23

Dissemination and Implementation Research in the Workplace*

PEGGY A. HANNON, REBECCA J. GUERIN, CHRISTINE M. KAVA, AND JEFFREY R. HARRIS

Acronyms

OSH: occupational safety and health
TWH: Total Worker Health
WHP: workplace health promotion

INTRODUCTION

Work is increasingly recognized as a powerful social determinant of health,[1] and the workplace environment impacts employed adults' access to health promotion and health and safety protection. We use the term workplace health promotion (WHP) to refer to a variety of benefit, communication, policy, and program approaches that encompass primary prevention though lifestyle behaviors (e.g., healthy eating and engaging in physical activity) and vaccinations, early detection of disease through screening, and treatment and management of chronic illness. Occupational safety and health (OSH) is defined as the science of the anticipation, recognition, evaluation, and control of workplace-related hazards that could harm the health, safety, and well-being of workers.[2] OSH has traditionally focused on activities that prevent occupational injury, illness, and disease ("health protection"); these include workplace redesigns to eliminate known hazards, equipment safety enhancements, safety training, and provision and use of personal protective equipment.[3] WHP and OSH have traditionally operated in independent silos, with separate administrators and organizational reporting structures.[3] For this reason, we discuss WHP and OSH separately for most of this chapter. In recent decades, recognizing synergies and potential costs savings, employers, researchers, safety professionals, and others in the OSH and WHP communities have promoted the "integration" of the workplace protection and health promotion domains.[3] Toward the end of the chapter, we discuss the National Institute for Occupational Safety and Health (NIOSH) *Total Worker Health*® approach in the United States that combines OSH and WHP.

We use two models to show the different levels of influence that employers may use to address WHP and OSH. The socioecological model states that health behavior is influenced by intrapersonal, interpersonal, institutional, community, and public policy-level factors[4] and is useful for considering WHP (Figure 23.1). The workplace shapes the daily environment in which health-related choices are made and interpersonal interactions occur. In the United States, most adults under the age of 65 obtain health insurance through an employer (their own or a family member's), so the workplace also impacts access to healthcare. Employers may have an incentive to address health behavior and safety across levels of the socioecological model in order to increase the health and productivity of their workforce. Using physical activity as an example, Table 23.1 shows examples of how the workplace

* Disclaimer: The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention.

Peggy A. Hannon, Rebecca J. Guerin, Christine M. Kava, and Jeffrey R. Harris, *Dissemination and Implementation Research in the Workplace* In: *Dissemination and Implementation Research in Health*. Edited by: Ross C. Brownson, Graham A. Colditz, and Enola K. Proctor, Oxford University Press.
 DOI: 10.1093/oso/9780197660690.003.0023

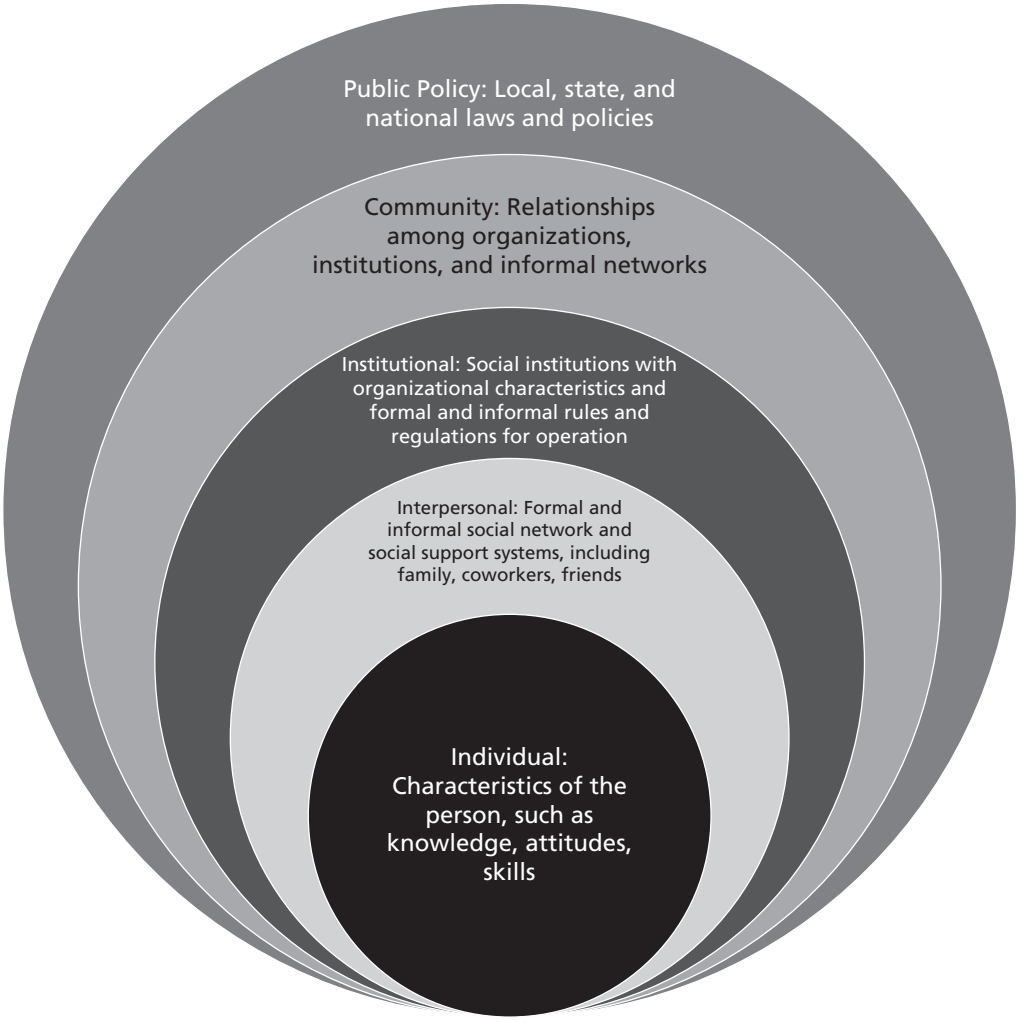

FIGURE 23.1 Socioecological model levels and definitions.

can impact health across different levels of the socioecological model.

Employers and practitioners' OSH efforts are also most effective when they are considered within a multilevel framework.[6] The hierarchy of controls (HOC; see Figure 23.2) is an effective framework for guiding the design of OSH interventions.[6] The hazard control methods at the top of the HOC graphic are more effective and protective than those at the bottom.[6] These methods range from elimination of the hazard to the use of personal protective equipment (PPE)—the least effective strategy, which potentially shifts the burden of protection to the worker.[7,8] Table 23.1 shows hearing loss prevention strategies at each level of the HOC.

Workplaces are not all created equal in their willingness, capacity, and resources to implement WHP and voluntary OSH programs. Thus, there is tremendous variation in the effectiveness of programs and policies they implement. These differences are often driven in part by the resources available, such that employers in small businesses and employers in low-wage industries may offer fewer WHP and OSH opportunities to their workers.[9,10] For example, in a recent employer survey, only 40% of employers with 10–24 workers offered any type of WHP program, compared with 92% of employers with 500 or more workers.[11] Differences in health opportunities for these workers have the potential to exacerbate existing health disparities. We refer to research

TABLE 23.1 WHP AND OSH INTERVENTION EXAMPLES ACROSS SOCIOECOLOGICAL MODEL AND HIERARCHY OF CONTROL LEVELS

Socioecological Model Level	Example: Physical Activity	Hierarchy of Controls Level	Example: Hearing Loss Prevention[5]
Public policy	Incentives to be physically active/ discounts on health insurance premiums allowed under the Affordable Care Act	**Elimination**	Require that noise reduction be factored into building design standards
Community	Workplace promotes and holds events at nearby community parks, YMCAs, or other locations that support physical activity	**Substitution**	Substitute loud for quieter equipment
Institutional	Workplace offers on-site physical activity facilities and/ or subsidized gym memberships	**Engineering controls**	Redesign equipment to eliminate noise sources and construct barriers that prevent noise from reaching a worker
Interpersonal	Workplace sponsors team physical activity program or challenge	**Administrative controls**	Schedule shifts to minimize noise exposure and provide quiet and convenient lunch and break areas
Individual	Workplace provides information about physical activity guidelines	**Personal protective equipment (PPE)**	Provide hearing protection devices, such as earplugs or earmuffs to workers, at no cost, so that workers are exposed to noise levels lower than established occupational exposure limits

Note. The intent of this table is to provide examples of each level of the SEM and the HOC, not to compare the two models.

with small businesses throughout the chapter; business size and industry are often the best available indicators of workers at risk for health disparities. Effective dissemination and implementation of WHP and OSH evidence-based programs will be key to addressing health equity in the workplace.

