a multidisciplinary professional approach to prevention and health care. A more recent survey of 2,064 OSH professionals including safety, occupational health nursing, and industrial hygiene respondents identified continued educational needs related to safety and health and other important topics such as OSH management and legal issues, compliance, risk management and risk communication, OSH culture and leadership, and a *Total Worker Health*® approach to meet the demands of their profession.[9] In summary, all of these indicate that academic and other training institutions may need to modify traditional approaches to education and training to those that adopt a broader, more comprehensive or systems approach.

Through the Occupational Safety and Health Act of 1970, the National Institute for Occupational Safety and Health (NIOSH) is required to provide an adequate supply of qualified OSH professionals through education, research, and training grants.[10] The NIOSH currently funds 10 *Total Worker Health* (TWH) Centers of Excellence, 18 Education and Research Centers (ERCs), 32 Training Project Grants (TPGs), 11 Centers for Agricultural Safety and Health, the National Children's Center for Rural and Agricultural Safety and Health, and CPWR-The Center for Construction Research and Training, functioning as the principal multidisciplinary centers for providing OSH workforce training, continuing education, and regional outreach.[11] In 2003, NIOSH launched the first federal workforce initiative to integrate OSH with the promotion of best practices, policy, and research for healthier workplace environments and to address worker safety, health, and well-being in a more comprehensive way.[12] *Total Worker Health* (TWH) is defined by NIOSH as policies, programs, and practices that integrate protection from work-related safety and health hazards with the promotion of injury and illness prevention efforts to advance worker well-being. The comprehensive principles of TWH are the integration of workplace systems including exposures, work organization, leadership, benefits, and work-life fit to enhance satisfaction and productivity through the work-life continuum. Over the past 18 years, TWH has become an increasingly applied discipline that offers transdisciplinary, holistic perspectives and approaches to occupational safety, health, and well-being issues associated with work and non-work environments.[13] Expanding on this transdisciplinary approach, the NIOSH Future of Work Initiative aims to meet emerging workplace needs by identifying new research solutions, practical approaches, and partnership opportunities to address the future of work in the U.S.[14]

In April 2016, NIOSH published the 2016–2026 National *Total Worker Health*® Agenda (Agenda) that proposed strategic goals across four broad categories to advance TWH research, practice, policy, and capacity-building.[15] Among these goals, the Agenda identifies several activities and strategies that provide guidance to develop an educational model, including: developing educational and training programs and products to expand capacity (KSAs) for integrating TWH approaches and methodology; survey key stakeholders to identify TWH training needs; develop standard TWH core competencies to be used across programs; develop guidance in consultation with educators and academic professional societies and organizations for incorporating TWH core competencies into the curricula of existing and new degree, certificate, and continuing education programs; and develop mechanisms to support and evaluate TWH educational activities. Since the

Agenda's publication, progress has been made in the development of academic, nonprofit and government programs focused on TWH education and training, TWH related job descriptions and positions[16], and the development of a TWH professional society.[17] Some academic institutions now offer training and certificate programs or degrees in TWH[18]; several TWH Affiliate professional societies are adopting TWH approaches in their educational programs[19]; and examples of the application of TWH concepts and findings are illustrated in numerous research, practical applications, health hazard evaluations, tools, and publications.[20]

Several examples have been provided of the benefits of a TWH-trained professional in addressing complex safety, health, and well-being issues and their interrelatedness as changes in the workplace, work, and workforce evolve.[9,21] The TWH Centers of Excellence are conducting education and training on such cross-cutting concepts. Examples include, among others: 1) Harvard Chan School's Executive and Continuing Professional Education Program which offers academic courses to build the capacity of the TWH workforce;[22] 2) Oregon Healthy Workforce Center (OHWC) graduate course titled *Principles of Occupational Health* for students in the Master of Public Health program within the Oregon Health & Science University- Portland State University (OHSU-PSU) School of Public Health, where several OHWC members deliver guest lectures on various topics related to occupational safety and health and the TWH approach, and OHWC's *TWH Curriculum for Practitioners and Professionals*[23]; 3) Colorado's Center for Health, Work and Environment's Certificate in TWH;[24] 4) and North Carolina Center for TWH and Well-Being's efforts to expand their academic TWH certificate to a continuing education version for working professionals.[25] While the TWH Centers of Excellence and some ERCs have initiated training in TWH principles and concepts, more educational and training opportunities are needed to develop additional competent TWH leaders.

Private, academic, and public sector institutions now routinely recruit for positions calling for TWH competencies and qualifications. Competency-based education (CBE) provides a framework of standardization for academic institutions, public health practitioners, and employers to identify and provide the knowledge public health professionals will need throughout their careers to perform the job skills necessary to effectively function in their role or position.[26] Several definitions of CBE have been proposed. Gervais defines CBE as an outcome-based approach to education that incorporates modes of instructional delivery and assessment efforts designed to evaluate mastery of learning by students through their demonstration of the knowledge, attitudes, values, skills, and behaviors required for the degree sought.[27] Competency based educational programs, while heterogeneous in nature, offer numerous benefits, including: self-paced learning; a focus on learning outcomes based on identified set of competencies that relate to workplace roles, jobs, or tasks; acknowledge outside experience and skills; value equity and diversity; are available throughout the work-life continuum; and are measurable through formative assessments.[28] Additionally, a competency-based approach to education has been shown to support workforce development to meet workforce training needs, workforce planning, improved performance and performance evaluation, and accreditation requirements.[29]

In 2014, incorporating a multi- and transdisciplinary approach, NIOSH presented a set of core competencies for TWH workforce development and capacity building to key stakeholders that were drawn from multiple disciplines, including occupational safety and health and public health professions (unpublished). Subsequently, collaborative efforts have included a 2017 roundtable of public health experts, workshops at two International Symposiums to Advance Total Worker Health (2014, 2018), and a 2020 publication in the Journal of Occupational and Environmental Medicine (JOEM) developed by experts representing multiple disciplines, training experts, and professional organizations.[30] The outcome from these collaborations reinforced the need for, and identified the benefits of, a more highly trained professional workforce and a redesign to a more comprehensive and integrated curriculum. Six broad TWH core competencies for education and training of professionals entering the field of TWH were proposed and shared with key audiences: Subject Matter Expertise; Advocacy and Engagement; Program Planning, Implementation and Evaluation; Communication and Dissemination; Leadership and Management; and Partnership Building and Coordination.[30] The TWH core competencies can guide workforce development and help public health organizations develop curriculum, prepare for accreditation, meet training needs, and improve performance. They can be integrated into public health practice, enhance workforce development planning, workforce training, and performance evaluation. The standardization of these competencies and skills, and the recent establishment of a TWH professional society will also serve as a resource for CBE education and training.[17] Evaluation of a CBE program is key to identifying the level of understanding and demonstration of competencies among participants, identifying learning needs and whether the curriculum and instructional design and implementation are appropriate or need modification.[27,31] Both process (focused on implementation) and outcome (focused on program effectiveness) evaluations are essential in a CBE evaluation framework. However, no standardization or evaluation framework for TWH competencies currently exist.

This article builds on the 2020 JOEM publication in two ways. First, we provide examples of specific KSAs for each proposed TWH core competency that would enable OSH and allied professionals to successfully perform a specific job or task (Appendix A, http://links.lww.com/JOM/B596); and second, we introduce a framework for developing and evaluating a TWH competency-based education or training program using a combined Analysis, Design, Development, Implementation, and Evaluation (ADDIE) and Kirkpatrick models approach. The KSAs provided in this article are not intended to be comprehensive, may vary by unique workplace needs and environments, and span more than one competency. The KSAs may also be used to provide the basis for developing a logic model, evaluation questions, indicators, and the level of training (e.g., certificate, continuing education, degree program).

Proposed Knowledge, Skills, and Abilities (KSAs) for TWH Core Competencies

The previously published TWH core competencies and the proposed KSAs in this article were informed by the Council on Linkages Between Academia and Public Health Practice (Council on Linkages) competency framework[32,33] and the Competency-to-Curriculum Toolkit (Toolkit).[34] The Council of Linkages framework describes core competencies as foundational skills necessary for professionals engaging in the practice, education, and

research of public health. The competencies are organized into domains that represent the skill areas within public health and the different types of responsibilities within an organization or level of expertise for public health professionals. Similar to this, the TWH core competencies are divided into six broad domains, for which KSAs are proposed to train professionals and practitioners across the spectrum of OSH and allied professions. The first part of the Toolkit focuses on assumptions, definitions, and the development of competencies, while the second part focuses on the process to develop curriculum and training models from proposed competencies. Moving from selected competencies to the development of a competency-based curriculum involves selecting the competency, describing key words and sub-competencies, developing learning objectives, resources for theory and practice, methods for learning experiences and develop evaluation criteria and indicators. The TWH KSAs proposed in this paper integrate TWH core competencies, learning objectives, and resources for OSH and allied professions, including OSH and workplace health promotion (WHP) practitioners, health educators, human resource (HR) specialists, and business and labor relations professionals.

Developing and Evaluating TWH Competency-based Education and Training Programs

Corporate and academic spending on education and training has steadily increased, making the development and evaluation of training and its impact on the US economy even more important. From 2020–2021, US companies spent over $92 billion on training, including on the job and remote training, to improve employees' skills and productivity.[35] In 2019, U.S. educational expenditures for post-secondary education increased to $671 billion; total expenses for public ($430 billion), private nonprofit ($228 billion) and private for profit ($13 billion) institutions.[36] Given the increased expenditure and the number of training and educational modalities currently available, developing and evaluating training programs is critical to ensure participants gain and maintain the necessary competencies and KSAs to effectively improve work performance, productivity, and behaviors that support organizational values and results.[37] Some TWH Centers are already conducting evaluations of their seminars, symposia events, summer institutes, and training and certificate programs, but information on TWH evaluation approaches used to evaluate education and training programs is not readily available or standardized, making it difficult for others to learn from or replicate.

According to James D. Kirkpatrick, "Evaluation is not an afterthought to training, but rather is meant to be integrated into the entire learning and development process."[38] The selection of the appropriate evaluation method and the data obtained at each stage of the process are critical, from identification of training needs and key stakeholders through the development of the training program, including modifications along the way, learning progress and barriers, improved performance and behaviors, improved skills and applications, and ensuring training objectives are met. The CDC Framework for Evaluation in Public Health (CDC Evaluation Framework) is one approach that can be used to plan for and conduct evaluations, including those for education and training programs.[39] The CDC Evaluation Framework is a non-prescriptive tool designed to summarize essential elements of program evaluation, presenting framework users with six connected steps in the evaluation practice and four standards for effective evaluations. The CDC Evaluation

Framework emphasizes the utility of logic models to describe programs, which can result in effective program evaluations. Additionally, numerous models have been created and adapted over time to support the development and evaluation of education and training programs. These training evaluation models focus on the continuum toward impact; from the development of learning, to individual knowledge gain, to organizational or societal outcomes and impact. They include the CIPP Evaluation Model (Context, Input, Process, and Product), the CIRO Model (Context, Input, Reaction, Output), the Phillips Return on Investment (ROI) Model, Kaufman's Model of Learning Evaluation, and the Kirkpatrick Model, to name a few.[40–43] However, according to Tamkin et al, these models' limitations include a significant focus on changes resulting from learning, and do not address the learning process. Essentially, these models center on outcome evaluations and don't include formative or process evaluations which assess development and implementation.

We recognize that numerous models may be used to successfully plan for and evaluate TWH education and training programs. Organizations developing, implementing, and evaluating their education and training programs are encouraged to seek out and use models that fit their needs best. When selecting an evaluation model to assess education and training programs, Tamkin et al., recommend considering: 1) the purpose of the evaluation, 2) the intended evaluation audience, taking into account the culture and needs of the organization where the evaluation is occurring, 3) the purpose of the training and its expected outcomes, and 4) the learning process model underlying the training and possible responses one wants to capture via evaluation during the various stages in the process. Researchers and evaluators should consider needs and constraints while maximizing the informativeness of the evaluation.[42] In addition to evaluation models, various programs and organizations often seek models that help guide the creation and implementation of the training and education program itself. When developing training or education programs, or conducting an evaluation, the development and use of a logic model can serve as guiding steps through the process, including indicator development. For this reason, we introduce a logic model for TWH education and training in this article and provide examples of indicators.

TWH Education and Training Logic Model

A logic model may be useful to help plan for and focus the training and education program and process, to determine what to measure, and to identify areas of the program most in need of evaluating.[44] Previously, NIOSH collaborated with the TWH Centers of Excellence to develop the *Total Worker Health Communication and Outreach Logic Model* which was included in the "NIOSH Centers of Excellence for Total Worker Health® (U19)" Notice of Funding Opportunity posted in 2020.[45] The *TWH Education and Training Logic Model* presented in Table 1 builds on the education and training component of that logic model, and was developed using the TWH competencies[31] and proposed KSAs required to successfully perform TWH-related job functions such as the design, implementation, and evaluation of TWH interventions to prevent, improve and enhance the working lives of the US workforce.