In this chapter, we first address the current state of WHP and OSH practice and research. We describe how current WHP and OSH programs are structured, which employers are most likely to offer such programs, whether the programs are evidence based, and who the key players are. We then provide an overview of dissemination and implementation research in WHP and OSH, including challenges and gaps in the field. We close with two case studies, one focused on a large employer's adoption of the *Total Worker Health*® ("TWH") approach, and the other focused on disseminating evidence-based WHP interventions to small workplaces.

To aid readers, we define employers, workplaces, and worksites. *Employers* are organizations, public or private, with workers (workers include employees as well as temporary workers, contractors, etc.). A *workplace* includes not only the physical location of work, but also the social, cultural, and policy environment created by an employer. We deliberately differentiate more broadly defined workplaces, often with multiple locations, from more narrowly defined physical *worksites*, the locations where workers actually work. Given the different

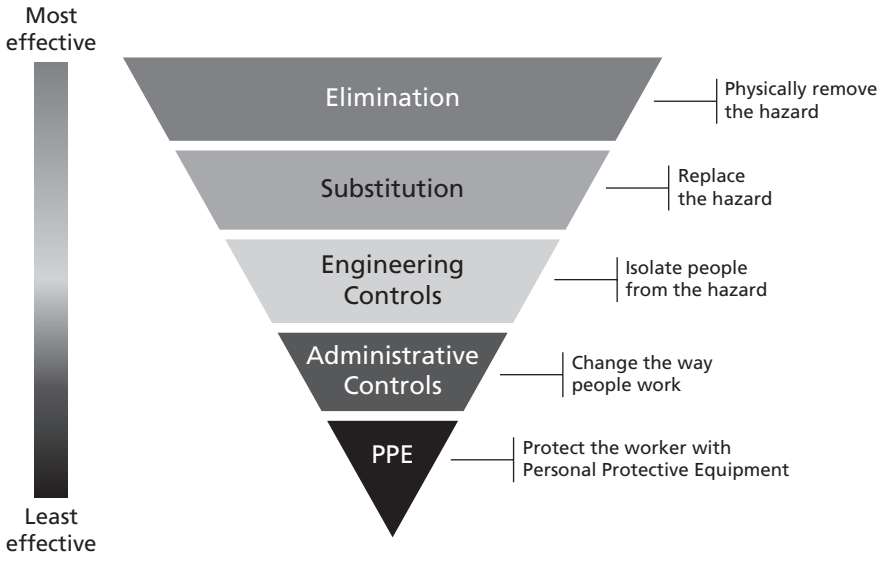

FIGURE 23.2 Hierarchy of controls.

Source: Reprinted with permission from the National Institute for Occupational Safety and Health (NIOSH). Hierarchy of controls. 2015. Accessed Feb 7, 2022. https://www.cdc.gov/niosh/topics/hierarchy/default.html

definitions used to define workplace size, we share the size definition used for small workplaces (when relevant) in the research we cite.

CURRENT STATE OF WORKPLACE HEALTH PROMOTION AND OCCUPATIONAL SAFETY AND HEALTH

Workplace Health Promotion

WHP Program Structures and Evidence Base

CDC workplace health model. The Workplace Health Model from the Centers for Disease Control and Prevention (CDC) (Figure 23.3) offers a comprehensive, systematic, and stepwise framework for WHP programs and has four components: assessment, planning and management, implementation, and evaluation.[12] The assessment component measures the workplace's current state at three socioecological levels: individual, organizational, and community. The planning and management component ensures readiness for implementation by addressing five infrastructural needs: leadership support, management, a plan for workplace health improvement, dedicated resources, and communications. The implementation component includes health-promoting processes in four areas: programs, policies, benefits, and environmental support. The evaluation component measures outcomes in four areas: worker productivity, healthcare costs, improved health outcomes, and organizational change, or the "culture of health." The Workplace Health Model is widely used, as discussed below. The importance of organizational climate and culture is covered in depth in chapter 9.

Who administers WHP programs? The Kaiser Family Foundation and the Health Research and Educational Trust (KFF/HRET) conduct an annual survey of employers. In 2017, but not since, the KFF/HRET survey asked employers who administered their health screening programs, defined as biometric screening, health risk assessment (HRA), or both.[13] The survey found that employers rely heavily on their health plans, and that reliance on health plans is inversely related to employer size. Among employers offering health insurance, 88% of small employers (from 3 to 199 workers) said that their programs are provided by their health insurer or third-party administrator, as did 70% of large employers (≥200 workers); 9% and 12%, respectively, provided the programs themselves (percentages do not add to 100% because different types of programs have different administrators).