The *TWH Education and Training Logic Model* is a graphic depiction of the relationship, process, and impact of providing TWH educational/training opportunities both at the academic and continuing education levels for professionals and organizations (target

audiences). This logic model is divided into seven sections: Inputs, Activities, Outputs, Short-term Outcomes, Intermediate Outcomes, Long-term Outcomes, and Future Impact. It is intended to provide a framework for identifying the numerous resources and expertise available to inform TWH knowledge and principles (Inputs), and the actions, behaviors, and processes (Activities) needed to accomplish the ultimate goal. The Outputs section includes identification of target audiences, and captures the quantity of various TWH educational/trainings conducted and persons trained. Outcomes are the desired results of implementing the educational/training program and the goals achieved. Outcomes are displayed in a sequence and may be divided into short-term, intermediate, and long-term, depending on the objective and length of the program. Short-term outcomes represent the immediate effects of the educational/training program and focus on the knowledge and attitudes of the intended audience. For example: Increased awareness and knowledge of the principles of TWH. Intermediate outcomes can be changes in behavior, normative, and policy. For example: Increase in TWH concepts integrated into workplace practice through trained TWH professionals. Long-term outcomes often take years to accomplish and represent the desired results of an educational/training program. For example: Increased capacity for TWH in practice. Future Impact refers to the ultimate impact of the program, which could be achieved within several years or longer. For example: Reduced workplace injury and illness and improved safety, health, and well-being among organizations and communities. The logic model is broad and may be modified as needed by those seeking to develop and implement TWH education and training programs and program evaluations. Developing or modifying the proposed logic model may help program staff determine at which step in the process the ADDIE and Kirkpatrick models may be applied, as discussed below.

Proposed Framework for Developing and Evaluating TWH Education and Training Programs

In this article we propose the combined use of the ADDIE model with the Kirkpatrick model as a framework to both design and evaluate education and training of current and future TWH OSH and Allied Public Health professionals. The ADDIE model has been widely used in developing and evaluating education and training programs across various disciplines, including OSH.[46–50] The ADDIE model goes beyond evaluation; it is comprehensive in nature and provides a framework for creating and implementing education and training programs, while also including an evaluation component. Its cyclical, ongoing process allows for continuous improvement. The products of each phase may be evaluated against the goals and learning objectives of the education/training, with results informing which phase of the model to enter next, and where changes may be needed to improve the education/training. One criticism of the ADDIE model, however, is the difficulty in verifying the degree of participants' expertise at the conclusion of the education/training.[43] Therefore, we also tie in and describe the utility of the Kirkpatrick model and how it can be applied in the context of the ADDIE model to surpass this limitation.

Overview of the ADDIE Model

The ADDIE Model was developed in the 1970s as a field-effective and efficient process to prepare trainees to meet work-performance requirements.[43] The model has evolved over time to become simpler and more flexible, enabling instructional system developers with

all levels of expertise to apply its use in developing effective and efficient instructional systems.[51] Below is a brief description of each ADDIE phase, where we provided some examples relevant to TWH.

Analysis: The analysis phase involves identifying job performance requirements to determine what KSAs trainees need to gain by the end of the training. Several methods may be used to understand training needs, establish learning goals, and explore delivery methods and resources for training development. These include a needs analysis of the target audience, goal analysis to identify training goals, task analysis to identify training content, and a review of results from prior trainings in the discipline or related disciplines.[43, 47–49] A job function and performance analysis which may be helpful for a TWH professional could include analyzing and integrating the roles and skills for specific OSH disciplines and public health professionals using current job functions, job descriptions, and curricula.[32, 50]

Design: The design phase includes setting the training strategy to accomplish learning goals, creating a detailed plan of instruction, and selecting instructional methods.[43, 47–49] Newman et al., described the various training formats and methods for training the TWH professional and suggested a combination of different training methodologies depending on the training needs.[31] For TWH training, this may involve the adoption and combination or blending of training materials and curricula already developed and tested for the education and training of specific professional disciplines such as OSH, public health (PH), Human Resources (HR), and business professionals. Several examples of this blended approach can be seen in recent TWH certification programs being offered in NIOSH funded TWH Centers of Excellence and ERCs.[22, 24, 52]

Development: In the development phase instructor and learner content and materials are developed, including the overall learning framework, modules, lectures, manuals, exercises, web-based and other e-material content. Materials and delivery methods are pilot tested to identify areas for improvement prior to implementation.[43, 47–49]

Implementation: The implementation phase focuses primarily on effective and efficient training implementation to accomplish training goals set in the design phase. For effective training delivery, continuous analysis and redesign may be necessary throughout the implementation phase to ensure training effectiveness.[49]

Evaluation: The evaluation phase is a continuous process that begins in the analysis phase and continues throughout the life cycle of the design, development, and implementation phases. Evaluation that occurs within or between the analysis, design, and development phases is sometimes referred to as process evaluation, while evaluation that occurs after implementation is sometimes referred to as outcome evaluation. Process evaluation assesses progress, with the goal of improving aspects of the training prior to implementation. Outcome evaluation provides insight into whether the training program was implemented as intended, the overall effectiveness of the instruction, any challenges encountered during implementation, ideas for improving the training during its next iteration, and possibly identifying new training opportunities.[43, 47–49] If feasible, the evaluation may also want to

assess longer-term outcomes, such as those identified in the proposed *TWH Education and Training Logic Model.*

Overview of the Kirkpatrick Model

The Kirkpatrick Model has been used extensively to evaluate education and training programs.[48, 53–54] The model posits that programs can be evaluated on four levels: reaction, learning, behavior, and results. This worldwide standard can be used to evaluate the effectiveness of an education or training program and can be applied before, during, and after to maximize and demonstrate an education or training program's value to the organization. The four-levels of the Kirkpatrick Model are briefly described below, with an example evaluation question at each level.

Level 1: Reaction – How participants respond to the training; what the participants thought of the training.

Example evaluation question: To what degree did participants react favorably to the training?

Level 2: Learning – Measures the extent to which participants learned the material; changes in KSAs with respect to the training objectives.

Example evaluation question: To what degree did participants acquire the intended knowledge, skills, and attitudes because of their participation in the training?

Level 3: Behavior – Changes in job behavior resulting from the training; to identify whether learning gained during the training is being applied.

Example evaluation question: To what degree did participants apply what they learned during the training at their job?

Level 4: Results – The bottom-line contribution of the training program; whether the training positively impacted the organization.

Example evaluation question: To what degree did targeted organizational outcomes occur as a result of the training?

Researchers and practitioners in the discipline of TWH are already implementing and evaluating education and training programs using this model.[55–56] One example is an article which applied the four levels of Kirkpatrick's model to evaluate the effectiveness of a 14-week TWH intervention designed for improved safety, health, and well-being measures of construction workers. The study assessed reactions and post-test scores to trainings and group education sessions, self-reported behaviors pre- and post-intervention, and objective measures of health outcomes.[55]

Use of the Kirkpatrick Model in the Context of ADDIE's Evaluation Phase

The ADDIE model has been successfully used to develop and implement education and training programs, and to evaluate them in conjunction with the Kirkpatrick model.[57–60] Using the combined approach addresses some of the limitations of using each model separately. For example, any one or all four of the Kirkpatrick model's levels can be applied

to conduct an outcome evaluation as part of the ADDIE model's evaluation phase. Several examples that apply both the ADDIE and Kirkpatrick models showcase that the use of both models strengthens the overall training development and implementation process, from the analysis to the evaluation phase.[57–60] Subsequent examples highlight how the ADDIE and Kirkpatrick models were both applied to develop, implement, and evaluate various education and training programs. As part of the ADDIE evaluation phase, all these programs employed Kirkpatrick levels 1 and 2 to gauge participant reaction and satisfaction with the education or training program, and to assess gain in knowledge. All programs noted that using Kirkpatrick levels 3 and 4, if feasible by the program, would strengthen the case for program effectiveness and assess improvement in health indicators long-term. In one example, as part of the Public Health Learning Network (PHLN), the nation's most comprehensive system of public health educators, experts, and thought leaders to advance public health practice and improve population health in the U.S., the Midwestern Public Health Training Center Regional Coordinating Center (MPHTC-RCC) applied the ADDIE model to develop, implement, and evaluate high-quality adult eLearning in public health.[57] They also employed Kirkpatrick's level 1 to ascertain participant satisfaction with the modules, and participant pre- and post-test scores as part of level 2 to assess overall gain in knowledge and skills. MPHTC-RCC developed an eLearning checklist for using the ADDIE model, which they shared in the article; although not used as part of their evaluation, they noted that using Kirkpatrick level 3 would strengthen the case for its program effectiveness in the long-term. In another example, Fernandes et al., used the ADDIE model to plan, develop, implement, and evaluate a 10-month management specialization course in oncology using in-person and virtual learning components (i.e., blended learning) in Brazil.[59] In the evaluation stage of the ADDIE model, the first three levels of the Kirkpatrick model were applied two months after completion of the course. Participants evaluated the course using a 27-item online form that assessed their reaction to the course, how much they learned based on course objectives, and changes in behavior and professional conduct. Although the study did not evaluate Kirkpatrick's level 4 due to time constraints, the authors noted that ideally, an assessment of improvements in health indicators and overall results would be measured two years after the intervention. Another example of the application of the ADDIE and Kirkpatrick models was the development and evaluation of e-learning modules as an approach for the dissemination and implementation of an evidence-based individual placement and support (IPS) model to support employment in 86 community health treatment programs in New York State.[60] Through iterative development, the ADDIE model was successfully applied to develop a series of e-learning modules for IPS. The authors focused on the first two levels of the Kirkpatrick model in the report, using a survey to ascertain learner reactions to the training, self-reported knowledge acquisition and self-reported practice change, and resulting knowledge via post-module quizzes. These are just some examples that highlight how both the ADDIE and Kirkpatrick models were used to develop and evaluate education and training programs. Institutions seeking to develop and evaluate TWH education and training programs are encouraged to apply components of the ADDIE and Kirkpatrick models to fit their needs, resources, and timing constraints.

Developing Indicators for the Combined ADDIE and Kirkpatrick Model Approach

Selecting appropriate indicators to answer evaluation questions is important to effectively evaluate education and training programs. Indicators can provide information on individual-level and organizational-level effects. The proposed KSAs and *TWH Education and Training Logic Model* can guide the development of indicators. Additionally, although not included in the Kirkpatrick model, if your organization finds it important to assess factors that lead up to training implementation (e.g., was training developed based on need, were appropriate stakeholders involved, etc.), we provide an example indicator which may align with the ADDIE model analysis and development phases. Likewise, an organization may want to assess factors beyond Kirkpatrick's Level 4: Results, such as their organization's capacity to provide ongoing and relevant training, ROI using a cost-benefit analysis to determine the value of the education/training program, and/or societal outcomes resulting from the education/training. In such a case, organizations may opt to apply evaluation models in addition to, or in place of, the Kirkpatrick Model to evaluate their education/training efforts.[61] For additional ideas on indicators that may be used to collect data on the four Kirkpatrick levels, see: Kirkpatrick JD, Kirkpatrick WK. Kirkpatrick's four levels of training evaluation. Association for Talent Development; 2016[38].

ADDIE model: Analysis & Development phase

Sample Indicator: Extent to which pilot testers perceived the training materials and delivery to be relevant and easy-to-follow for the intended population.

Description: Systematic collection of information from multiple sources (i.e., assessments) that enable identification of areas where training may be required, type of training to be provided, who should receive the training, existing/required resources, etc. can aid pilot testers in assessing whether training materials are relevant for the intended population. Assessments may include but are not limited to: job performance requirements; needs assessment of target audience; goal analysis to identify training goals; task analysis to identify training content; and review of results from prior trainings in the discipline. Worker input and leadership commitment is key for a training strategy to be effective. Ideally, the leading staff from the training organization will play a key role in developing the strategy, either alone or in collaboration with external consultants. Initial and continuous analysis of training implementation may identify the need to redesign the education/training methodology or delivery to ensure training effectiveness. For example, the extent to which pilot testers understood the content and perceived training materials and delivery as needed and relevant to the intended population.

Kirkpatrick model: Level 1 – Reaction

Sample Indicator: Number and/or percent of trainees that thought the education/training program delivered learning objectives as outlined in the curriculum or syllabus.