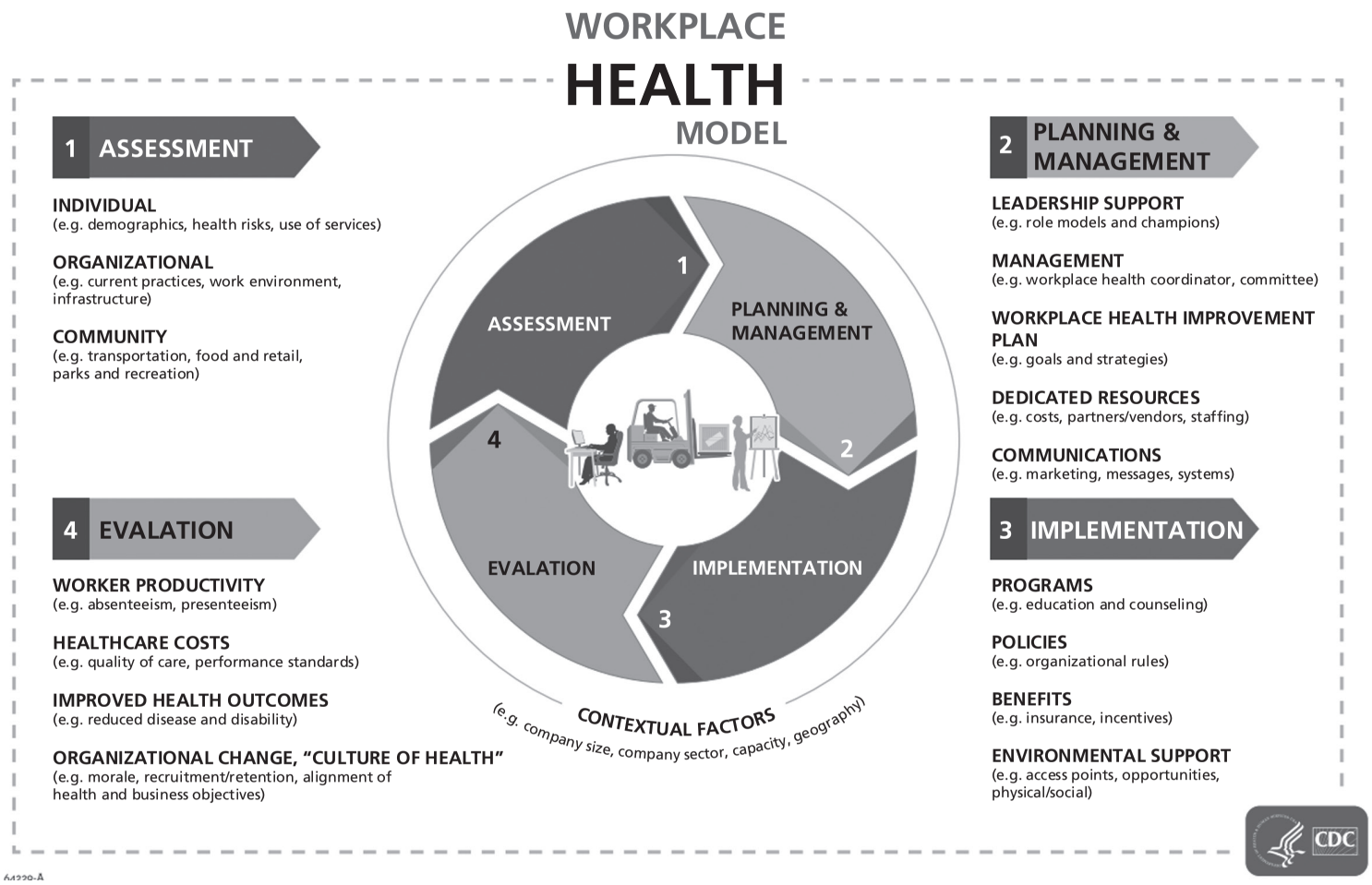

FIGURE 23.3 CDC workplace health model.

The other administrators of WHP programs are vendors. In the 2017 KFF/HRET survey, 28% of small and 48% of large employers said third-party vendors provided their programs.[13] A growing workplace wellness industry includes vendors ranging from those offering a full range of services to those that are highly specialized, for example, those conducting HRAs only or those offering HRAs along with web-based lifestyle management tools.[14] The vendors serving large employers are relatively few in number and often serve a national market. The vendors serving small and midsize employers serve more local markets.[15] One potential advantage of external administration of WHP programs is reducing employees' concerns about privacy. A recent national survey of large health plans and vendors offering WHP revealed three trends.[16] First, the workplace wellness industry is becoming more diverse and competitive. Second, there is an increased focus on affecting worker health by modifying workplace culture. Third, employers are increasingly interested in assessing broad measures of program value beyond reduction of healthcare costs; these measures include worker retention, job satisfaction, and productivity.

Employers usually purchase WHP and other insurance services via intermediaries.[17] The intermediaries used most commonly by large employers are consulting firms.[17] The intermediaries used most commonly by small and midsize employers are insurance brokers.[18] These brokers often sell WHP programs along with other services, such as health and other insurance products.[18] Small and midsize employers also commonly purchase health insurance in groups via aggregators, such as chambers of commerce and trade associations.[19]

Which employers have WHP programs? WHP offerings and comprehensiveness vary by employer size and industry. In 2021, the KFF/HRET survey[20] found that, among employers offering health insurance benefits, large employers were more likely than small employers to offer smoking cessation programs (69% vs. 42%, large vs. small); weight loss programs (63% vs. 44%); and lifestyle/behavioral coaching (71% vs. 48%). The 2020 version of the KFF/HRET survey[21] found large variation in offerings by industry, with state and local government most likely to offer WHP programs and retail employers least likely.

Further information comes from the Workplace Health in America survey, a national survey conducted by the US Department of Health and Human Services. This survey counts WHP programs as "comprehensive" if they offer all of five elements: health education, integration with the organization's structure, linkage to related programs, supportive social and physical environment, and worksite screening.[11] In 2017, 17% of employers of all sizes offered comprehensive programs. Those that had a person assigned to WHP, had an annual budget for WHP, and had health program experience for longer than 5 years were, respectively, 19.5 times, 38.2 times, and 8.4 times more likely to offer comprehensive programs than those that did not (all P values $< .001$).

Which workers participate in WHP programs? The 2020 KFF/HRET survey found that 44% and 45%, respectively, of workers in large companies completed health-risk assessments and biometric screening (small companies were not asked this question).[21] Determinants of participation have been studied at both individual and organizational levels. At the individual level, a recent literature review found that workers were more likely to participate in WHP programs if they were older, female, in good health, and had a supervisor supportive of participation.[22] Higher wage levels were also associated with higher participation.[23] At the organizational level, participation was associated with organizational and leadership support and incentives.[24]

WHP impact, and disparities in impact, on health behaviors and health outcomes. The question of effectiveness continues to vex WHP practitioners and researchers.[25] For each of the four health-promoting processes (policies, programs, benefits, and environmental supports) laid out by the CDC workplace health model, there are good examples of effective interventions that can and are being delivered in workplace settings. For example, smoke-free workplace policies have been shown to aid cessation and protect against exposure to secondhand smoke. Similarly, environmental supports, such as workplace walking trails and gym facilities in or near workplaces, have been shown to increase physical activity. Both the CDC's Guide to Community Preventive Services (https://www.thecommunityguide.org) and the Cochrane Collaboration (https://www.

cochrane.org) list other effective workplace-based interventions.

The question is whether such interventions are effective when combined into multifaceted WHP programs and implemented by employers and their insurers and vendors in real-world workplaces. Several studies of comprehensive programs over the years have shown effectiveness, but these studies, usually with voluntary participation, have been criticized for their potential for selection bias.[25] Recently, two randomized controlled trials of WHP programs, one in a large US warehouse retail company[26] and the other at the University of Illinois,[27] showed only modest effects on a small number of health behaviors and no effects on more distal health and financial outcomes. Participation rates in both these studies were low, 35% and 27%, respectively, and their offerings were not comprehensive.[28]

Factors influencing program effectiveness. In addition to the recent review of determinants of worker participation in WHP programs,[22] two older reviews assessed key factors associated with program effectiveness. A 2013 RAND review commissioned by the federal government listed five factors: (1) use of existing resources and relationships, (2) leadership engagement at all levels, (3) effective communication strategies, (4) opportunity for workers to engage, and (5) continuous evaluation.[29] In another recent review, Goetzel cited the importance of a "culture of health," defined as "one in which individuals and their organizations are able to make healthy life choices within a larger social environment that values, provides, and promotes options that are capable of producing health and well-being for everyone regardless of background or environment."[30] The CDC workplace health model also stresses the importance of evaluating an employer's culture of health.[12]

Role of Industry Organizations, Governmental Agencies, and Regulators in WHP

The US workplace wellness industry was estimated to generate $10 billion in annual revenue in 2019,[31] but it is loosely organized and largely unregulated. There is no national trade association of vendors, though there is a small professional association, the International Association for Worksite Health Promotion (https://www.iawhp.org). The National Committee for Quality Assurance, a private nonprofit organization, developed a Wellness and Health Promotion Accreditation.[32] To be accredited, insurers and vendors must pay a fee, so the number of accredited organizations is small and largely limited to those serving national employers.

Government and industry organizations sponsor publicly available scorecards that guide employers in assessing their WHP programs. Developed in 2012, the free CDC Worksite Health Scorecard has rapidly gained prominence.[33] As of 2019, more than 2,800 employers from 48 states had completed the scorecard.[33] CDC has also developed and delivered Work@Health, a companion WHP training program for employers, delivered via in-person, online, and hybrid formats.[34] Other commonly used scorecards[35] include the American Heart Association's Workplace Health Achievement Index,[36] the Health Enhancement Research Organization's Health and Well-Being Best Practices Scorecard,[37] and the Wellness Council of America's Well Workplace Checklist.[38]

Occupational Safety and Health

OSH Program Structures and Evidence Base

Who administers OSH? Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their workers. The OSH Act also created the Occupational Safety and Health Administration (OSHA) within the US Department of Labor. OSHA's mission is to ensure that workers work in a safe and healthful environment by setting and enforcing standards, authorizing the secretary of labor to assess civil monetary penalties for noncompliance,[39] and providing training, outreach, education, and assistance. Employers must comply with all applicable OSHA standards and with the General Duty Clause of the OSH Act, which requires employers to keep their workplace free of serious recognized hazards. Despite its importance, the OSH Act has faced challenges, including that state and local public sector workers are not covered by federal OSHA, and the law may not be equipped to address working conditions and worker-employer relationships that are radically different from those that existed more than 50 years ago when it was enacted.[40]

The OSH Act also established the National Institute for Occupational Safety and Health (NIOSH), within the Department of Health and Human Services.[41] NIOSH produces research, including developing exposure criteria for toxic materials and harmful physical agents, that can support OSHA's formulation of safety and health standards.[41] NIOSH provides the only dedicated federal investment for a wide range of research activities to prevent the societal cost of work-related fatalities, injuries, and illnesses in the United States and has issued guidance documents on newer and emerging issues, such as workplace violence and occupational exposure to nanoparticles such as nanosilver used in the manufacture of electronics and textiles.[39,41,42] Research in or directly relevant to the OSH field is carried out in government laboratories (including at NIOSH), universities, the private sector, and in institutions affiliated with organized labor.[43]

Which employers have OSH in place? Which workers benefit from OSH protections? Under the OSH Act, most US employers have the responsibility for administering OSH programs in workplaces. Larger businesses may have dedicated OSH professionals on staff and/or safety committees with representation from management, safety professionals, and workers. Core OSH professions (occupational safety, industrial hygiene, occupational medicine, and occupational health nursing) focus on different aspects of OSH activities, but share a common goal of identifying hazards in the workplace and assisting employers and workers in eliminating or mitigating the attendant risks.[43] Many of these professionals work on a contractual basis or as consultants.[42] Workers in smaller businesses may rarely encounter one of these OSH professionals.[43] For several reasons, including a lack of resources, peer networks, and motivation to engage in non-production-related activities, smaller businesses with fewer than 250 workers have been shown to engage in fewer safety activities than larger businesses and may benefit from assistance with OSH activities from external organizations (intermediaries),[10] such as insurance companies, healthcare providers, and trade and professional associations.

OSHA recommends practices to provide employers, workers, and worker representatives (including labor unions or religious or community groups) with a flexible framework for addressing safety and health issues in diverse workplaces. These recommendations include seven core elements for a safety and health program: management leadership; worker participation; hazard identification and assessment; hazard prevention and control; education and training; program evaluation and improvement; and communication and coordination for host employers, contractors, and staffing agencies.[44] OSHA recognizes that, for health and safety programs to succeed, workers (and if applicable, their representatives) must participate in developing and implementing every program component. The OSHA recommended practices also align with voluntary, international, and national consensus standards, such as ANSI/ASSP Z10-2019. This national consensus standard (from the American National Standards Institute [ANSI] and the American Society of Safety Professionals [ASSP]) defines the minimum requirements for an occupational health and safety management system using a "systems-thinking" approach that recognizes that an organization's processes are dynamic and interrelated, and that worker participation plays a critical role in successful implementation of voluntary standards.[45]

OSH impact, and disparities in impact, on safety and health injury/disability outcomes. Since enactment of the OSH Act, worker deaths in the United States are down, from about 38 worker deaths a day in 1970 to 15 a day in 2019. Worker injuries and illnesses have declined, from 10.9 incidents per 100 workers in 1972 to 2.8 per 100 in 2019.[46] Previous studies indicated that OSHA standards are effective in preventing occupational injuries and illnesses.[40,47]

Despite this progress, the challenge for preventing work-related injuries, illnesses, and deaths remains substantial, as millions of U.S. workers are injured annually, and thousands are killed.[40] Work-related morbidity and mortality risks are especially high in certain industries, including manufacturing, agriculture, and healthcare[40,48] and among certain worker populations, where declines in worker illnesses and injuries have not been evenly distributed.[1]

For example, young workers ages 15–24 years in the United States experience a disproportionate burden of work-related injury compared to adult workers, and these injuries can have lifelong physical, social, and emotional impacts.[49] Older workers also face

disproportionate risks. Although older US workers (≥55 years) have experienced similar or lower rates of work-related injuries and illnesses compared with younger workers, older workers face a greater risk of being killed at work than workers as a whole.[50]

In 2020, approximately 17% of the US civilian labor force was foreign born.[51] Research indicates that workers from racial/ethnic minority groups and immigrants experience a disproportionate burden of negative OSH outcomes. These groups are overrepresented in dangerous occupations[52] and have limited access to worker protection resources.[53] Many workers in "precarious" job arrangements are hesitant to refuse hazardous work or to report hazards for fear of retribution.[1,40]

Workers may also be members of multiple groups at disproportionate risk for injury and illness and therefore experience overlapping structural inequities.[1] For example, women and workers from racial and ethnic minority groups make up a disproportionate share of the low-wage workforce in some temporary occupations, including security guards, home healthcare, hospitality, and logistics.[54] Immigrant workers and those of lower socioeconomic status are frequently employed in higher risk occupations (e.g., construction and agriculture), which are often subject to outdoor extreme weather conditions exacerbated by climate change.[55] Therefore, the increased health and safety risks associated with temporary and contingent work arrangements accrue to workers already experiencing increased injury and fatality rates.[1,54,55]

Factors influencing program effectiveness. Many effective OSH interventions improve worker safety, health, and well-being. Positive effects range from preventing occupational injuries and hearing loss to reducing musculoskeletal, skin, and lung diseases[7,56] and reducing work-related stress.[57] Many OSH interventions have proven to be effective under controlled conditions, but their implementation in practice is often difficult. Interventions may not work as expected, especially in small businesses.[10]

Costs may affect employers' ability or willingness to implement effective OSH interventions. A review by Keefe et al.[7] identified the enforcement of the OSHA Noise Standard as a control technology not being used to maximal benefit to reduce exposure at the source and protect workers from hearing loss. Affordability was cited as the main reason why employers (particularly those in small and medium-size enterprises where some exposures occur at the highest levels) rely on less costly and potentially less protective solutions (e.g., PPE) rather than on expensive retrofits to buildings and structures.[7]

OVERVIEW OF DISSEMINATION AND IMPLEMENTATION RESEARCH IN WORKPLACE SETTINGS

There are far fewer studies specific to disseminating and implementing evidence-based WHP and OSH programs than studies investigating the effectiveness of new programs. Drawing from key constructs in the dissemination and implementation literature, we cover several factors that may influence dissemination and implementation of effective WHP/OSH programs. These factors include employers' and workers' motivations to adopt health promotion programs; workplace readiness and capacity to implement programs; the extent to which effective programs can be adapted to fit the workplace context and workers' needs; and the extent to which effective programs are sustained.

Workplace Health Promotion

Employer and worker motivations to adopt WHP programs. Employers and workers may have different motivations and interests in WHP programs. One of employers' primary motivations to adopt these programs is containing healthcare costs.[58] Much of the controversy about WHP effectiveness hinges on healthcare cost return on investment as *the* metric of WHP success. Additional motivations for WHP found in our work with employers and in other studies include recruitment and retention of workers, improving worker productivity, improving morale, and reducing worker turnover.[59,60] Some also cite altruistic motives, wishing to implement WHP programs to help improve workers' health or believing it's the right thing to do.[61]

Worker participation in WHP programs is often low; in a large-scale trial evaluating a multicomponent workplace wellness program, participation rates ranged from 34% to 45%.[26] A common strategy to increase participation is to deliver incentives for participation.