Description: The purpose of this indicator is to determine whether the content of the education/training provided trainees with the knowledge and skills outlined in the course objectives. Evaluations by trainers/participants are widely used in training sessions for service personnel. Trainees may be surveyed upon education/training completion to provide

input. Surveys are subject to courtesy bias, especially if participants doubt the confidentiality of the exercise or if they have developed a positive interpersonal relationship with the trainers over the course of the event. Those administering the evaluation can best reduce this bias if they stress that the answers will remain confidential and that the learners should not put their names on the evaluation forms.

Kirkpatrick model: Level 2 - Learning

Sample Indicator: Number and/or percent of trainees who gained relevant knowledge from the education/training.

Description: This indicator measures the trainees' ability to retain key information during and at the end of the education/training program. Ideally, pre-and post-tests are used to measure change in knowledge prior to the start of the program and throughout/at the end. Test results indicate whether the learner understands certain concepts and topics, even though the number and definition of key points may differ by context. The items included in the test should be relevant to a particular training exercise. Use of this indicator on subsequent tests can help monitor trends over time within a program and can determine knowledge retention as part of formal education/training evaluations. However, this indicator has two limitations. First, tests may lack standardized items. This lack of standardization makes it difficult to compare the results from this indicator across various education/training programs and implementing organizations. Second, improved knowledge is only one indication of training effectiveness; by itself, it does not necessarily ensure improved performance. Despite these limitations, education/training organizations routinely use this indicator to control the quality and effectiveness of education/training conducted in connection with their activities.

Kirkpatrick model: Level 3 – Behavior

Sample Indicator: Number and/or percent of learners competent to provide specific services upon completion of education/training.

Description: This indicator measures the technical competence (ability to deliver a service according to a set standard of the context) of participants who have completed education/training in a specific skill set. Thus, the evaluator must know the standard of the context (e.g., pre-established operational definitions of criteria determining competency; assessment of each learner against established standards for a number of service delivery or programmatic tasks conducted by an expert observer). The indicator reflects both the adequacy of the education/training and the ability of learners to absorb the information or knowledge. Given the novelty of the TWH field, education/training programs may use their own criteria to define competency and the level at which a learner must perform in each competency area. Competency tests are often in the form of a checklist administered by the educator/trainer and/or external expert observer, and the expected level of competency obtained may range in percent received on the test. Assessing competency is generally more complex than the testing of knowledge. Whereas measuring knowledge is easier than measuring competency (i.e., the correct performance of skills), the latter is more likely to define the quality of service delivery that TWH trained personnel can provide.

Sample Indicator: Number and/or percent of learners assigned to an appropriate service delivery point and/or job responsibilities.

Description: This indicator measures the extent to which the organization is taking full advantage of the education/training it provides to its personnel. Ideally, 100 percent of trained personnel will apply their skills to service delivery at some selected interval post-training (e.g., six months). This indicator provides a quantitative measure of the efficiency of training because it monitors the extent to which organizations assign trained employees to appropriate positions within their facilities and tap the service delivery skills obtained from the training (e.g., planning and implementing TWH programs). Data for this indicator may include a listing of learners from the education/training program and place of work and job description of each learner "X months" (e.g., six months) post-training. This data can be obtained from program records of learners, and listing of job postings and job titles for employees within a given organization (e.g., Kaiser Permanente, Mount Sinai Health System, etc.). However, the limitation of this indicator is its failure to shed light on the reasons for "departures" from service – if a far lower percentage are deployed to appropriate positions than expected. In such a case, the organization could separate the "place assigned" and "job responsibilities" to further understand the dynamics at hand.

Kirkpatrick model: Level 4 – Results

Sample Indicators: Customer satisfaction, employee engagement, enhanced productivity, output levels, quality of outputs, and time associated with completing outputs, financial data such as sales growth and cost containment, market share.

Description: Results indicators help to bridge the gap between individual education/training initiatives and organizational results. They are defined as observations and measurements that suggest that critical behaviors resulting from the training are on track to contribute to a positive and desired organizational impact. Organizational results data can be captured at different levels, including at the strategic, operational, and tactical levels. Additionally, each organization will have its own set of indicators that encompass departmental and organizational goals. For this reason, this document lists potential indicators but does not provide detailed information on each. While the sample indicators above are important measurements, they must be balanced with a focus on the highest-level organizational result. For example, a company with excellent customer satisfaction scores could go out of business if it does not maintain profitability and comply with laws and regulations. Note that customer satisfaction is an example of a goal that does not provide an affirmative answer to the question, "Is this what the organization exists to contribute?" No organization exists simply to deliver customer service alone.

Summary and Future Direction

As the TWH discipline evolves toward new and innovative evidence-based research and practical applications within workplaces, there will be a continued demand to identify and apply appropriate training and education for OSH and allied professionals in the discipline. These professionals will require knowledge, skills, and a multidisciplinary expertise not formally provided in the current educational structure. Previously, six broad

core competencies for TWH, key priority audiences, and several training methods were proposed, continuing the discussion with key stakeholders on the training and education needs of the public. As a result, some academic institutions now offer training and certificate programs or degrees in TWH[18], several TWH Affiliate professional societies are adopting TWH approaches in their educational programs[19], and examples of the application of TWH concepts and findings continue to be illustrated in research publications, interventions, and practical applications. In this article, we proposed examples of specific KSAs that expand and enhance each TWH core competency. We also developed a *TWH Education and Training Logic Model* and proposed the combined use of the ADDIE and Kirkpatrick models as a framework for developing and evaluating TWH education and training programs. The logic model may provide prospective institutions examples of measurable inputs, activities, outputs, outcomes, and future impact for developing and evaluating TWH education and training programs, and the ADDIE and Kirkpatrick models may aid institutions in planning for and evaluating such efforts and creating a standardized process for TWH education and training planning and evaluation. All these proposed components can be integrated into public health practice, guide and enhance TWH workforce development planning and TWH education and training, be used to develop a TWH curriculum, evaluate such efforts, and prepare for future accreditation. As Black pointed out, “for developing, implementing and measuring the impact of integrated TWH programs, practices and policies in the workplace, health and safety professionals with the TWH competency-based-education knowledge and skills is a requisite to working collaboratively and effectively with allied professionals, employers, employees, labor, and government organizations.”[62] For example, TWH trained professionals will be able to effectively communicate the relationship of work and non-work health and well-being, translate and apply TWH research into practice-based solutions to advance the discipline, and illustrate the value of the adoption of an integrated approach to key stakeholders including industry, academia, labor, and health care.[62]