However, discovering whether workers see programs as relevant to their needs may be a more beneficial first step. The topics most wellness programs address align with behaviors that workers need to change, want to change, and are actively trying to change. These behaviors include healthy eating, physical activity, weight management, smoking cessation, and stress management.[62–64]

The nature of job activities may impact the health interests of employers and workers. For example, employers with workers in sedentary jobs may be interested in physical activity and/or weight management; in contrast, employers with workers in physically active and demanding jobs often display little interest in increasing their workers' physical activity. Employers who retain workers long term and have an aging workforce are more likely to prioritize chronic disease prevention and management.

Readiness and capacity to implement effective WHP programs. Readiness at the organizational level is characterized in Weiner's theory of organizational readiness to change.[65] The theory identifies two facets of readiness for change: change commitment (a shared resolve among organizational members to implement a change) and change efficacy (a shared belief among organizational members that they have a collective capability to implement a change). Change commitment and change efficacy are influenced by change valence (how much organizational members value the proposed change) and informational assessment (organizational members' perceptions of the tasks and resources needed to implement the change). Change valence and informational assessment are predicted by contextual factors, such as the organizational culture, resources, and past experiences with change. Change commitment and change efficacy predict change-related effort, which in turn predicts implementation success (see Figure 23.4).

Many employers face readiness and capacity challenges to adopting and implementing WHP programs, including lack of financial resources, competing demands, and lack of management support.[66] Additional logistical challenges include lack of space for programming, workers spread across multiple worksites and shifts, workers without access to computers at work, and workers with limited English proficiency.[63,66] Small and medium-size worksites exhibit less readiness and capacity for WHP than large worksites[9,61,67]; we also see differences by industry (e.g., employers in industries such as education show more readiness and capacity than employers in accommodation and food services).[68] There are limited tools to measure readiness and capacity for WHP.

Adapting WHP programs to fit different workplace contexts and worker populations. Workers who work night shifts, less than 20 hours a week, receive hourly pay, are temporary or contract workers, and are in blue-collar jobs are less likely to participate in WHP programs.[69] To meet the needs of underserved worker groups, effective WHP programs need

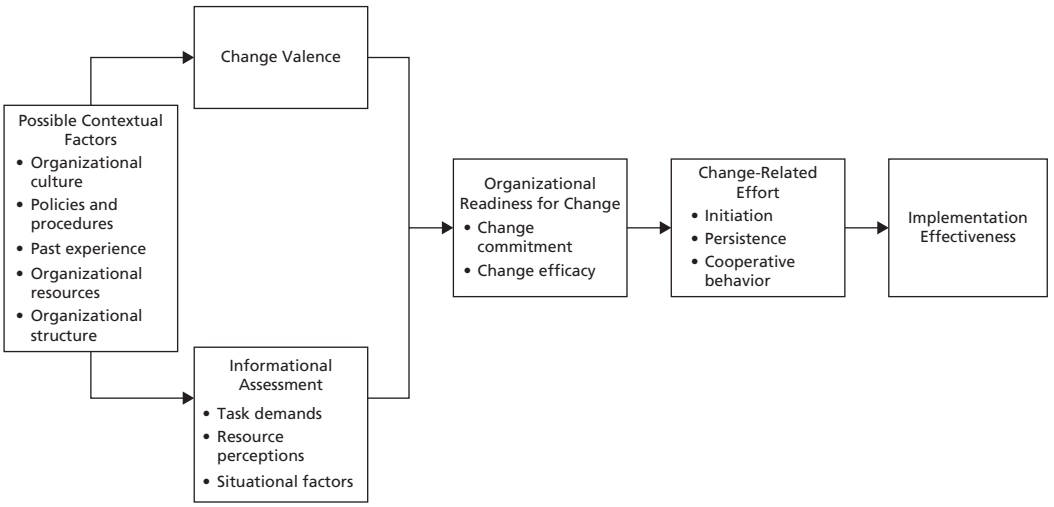

FIGURE 23.4 Theory of organizational readiness to change (Weiner, 2009).[65]

to be adapted to fit various workplace populations and contexts. Recent calls have been made for employers to systematically collect information on the health preferences and social needs of various worker groups to create more inclusive and equitable WHP programming (and this step would fit into the needs assessment described above).[70]

Translation of evidence-based interventions into practice within diverse settings and populations is gaining increasing attention.[71] Many programs are tested via rigorous randomized controlled trials that have strict participation criteria; workplaces willing to participate in such trials are often not representative of workplaces in general.[72] In a scoping review of frameworks to guide adaptations of evidence-based public health interventions, the authors identified key steps to the adaptation process, including assess community capacity, determinants, and needs; review and select evidence-based interventions; consult with content experts and partners; decide on and make intervention adaptations; train implementers; pretest adapted materials; and implement and evaluate the adapted intervention.[73] One study used a framework[74] to help guide adaptations to a weight management intervention for low-wage workers.[75] Tabak and colleagues conducted formative research with key partners and beneficiaries (e.g., food service workers) to inform intervention adaptations, for example, replacing interactive voice response with text messages to enhance reach. This study showed how adaptation frameworks can guide effective adaption and marketing of an intervention for dissemination to a different audience from the original testing audience.

Sustainability of WHP programs. Sustainability is a key aspect of successful implementation. Moore and colleagues[76] defined sustainability as (a) the continued delivery of a program, clinical intervention, and/or implementation strategies and (b) maintenance of individual behavior change, noting that program and behavioral changes may evolve or adapt over time while continuing to offer benefits at the individual and systems level. Multiple barriers and facilitators can influence whether an evidence-based intervention is sustained, and calls have been made to test and document use of sustainability frameworks and intervention adaptations to enhance sustainability in order to advance our knowledge in this area.[77,78]

There is an increasing focus on measuring long-term outcomes in studies evaluating the effectiveness of WHP programs. One study examined the sustainability of a WHP program that incorporated gamification principles and found significant, clinical improvements on several clinical outcomes (e.g., blood pressure) at both 1 and 2 years after the intervention began.[79] In contrast, a WHP program designed for blue-collar workers in the construction industry demonstrated significant intervention effects on body weight, waist circumference, physical activity, and intake of sugar-sweetened beverages at 6 months, but these changes were no longer significant at 12 months.[80] Additional research is needed to help us understand which programs are sustainable and which conditions promote sustainability of WHP programs.

Occupational Safety and Health

Employer and worker motivations to adopt OSH measures. Legal compliance with OSH safety laws and regulations (and the risk of sanctions for noncompliance) are important motivators for employers to adopt OSH measures. For example, OSHA's 1991 blood-borne pathogens standard, enacted in response to the US HIV/AIDS crisis, has contributed to a substantial decline in healthcare worker risk for blood-borne diseases.[40,81] However, some noted challenges with the current regulatory environment[40] have potentially placed an increased reliance on employers to monitor their own compliance with OSH laws and to provide worker protections.[82]

A business case for OSH advances the premise that the economic advantages to organizations (in terms of reducing Workers' Compensation rates, worker presenteeism and absenteeism, and increasing worker productivity) outweigh the costs of implementing voluntary OSH programs.[82] However, ethical arguments about OSH being the "right thing to do"[83] and the fear of loss of corporate credibility and reputational damage[84] are cited as other, important motivators for employers to adopt and implement OSH programs and activities. Contextual factors as experienced by business owners and managers, including access to resources; characteristics of the manager, including their own personal estimation of the extent of work-related safety and health risks and the need for OSH precautions

if these risks are underestimated or perceived to be beyond their control[10]; and the workplace culture have also been shown to influence their motivation for adoption of participatory OSH programs.[85]