Through the evolution of the competency-based-educational framework, several examples of a blended approach have been successful, incorporating TWH competencies and courses into existing programs. This strategy may be appropriate for transitioning from the traditional educational model to provide time and resources, modification of the curriculum, and the development of TWH educators. Initially, TWH topics and principles can be incorporated into the NIOSH funded TWH Centers of Excellence, ERCs and other Centers of Excellence to train graduates and provide continuing professional development that will build a pool of qualified professional practitioners and researchers to conduct research, outreach and research-to-practice activities. Additionally, other educational and training programs and products outside of academia exist or can be developed and made accessible to OSH and other health care professionals, HR and other business professionals during meetings, workshops, seminars, panel discussions, e-newsletters, listservs, and journals to expand capacity, such as, e-learning modules, case studies, toolkits, micro-training, TED talks and other training resources. Support of existing educational programs and curricula where TWH education is currently offered and where TWH principles can be incorporated is critical. This paper can offer guidance on the development of KSAs, and an education and training development and evaluation framework that can be further tested through

other educators, academic professional societies, and organizations for incorporating TWH training into existing and new degree, certificate, and continuing education programs. It can also help identify potential gaps in TWH education and training and the evaluation of such efforts, given the lack of TWH literature that describes which evaluation frameworks were used in program evaluation efforts. Academic and educational/training institutions are encouraged to pilot test the proposed KSAs and development and evaluation framework for TWH education and training, as feasible, and publish their findings. With the recent establishment of a TWH Professional Society, numerous partnership and educational opportunities are now available or planned to further expand TWH research, interventions and outreach approaches, and provide effective business strategies that will build TWH into leadership and management practices within the workplace and community.

As work and the workplace changes and the TWH approach evolves through new research, trained TWH professionals, effective interventions and outreach, and the integration of health protection to eliminate/reduce injury and illness with the promotion of health and well-being, it will have profound and far-reaching effects within and outside the workplace and throughout the nation.

Acknowledgements, including all sources of support:

The authors would like to acknowledge the following individuals for their review and input of the manuscript: Amia Downes, DrPH, MPH, Program Evaluator, National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC); Suzanne Nobrega, PhD, Principal Investigator, Outreach Director, Center for the Promotion of Health in the New England Workplace; Liliana Tenney, DrPH, MPH, Assistant Professor, Director of Outreach and Programs, Center for Health, Work & Environment; Department of Environmental and Occupational Health.

Funding Sources for All Authors:

This work was supported by the Centers for Disease Control and Prevention (CDC). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. See, for example, 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

Data Availability:

No data are available from the development of this manuscript.

Appendix A.: Knowledge, Skills, and Abilities (KSAs) for Total Worker Health

1. Subject Matter Expertise

Technical and public health knowledge: occupational safety and health, health promotion, organization of work, business, and health service

- Identifies the factors and relationships of workplace exposures and personal risk factors to safety, health, and well-being
- Identifies the non-occupational/environmental factors that may contribute to worker illness and injuries (psychological, behavioral, sociocultural, organization of work, and built environment)

- Interprets clinical tests and guidelines to apply appropriate interventions for care management.
- Knowledge of social environments and community health supports
- Applies standards related to workplace prevention, protection, and behavioral factors
- Designs, interprets, and applies workplace prevention and promotion best practices in collaboration with other health professionals
- Can explain disability management and return to work programs, disease management programs, worker compensation programs, employee assistance and wellness programs, and human resource and benefit programs (e.g., group health and work-family initiatives)

Risk/Needs assessment, analysis and decision making

- Defines the risks and health outcomes of environmental exposures (chemical, physical, and biological) and health outcomes
- Ability to identify health and safety risks and conduct risk assessments
- Describes the relationship of personal, organizational, and occupational health conditions and risk factors
- Consults with employee/employer/community on appropriate risk reduction approaches
- Develops appropriate intervention and risk reduction programs and services
- Evaluates the health outcomes and the value of investment of an integrated health protection/health promotion program in the workplace
- Applies critical thinking to address workplace and community health factors and status
- Communicates the outcomes, effectiveness and sustainability of the program, intervention, policy to key stakeholders

Surveillance and research methods and analysis

- Identify data needs, sources, and quality of existing data, analyzes data and identifies data gaps
- Collects, analyzes, manages, and uses both quantitative and qualitative data
- Identify and evaluate the epidemiological evidence for health protection/health promotion problems and needs
- Identify opportunities and resources for research and collaboration with safety and health professionals to build and implement programs and practices
- Document and communicate the public health hazard or behavior and key factors related to the problem to key stakeholders

- Identify and apply evidence-based approaches to the development, implementation, and evaluation of integrated health protection/health promotion interventions
- Set standards for research that agrees with TWH concepts
- Able to analyze health data that informs programs and policies in the workplace

Reading, interpretation, and practical application of research studies

- Uses data to determine the root causes of health disparities and inequities
- Uses data to inform strategic plans, quality improvement plans and professional development
- Develops, explains, implements, and evaluates data management plans
- Ensures protection of personal data

Applied public health practices, approaches, and interventions

- Identifies key stakeholders to plan, implement, and evaluate health programs, policies, and interventions
- Describes the social and behavioral factors affecting well-being and change
- Defines the health care delivery system including care options, insurance, benefits, and compensation systems
- Identify and translate research findings that demonstrate effective TWH approaches into organizationally appropriate practices, work design, technologies, and services to address stakeholders needs
- Develop and apply strong, evidence-based, data-driven program based on relevant, measurable, and practical safety, health, and behavioral outcomes
- Identifies, uses and communicates appropriate public health information, methods, and tools
- Applies public health informatics in data, information, and knowledge
- Assesses and makes improvements in public health data system

2. Promotion and Engagement

Ethics and worker representation

- Identifies appropriate laws, standards, and recordkeeping practices to maintain confidentiality
- Explain ethical issues related to surveys and research methods
- Ensures health equity, diversity, inclusion, and justice are included in the work and community environment, including awareness of personal biases

- Apply ethical issues and principles to integrated public health research, programs, and policies
- Identifies and reduces barriers that generate health inequities
- Develops, implements, evaluates public health policies, programs, and practices to improve workplace safety, health, and well-being