Readiness and capacity to implement effective OSH measures. When considering uptake of some voluntary OSH strategies, business enterprises engage in a complex cost-benefit analysis regarding the risks and advantages of change. When making adoption decisions, partners and beneficiaries may prioritize factors such as compatibility with existing programs, cost-effectiveness, the values and culture of the organization, and relative advantage over other programs.[86] An assessment of organizational readiness for change[65] is an important precursor to the successful implementation of participatory OSH programs.[87] Both managers' and workers' ability to envision future improvement and their shared interest in WHP and OSH have been demonstrated to be key to new program adoption.[87]

An organizational readiness for change tool was developed to help prepare for implementation of a participatory OSH program based on TWH principles in eight domains: (1) current safety/health/well-being programs; (2) current organizational approaches to safety/health/well-being; (3) resources available for safety/health/well-being; (4) resources and readiness for change initiatives to improve safety/health/well-being; (5) resources and readiness for use of teams in programmatic initiatives; (6) teamwork; (7) resources and readiness for worker participation; and (8) management communication about safety/health/well-being.[88] This tool has been used prospectively to assess potential facilitators and barriers to implementing a participatory TWH program in five public healthcare facilities, allowing program implementers to be proactive in tailoring aspects of the implementation to better fit the needs of the organization.[89]

Adapting OSH approaches to fit different workplace contexts and worker populations. Successful OSH efforts require implementing programs that are both evidence based and fit the needs of the organization and its workers.[90] For example, it is generally necessary to tailor interventions to the specific needs and context of small businesses, and several facilitators and drivers have been identified that can be used to adapt participatory OSH programs to meet the needs of end users.[91] Given that, to be effective, OSH interventions should be tailored to specific organizational contexts, generalizing and transferring them to other organizations presents substantial challenges.[92] Contextual fit is especially relevant for organizational-level interventions (typical of OSH), requiring participation from multiple parties and new practices and procedures to support worker engagement.[89]

Balancing fidelity and adaptation has been explored extensively in the dissemination and implementation literature, but only to a limited degree in OSH.[90] While intervention adaptation is inevitable, and even desirable, to meet the local needs and constraints of end users, the value of adaptation (and fidelity to the original program design) when implementing a voluntary OSH program may be different for various program providers and recipients, and recommendations have been proposed for reconciling respective roles.[90]

Intervention adaptation is especially important in addressing occupational health equity concerns, where one-size-fits-all approaches are likely to be ineffective for workers and employers from diverse populations. For example, PPE, which has been critical for healthcare workers during the COVID-19 pandemic[6] and in other high-risk industries like construction, has not traditionally been designed for women and racial/ethnic minorities. Ill-fitting equipment may decrease effectiveness, increase exposure risks, and deter workers from using it.[93] PPE are being adapted to account for a wider range of body shapes and sizes, ensuring that it is accessible and effective for all workers.[55] Research has also been conducted on the need to adapt OSH training programs to meet the needs of workers who experience several languages and/or who work in settings that put them at increased risk of exposure to hazards.[53]

Sustainability of OSH measures/programs. Intervention maintenance and long-term sustainability have been shown to be more likely when such programs are aligned with the organizational mission and values and enjoy the support and involvement of several key groups and individuals (e.g., senior managers, policymakers, community leaders, and workers).[92] Adequate resources, breadth of worker participation, and management support have been shown to be important preconditions for

program sustainability.[92,94] Research has demonstrated barriers to OSH program sustainability include communication among workers, staff turnover and overreliance on individual champions, inconsistent management commitment, and lack of a reward system for participation.[94]

Including worker input at every step of program design and implementation improves the ability to identify the presence and causes of workplace hazards, creates a sense of program ownership among workers, enhances their understanding of how the program works, and helps sustain the program over time.[44]

RESEARCH GAPS AND FUTURE DIRECTIONS

Limited Application of Implementation Science Theories and Frameworks

There are over 60 published dissemination and implementation frameworks and models,[95] yet there remains a gap in the application of these frameworks to address WHP/OSH.[96] Some WHP/OSH studies have used frameworks like the Consolidated Framework for Implementation Research (CFIR) and RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) to understand contextual factors that influence implementation and to inform program evaluation. These and other frameworks could also be used to inform engagement among partners and beneficiaries during WHP/OSH program implementation, develop logic models for implementation, and select and adapt implementation strategies.[97] In recent years, several dissemination and implementation frameworks have been developed, revised, and extended to explicitly focus on health equity; examples include an extension of the RE-AIM framework,[98] the application of an intersectionality lens to the Theoretical Domains Framework,[99] and a race(ism)-conscious adaptation of the CFIR.[100] Future research should apply equity-focused dissemination and implementation frameworks to address health disparities when implementing WHP/OSH programs.

Limited Study of Workplace Contextual Factors

Few WHP or OSH studies to date have identified contextual factors that could have played a role in influencing intervention effectiveness.[90,101] Randomized controlled trials, considered the gold standard in WHP and OSH research, aim to minimize variance, effectively "controlling out" context rather than assessing it.[90] A systematic review of TWH studies[102] identified only a limited number of interventions focusing on multilevel contextual factors (e.g., work organization, union membership, health insurance status, management support, and worker stress related to company downsizing). Variation in intervention effectiveness by individual, worksite, organizational, or community factors was not assessed in any of the identified studies.[102]

Research is needed that takes a systems-level approach to consider factors beyond the workplace that have direct and indirect effects on worker health.[55,82,101] This requires understanding the importance of broad social, economic, and political factors that affect workers directly and indirectly by influencing the adoption of WHP and OSH policies, practices, and programs by employers and other organizational decision makers.[82] Understanding the forces shaping the future of work is critical for anticipating the outcomes associated with changes in the conditions of employment.[55,82] This will in turn inform decision-making on interventions that protect and promote worker safety, health, and well-being.[82]

Limited Integration of WHP and OSH

As mentioned previously in this chapter, recognizing the benefits of the "integration" of the workplace protection and health promotion domains,[3,103] NIOSH developed the TWH approach in 2011.[104] TWH is defined as policies, programs, and practices that integrate protection from work-related safety and health hazards with promotion of efforts to advance worker well-being.[41,104] Growing evidence indicates that integrated health interventions are successful in addressing a wide range of OSH and well-being outcomes,[105] suggesting the need for wider adoption of this approach. The TWH paradigm acknowledges the interaction of work and nonwork factors,[55] such as social determinants of health,[1] that affect OSH outcomes. Although TWH efforts and activities have increased in recent years, it is still an emerging area with opportunities to study dissemination and implementation research questions[101] (e.g., whether and why different types of employers may find an integrated approach

more or less acceptable and feasible than separate WHP and OSH programs).

COVID-19 and the Future of Work

Most research cited in this chapter pre-dates the COVID-19 pandemic, which exerted multiple and extensive impacts on work and the workplace in the United States. COVID-related restrictions limited business operations and revenue, with small businesses disproportionately likely to close, lay off staff, and/or lose revenue.[106] The risk of COVID-19 is closely tied to employment patterns,[107] as workers deemed essential are disproportionately racial or ethnic minorities, are paid low wages, and labor in jobs that cannot currently be done from home.[107,108] They work in both healthcare and nonhealthcare occupations,[107] such as in food preparation, construction, transportation, corrections, and first response.[88,108] In one survey, more than half of essential workers reported they leaned on unhealthy habits to get through the pandemic; 80% said their sleep was affected, and almost 40% said they were drinking more to cope with stress. Fifty percent said they gained weight (median 20 pounds).[109] The COVID-19 crisis also highlights the urgent need to focus on the mental health aspects of occupational health, including among the nation's public health and healthcare workers,[110] and the impact of job loss and decreased work hours on mental health outcomes during the pandemic.[111] For other workers who teleworked throughout the pandemic, the future of work may look very different and provide more flexibility around where and when work happens.[82] Workers are voicing more desire for a broader range of wellness benefits, such as mental health support and flexible scheduling,[112] and some employers are responding. The 2021 KFF/HRET survey[20] found that large employers were more likely than small employers to have changed offerings in response to the COVID-19 pandemic: 34% versus 17% expanded or modified existing programs to better address the needs of people working from home; 58% versus 38% provided or expanded online counseling for emotional and financial distress. New awareness of health and risk disparities in our workforce coupled with increased worker leverage during staffing shortages may create opportunities for OSH and WHP researchers to partner with employers, workers, and dissemination partners to determine new priorities and needs and how best to address them.

CASE STUDY 23.1: DOW CHEMICAL COMPANY AND TOTAL WORKER HEALTH

Background

The Dow Chemical Company was created in 1897 and is a global manufacturer of plastics, chemicals, and agricultural products (https://corporate.dow.com). It operates worldwide and had 35,700 full-time workers at the end of 2020.[113]

History

Dow has had an occupational health program for more than 100 years and a WHP program for more than 30 years.[114] In 2015, it merged these programs to create a TWH program and made its implementation part of its 2025 Sustainability Goals. Dow's TWH strategy has three interdependent elements: Healthy Culture, Healthy Workplace, and Healthy People.

The Healthy Culture Index is based on the CDC Worksite Health Scorecard with its major components: organizational support, tobacco control, nutrition, lactation support, physical activity, and stress management. In addition, it includes industrial hygiene practices, workplace exposure assessment, access to healthy options, and worker health culture.[115]

The Healthy Workplace element identifies workplace health risks and prioritizes and reduces them utilizing an HOC approach (preferring engineering controls to reduce risk rather than relying on PPE; https://www.cdc.gov/niosh/twh/guidelines.html). This element also relies on free worksite health clinics operated at 58 sites globally.[116] Other components of the Healthy Workplace include an integrated well-being strategy, with resources aimed at physical, mental, community, and financial well-being, along with a worker-assistance program; case management for those with chronic illness; traditional health insurance; and well-being champions on-site and available via social media.

The Healthy People element integrates traditional measures of both occupational health and health promotion. For example, it measures occupational injuries and illnesses. Safety measures are published annually.[114] It also

measures the American Heart Association's "Life's Simple 7," which include blood pressure, cholesterol, blood sugar, physical activity, healthy eating, weight management, and tobacco avoidance or cessation.[117]

Examples of Dow's integrated TWH approach include smoking cessation programs as part of training for respirator wearers; installation of sit/stand and walking workstations for office workers, along with management of personal safety risks inherent in these stations; and physical activity programs aimed at reducing ergonomic risks to minimize injuries.[115] The 2020 Dow Sustainability Report[114] profiles selected results of the program. These include improvements in safety metrics as well as implementation of distancing and other approaches to minimizing COVID-19 transmission in the workplace. NIOSH also highlights the program as part of its "Promising Practices" website.[118]

Implications for Practitioners, Policymakers, and Researchers

Dow provides an example of a large multinational company with many potential workplace hazards. It has long been active in both occupational health and health promotion but integrated those approaches only recently. Historically, Dow has conducted and published health promotion research[119] and is a promising site for practical and research insights into TWH implementation in the future.

CASE STUDY 23.2: DISSEMINATING EVIDENCE-BASED PROGRAMS TO SMALL WORKSITES VIA CONNECT TO WELLNESS

Background

Small employers face two major barriers in adopting and implementing evidence-based programs for their workers: (1) lack of information needed to find, choose, and adapt programs and (2) lack of resources required to implement programs.[120] Small employers need help in selecting programs, and they need programs that are low cost or free and take little time to implement.

The Community Guide (https://www.thecommunityguide.org) lists evidence-based strategies for cancer screening, healthy eating, physical activity, and tobacco cessation that worksites of all sizes can adopt and implement. In addition, all 50 states provide breast and cervical cancer screening and treatment free of charge for low-income and uninsured women, as well as free telephone quit lines for tobacco cessation for smokers. Very few small worksites promote these services, even though they are most likely to have workers that are eligible for their services.[121,122]

Connect to Wellness Intervention and Research

The Health Promotion Research Center (HPRC) at the University of Washington collaborated with the American Cancer Society to develop and test an intervention, *Connect to Wellness*,[†] to disseminate evidence-based programs to small employers (20–250 workers) in low-wage industries. The HPRC Dissemination and Implementation Framework[123] guides our intervention and dissemination research activities. Employers participating in Connect to Wellness complete activities with the assistance of a trained interventionist. In the assessment phase, the interventionist measures current worksite implementation of cancer screening, nutrition, physical activity, and tobacco cessation programs. In the recommendations phase, the interventionist creates a tailored *Recommendations Report* and delivers the report in a face-to-face meeting with the employer. At the Recommendations Report meeting, the interventionist provides *implementation toolkits* for each of the recommended programs. During the implementation phase, the employer begins adopting the recommended programs and promoting them to workers. The interventionist contacts worksites monthly by email or telephone during this phase to offer implementation assistance.

We conducted three studies to develop and test Connect to Wellness, including a randomized controlled trial.[124,125] The primary outcome

[†] *Connect to Wellness* was originally called HealthLinks, and early papers about the program use the HealthLinks name. We discovered that a different workplace health promotion program was using the same name, so we rebranded the program as *Connect to Wellness* in 2020.

was worksite-level adoption and implementation of evidence-based programs. We measured programs by asking several questions about each one and then using a scoring algorithm to calculate a score ranging from 0% to 100% implementation for each program. In each study, total worksite implementation increased at least 20% (absolute) from baseline to follow-up.[121,125]

Lessons Learned

One of the most challenging aspects of Connect to Wellness, as with many similar programs, is recruiting employers to participate. It is especially difficult to recruit employers in some of the lowest-wage industries we prioritize due to their risk profile, such as accommodation and food services and retail trade. Two reasons for this include very limited staff time and budget for wellness at these workplaces and perception that chronic disease prevention is irrelevant for their (comparatively) young, high-turnover workforce.[126] Recruiting employers via warm referral from their health insurance provider is very effective,[127] but this strategy only reaches employers that offer health insurance. Recently, we added new toolkits with interventions to manage stress and address COVID-19 risk and vaccination. These topics may be of more universal interest than chronic disease prevention. Adapting and tailoring the menu of evidence-based interventions to fit audience capacity and needs will likely be key to Connect to Wellness future reach and impact.

One of the core elements of Connect to Wellness is assistance from a trained interventionist. Connect to Wellness is offered as a free service, and this assistance component makes scale-up challenging. We pilot tested a training model in which we distance-trained local health department staff (e.g., health educators and public health nurses) in several counties in Washington State to deliver Connect to Wellness to worksites in their communities, and this was successful.[122] We are currently attempting to scale up this model to local health departments in other states. Two key challenges to engaging health departments currently include the shift in CDC funding for health departments from disease prevention to disease management[128] and the COVID-19 pandemic. In light of these challenges, we opened recruitment to state health departments, many of whom are already doing some level of WHP activity.[129]

Implications for Practitioners, Policymakers, and Researchers

Small businesses face unique challenges to adopting and implementing health promotion programs. Connect to Wellness disseminates a simple, three-step process of implementing evidence-based interventions and provides free in-person assistance from a trained interventionist. One of the key challenges for practice and research is to match the level of assistance given with the level needed for employers to be successful in implementing programs. Our use of a specific dissemination and implementation framework[123] helped us build a program of research around small worksites in low-wage industries; the program includes formative research with these employers and their workers, efficacy testing of Connect to Wellness, building out and testing additional implementation strategies such as wellness committees, and new partnerships to attempt scale-up.