Diversity and cultural awareness

- Identify important cultural, social, behavioral, and diverse issues in unique work and community environments to implement integrated interventions, programs, and policies
- Demonstrate commitment to diversity and the ability to work in a multicultural environment
- Identifies and assesses factors affecting health, health needs, assets, and resources to improve health in the workplace and community
- Promotes and implements organizational policies, practices, and programs achieves health equity
- Develops culturally appropriate integrated programs and interventions that meets the needs of the organization

Social and community Determinants of health

- Identify and understand the role that individual, work, and community factors play in safety and health hazards, the promotion of injury and illness prevention practices and well-being
- Explain the theories, concepts and models of social and behavioral factors that affect the implementation of integrated safety and health interventions, programs, and policies.
- Able to identify critical individual, organizational and community concerns, factors, and resources
- Identify and include critical stakeholders in the planning, implementation, and evaluation of integrated TWH programs

Training and education skills

- Contributes to achieving and sustaining a diverse, inclusive, and competent public health workforce
- Identifies training needs for reskilling and upskilling
- Identifies and recommends supervisor and management training
- Identifies and conveys TWH principles and approaches to improve the safety, health and well-being of the organization’s workforce

3. Program Planning and Development, Implementation and Evaluation

Public health programs and resources planning

- Identify stakeholder's needs and resources
- Identify resources and develop a budget for an integrated health protection/health promotion program
- Explain and illustrate integrated TWH policies and procedures and barriers to effectively incorporate them into program plans and structures
- Monitor and evaluate programs for their effectiveness and quality and apply strategies for continuous program improvement
- Plan, implement and evaluate integrated TWH interventions, programs, and policy in the workplace to affect comprehensive work, social and community wellbeing

Implement effective processes, practices/policy guidelines

- Use evidence-based integrated concepts, methodologies, and research approaches to develop, implement and evaluate public health safety and health promotion issues and programs
- Collects and applies data and information technology to develop and implement effective TWH methods and guidelines
- Describes the role of workplace stakeholders, policies and practices and their effects on implementation and sustainability of programs
- Uses workplace and community assessments and stakeholder inputs to determine safety and health priorities that influence organizational designs and policies
- Identifies economic indicators and business case for implementing TWH concepts
- Ability to analyze the potential costs, benefits, incentives, barriers to implementing TWH processes and practices

Evaluation plan, methods, and resources

- Identify stakeholder's needs and resources
- Use integrated concepts, methodologies, and research approaches to develop, implement and evaluate public health safety and health promotion issues and programs
- Apply standard measures of organizational effectiveness (turnover, presentisms, morale, and other performance indicators
- Identify resources and develop a budget for an integrated health protection/health promotion program

- Identify and evaluate value on investment of an integrated intervention, program, or policy
- Evaluate the potential benefits, cost, and harms of implementing TWH policies and practices
- Effectively explains the importance of evaluation to improve policies, programs, and organizational improvements

4. Communication and Marketing

Health, safety, and well-being literacy and behaviors

- Identify the conditions and policies that contribute to health inequities and disparities
- Explain the health benefits of a resilient workforce and community
- Communicates and works with diverse teams to identify needs, develop interventions and programs that can be implemented, adopted, and sustained
- Describe and communicate the concepts and principles of health protection, health promotion, organization of work and the integration of programs
- Explain and apply the hierarchy of control and behavioral change
- Develop communication strategies and products that will reach, and effect intended individuals within the organization and community
- Communicates the value of safety, health and well-being to employers, employees, communities, and others within the workplace and community

Health communication strategies and teamwork

- Establishes relationships with key stakeholders in the workplace (employee, employer, HR, business, etc.) and community (health departments, health care organizations, academic institutions, politicians, and policy makers, etc.)
- Partners with existing organizations and builds relationships to improve communication and team work to improve safety, health, and well-being
- Collaborates with key stakeholders to identify needs, resources, and effective and sustainable strategies for organizational improvement
- Collaborates with team members to evaluate the impact of education, policies, programs and practices on safety, health, and well-being at work and in the community
- Identifies and addresses facilitators and barriers that impacts deliver of a TWH approach
- Responds to emerging and emergency needs and issues that impact organizational change

Evaluation of communication and marketing efforts

- Facilitates communication among individuals, groups and organizations
- Defines and can effectively communicate the principles and approaches to integrated health protection/health protection program planning and marketing
- Translate and disseminate effective programs and technologies to establish partnerships with labor, employers, government, professional and academic organizations
- Work with partners to develop a social and support network to implement TWH best practices
- Explains the importance of evaluation to improve policies, programs within the workplace and community to improve health and productivity
- Evaluation of effective communication of information and negative impacts of misinformation and disinformation

5. Leadership and Management

Health systems and healthcare navigation

- Uses a system thinking approach to strategic planning and health improvement in the workplace and community
- Describe the organizational structure of health care delivery, models and health insurance policies and costs
- Identifies the needs and available healthcare resources to manage care
- Works collaboratively with employees, employers, and other occupational and environmental health care providers to promote an integrated approach to worksite safety and health
- Coordinates surveillance methods and screening to identify appropriate and cost-effective services and programs
- Develops and manages programs using a multidisciplinary systems approach to achieve a safe and healthy work environment

Strategic planning and leadership

- Develop and communicate the integration of core values, mission, and vision to improve total worker health
- Develop an organizational awareness of values, cultures, and structures to effectively introduce total worker health principles and policies
- Build relationships, teams, and develops people to motivate, guide and achieve the identified goals of the organization

- Identify new emerging workplace conditions, organizational structure, job design, high risk populations and burdens (mental health, comorbid conditions, economic)
- Define and explain the role and impact of leadership, management and supervisors in the integration and adoption of TWH concepts and programs
- Secures and manages human resources and financial resources

Laws, standards, policy, and regulations

- Describe the laws, standards, regulations, and policies related to public health protection, promotion, and health services
- Explain the principles and processes to develop integrated public health programs and policies
- Identify the information necessary to inform policy decisions (e.g., health, fiscal, administrative, legal, ethical, social, political)
- Engages, implements, and manages polices, practices and programs to ensure equity, diversity, and inclusion within the workplace and community
- Promote policies that support safe and healthy work environments throughout the workers occupational lifespan leading to productive aging

Multidisciplinary/cross-functional teams

- Identify and work with interdisciplinary and cross functional teams and partners to understand and develop an integrated approach to the public health problem
- Integrate multidisciplinary/interdisciplinary concepts and methods to develop a specific intervention, program, or research agenda
- Develop comprehensive measurement and evaluation tools that integrate multidisciplinary concepts and techniques.
- Build capacity to implement and promote TWH initiatives through participation in training and educational outreach to key stakeholders

6. Partnership Building and Coordination

Participatory, collaborative, transdisciplinary, cross-functional teams, and partnership

- Recognize the importance of engaging government and nongovernment organizations, policy makers, and the community to support safety, health and well-being in planning and program development
- Discuss the impact of a collaborative, multidisciplinary team approach to improve safety, health, and well-being
- Identifies factors that affect the health of workers, workplaces, and communities (equitable and fair treatment and wages, employer and supervisor support, community support)

- Identifies and fosters collaboration among workers, employers, and the community organizations to build trust and foster engagement in sustainable solutions and strategic planning

Resource identification, work-place design, and organizational culture

- Describe the impact that process changes have on the organizational culture, vision, and goals (communication, priorities, staff, restructuring, work activities, training and skill development, and budgets)
- Determines human resource needs and recruitment strategies to develop a safe, healthy, and productive workforce and workplace
- Identifies financial needs, develops program budgets and opportunities for other funding sources
- Considers organizational culture to foster a healthy work environment that prioritizes diversity, equity, and inclusion of all workers
- Foster a safe environment supporting differences in perspectives, approaches, and solutions to priority workplace and community issues
- Develops strategies to evaluate and improve workplace safety, health, well-being, productivity, and job satisfaction throughout the working continuum

Transdisciplinary, interdisciplinary, and integrated interventions and programs

- Defines and communicate the importance of an integrated approach, including multiple disciplines, in a comprehensive approach to safety, health, and well-being
- Describes the structure and function of an integrated, multidisciplinary approach and how it will impact the safety, health, and well-being of workers, workplaces, and communities

Solution design Combining worksite safety, health promotion, and worksite wellness concepts

- Describe conditions, system, and polices affecting worker and community health and resilience
- Works with leadership, supervisors, managers, and employees to provide needed training, mentoring, advising, coaching and experiential learning to enhance job satisfaction and performance
- Creates opportunities for public health care and other organizations to collaborate for a shared goal to improve safety, health, and well-being of the larger community
- Identifies gaps in knowledge and skills to develop solutions needed for success on the job

- Identifies emerging needs and fosters innovative approaches for solutions and applied adoption of TWH approaches

Measurement and evaluation tools

- Engages stakeholders in the development and evaluation of tools and measurements, informing the impact, reach, and sustainability of an integrated TWH approach
- Develops, implements, and evaluates best practices for an integrated approach
- Assesses the implementation and impact of integrated policies, practices and programs that attain diversity an inclusion for a safe and health workforce and workplace
- Identifies and develops strategies to address facilitators and barriers that impact workers within the workplace and their ability to thrive

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Clinical Relevance:

Total Worker Health (TWH) is a transdisciplinary discipline that may impact changes in the workforce. There is a need for standardized approaches to develop and evaluate TWH education and training programs. TWH professionals will benefit from proposed set of knowledge, skills, and abilities, and a training development and evaluation framework

SMART Learning Outcomes:

- Propose a framework for developing and evaluating TWH education and training efforts that may inform future pilot testing by implementing institutions.
- Develop best practices for knowledge, skills, and abilities (KSA) development, and continuing education and training opportunities for TWH professionals.
- Increase collaboration between national, state, and local agencies, business, academic institutions, and community leaders to develop comprehensive and measurable training, reskilling, and workplace transition policies that support the well-being of workers, families, communities, and society.

Table 1.

Total Worker Health® (TWH) Education and Training Logic Model

Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-term Outcomes
• NIOSH external partners • NIOSH funded Centers of Excellence • NIOSH Affiliates • Other academic departments to provide subject matter expertise • NIOSH expertise • TWH research findings • Researchers • Practitioners • Mentors • Financial resources • Subject matter experts to conduct TWH trainings • Education/training facilities and technology • Education/training plans	• Identify training audiences (Public Health Professionals,, Occupational Safety and Health Professionals, Business, Labor, Human Resources, Employers, Employees, etc.) • Conduct needs assessments to determine training content • Develop competencies and content for required knowledge, skills, and abilities based on needs assessment and training audience • Develop/modify existing training process to fit need • Customize TWH education content based on needs and feedback of different audiences • Explore the benefits of a TWH Certificate Program • Deliver TWH trainings/workshops through multiple formats, including experiential/on-the-job training (e.g., in person, online) • Develop resources to increase adoption of TWH practices • Share educational resources via public platforms (e.g., websites, social media)	• Documentation of learning or intervention needs for target audience • Developed training competencies, content, and processes • # of training sessions/ workshops • # of people trained • # of people with a TWH certificate • # of meetings/hours spent providing on-the-job technical assistance to trainees • # of organizations (e.g., academic and provider) that pilot tested TWH trainings/ workshops • # of educational resources produced and shared to increase adoption of TWH practices (toolkits, handouts, webinars, online modules, etc.)	• Increase in TWH learning opportunities • Increased number of TWH-trained practitioners, professionals, researchers, and students with TWH knowledge and skills • Increased TWH awareness and strengthened existing and/or emerging TWH knowledge base • Increased traffic and engagement with TWH websites and social media • Organizations have increased access to TWH resources • Expanded, tailored TWH content to address new and diverse needs and audiences	• Developed multi-disciplinary approach to TWH research, practice, and policy • Increased collaboration among multiple disciplines to adopt TWH programs • Increased knowledge, use and dissemination of TWH approaches across industries and communities • Ongoing TWH research findings integrated into trainings/materials • Increased implementation and adoption of TWH activities • Employers develop job descriptions utilizing TWH core competencies	• Adoption of TWH principles and resources in organizational and community programs or initiatives • TWH concepts integrated into workplace practice through trained TWH professionals • Increased integration of TWH concepts into public health, labor, and policy systems • Adoption of TWH curriculum/ toolkits across industries and worker groups • Collaboration between TWH Centers, practitioners, and community organizations to increase capacity for TWH in practice • Evidence-based workplace and public policy changes that embrace health equity • Diffusion of “culture of TWH” across industry sectors, professionals, practitioners, and communities • Organizations demand and hire employees with TWH skillset • Sustained supply of qualified TWH professionals to meet changing demands in the field

Future Impact: Reduced workplace injury and illness and improved safety, health, and well-being among organizations and communities

J Occup Environ Med. Author manuscript; available in PMC 2024 August 06.