SUMMARY

The workplace gives us an opportunity to reach more than 60% of noninstitutionalized adults in the United States (https://data.census.gov/cedsci/all?q=employment). A substantial body of evidence demonstrates the effectiveness of a range of WHP and OSH programs, but comparatively little research focuses on disseminating and implementing effective WHP and OSH programs. WHP and OSH traditionally operate in distinct silos; TWH is an integrated approach that is gaining popularity, but far from universal adoption. Partnerships between academic researchers, employers, governmental organizations, and for-profit and not-for-profit vendors are needed to identify (and create) effective WHP, OSH, and TWH programs; tailor them to meet the needs and capacities of employers and workers across size and industry categories; market them effectively; provide appropriate levels of implementation assistance; and evaluate impact and use the results to improve the programs and increase their reach.[123,130]

SUGGESTED READINGS AND WEBSITES

Selected Readings

Tamers SL, Chosewood LC, Streit J (Eds.). Worker safety, health, and well-being in the USA. *Int J Environ Res Public Health*. 2021;19(3) Special Issue. Accessed January 10, 2022. https://www.mdpi.com/journal/ijerph/special_issues/worker_health

Articles in this special issue address topics related to the future of work in the United States, work as an important social determinant of health, and implications for worker safety, health, and well-being. Included are articles with a dissemination and implementation perspective and that apply a Total Worker Health approach.

Kaiser Family Foundation and Health Research & Educational Trust. *Employer Health Benefits: 2021 Annual Survey.* Kaiser Family Foundation and Health Research & Educational Trust; 2021. Accessed December 12, 2021. https://www.kff.org/health-costs/report/2021-employer-health-benefits-survey/

This report summarizes the 2021 KFF/HRET survey of employer health benefits. This report, from a US employer survey conducted annually for the past 24 years, highlights changes employers have made in response to the COVID-19 pandemic. Survey reports and resources from prior KFF/HRET surveys (1998–2021) are also available at the link.

Rothstein MA (Ed.) The Occupational Safety and Health Act at 50, 1970–2020. *Am J Public Health*. 2020;110(5, special section):621–647. Accessed January 15, 2022. https://ajph.aphapublications.org/toc/ajph/110/5

This special section of the American Journal of Public Health *commemorates the 50th anniversary of the Occupational Safety and Health Act by including views from a range of experts on important issues—past, present, and future—in the areas of occupational safety and health regulation and beyond.*

Pollack Porter KM, Campbell L, Carson A, et al. Driving health equity in the workplace. American Heart Association CEO Roundtable; 2021. https://www.heart.org/en/about-us/office-of-health-equity/driving-health-equity-in-the-workplace

This report, written by a diverse group of WHP experts in academia and industry, lays out 20 actions that employers can take today to increase health equity in their workplaces. The 20 actions, with supporting evidence, are divided into 15 internal actions that workers can take within their own organizations and 5 external actions that lie in the realm of public policy for which employers should advocate. An example of an internal action is offering paid family and medical leave; an external example is advocating for high-quality, accessible, and affordable early care and education for children.

Hudson HL, Nigam JAS, Sauter SL, Chosewood C, Schill AL, Howard J, eds. Total Worker Health. American Psychological Association; 2019.

This volume presents approaches for implementing integrative prevention programs to address policies, programs, and practices that address risks arising from both the physical and organizational work environment and that extend beyond the workplace. These include applications for diverse worker occupations and industries. Evidence of program effectiveness is also discussed.

Selected Websites and Tools

Centers for Disease Control and Prevention, Workplace Health Promotion. https://www.cdc.gov/workplacehealthpromotion/index.htmlAccessed November 20, 2021. Published March 8, 2019.

This website provides information on CDC's workplace health promotion activities and tools. It includes their Workplace Health Model and Workplace Health Scorecard, both cited in this review, as well as links to evidence-based policies, programs, and communications; data and surveillance; and other tools and resources to support workplace health promotion practitioners and researchers.

Cochrane Database of Systematic Reviews. http://www.cochranelibrary.com/cochrane-database-of-systematic-reviews/index.html. Accessed November 13, 2021.

This searchable database of systematic reviews uses literature from global sources, including both high-income and lower- and-middle-income countries. At the time of writing of this chapter, there were eight reviews on primary and secondary prevention in workplace settings.

The Cochrane Database also includes a specific focus on occupational safety and health at https://work.cochrane.org/cochrane-reviews-about-occupational-safety-and-health.Accessed November 13, 2021.

The Community Guide, Worksite Health. https://www.thecommunityguide.org/topic/worksite-health.Accessed December 5, 2021.

This website summarizes the recommendations and systematic reviews related to workplace health promotion from CDC's Community Guide. Links are provided to stories from the field and other resources. It is worth exploring other topics on the Community Guide's website as evidence-based strategies in other topic areas are often relevant to workplace health promotion. For example, several strategies for cancer screening (distributing small media or home test kits) can be implemented in the workplace.

Total Worker Health Planning, Assessment, and Evaluation Tools. https://www.cdc.gov/niosh/twh/tools.html January 11, 2023.

This site provides a list of free, publicly available resources that can support the planning, assessment,

and evaluation of programs, policies, and practices aligned with a TWH approach.

REFERENCES

1. Flynn MA, Check P, Steege AL, Siven JM, Syron LN. Health equity and a paradigm shift in occupational safety and health. *Int J Environ Res Public Health*. 2021;19(1):349.
2. Alli BO. *Fundamental Principles of Occupational Health and Safety.* 2nd ed. International Labour Office; 2008.
3. Loeppke RR, Hohn T, Baase C, et al. Integrating health and safety in the workplace: how closely aligning health and safety strategies can yield measurable benefits. *J Occup Environ Med*. 2015;57(5):585–597.
4. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Educ Q*. 1988;15(4):351–377.
5. National Institute for Occupational Safety and Health (NIOSH). Reducing noise exposure: noise controls. 2018. Accessed February 7, 2022. https://www.cdc.gov/niosh/topics/noise/reducenoiseexposure/noisecontrols.html
6. National Institute for Occupational Safety and Health (NIOSH). Hierarchy of controls. 2015. Accessed February 7, 2022. https://www.cdc.gov/niosh/topics/hierarchy/default.html
7. Janson DJ, Clift BC, Dhokia V. PPE fit of healthcare workers during the COVID-19 pandemic. *Appl Ergon*. 2022;99:103610.
8. Keefe AR, Demers PA, Neis B, et al. A scoping review to identify strategies that work to prevent four important occupational diseases. *Am J Ind Med*. 2020;63(6):490–516.
9. Harris JR, Hannon PA, Beresford SA, Linnan LA, McLellan DL. Health promotion in smaller workplaces in the United States. *Annu Rev Public Health*. 2014;35:327–342.
10. Sinclair RC, Cunningham TR. Safety activities in small businesses. *Saf Sci*. 2014;64:32–38.
11. Linnan LA, Cluff L, Lang JE, Penne M, Leff MS. Results of the Workplace Health in America survey. *Am J Health Promot*. 2019;33(5):652–665.
12. Centers for Disease Control and Prevention. Workplace health model. 2021. Accessed Dec 6, 2021. https://www.cdc.gov/workplacehealthpromotion/model/index.html
13. Kaiser Family Foundation and Health Research & Educational Trust. Employer *Health Benefits: 2017 Annual Survey*. Kaiser Family Foundation and Health Research & Educational Trust; 2017.
14. Society for Human Resource Management. Wellness programs—compare and research wellness programs companies and businesses. 2022. Accessed February 7, 2022. https://vendordirectory.shrm.org/category/benefits-health-welfare/wellness-programs
15. Rooke L. *An Analysis of Services Offered by Comprehensive Wellness Vendors in Washington State*. Masters thesis. Health Services, University of Washington; 2015.
16. Abraham J, White KM. Tracking the changing landscape of corporate wellness companies. *Health Aff (Millwood)*. 2017;36(2):222–228.
17. Marquis MS, Long SH. Who helps employers design their health insurance benefits? *Health Aff (Millwood)*. 2000;19(1):133–138.
18. Thornton M, Hammerback K, Abraham JM, Brosseau L, Harris JR, Linnan LA. Using a social capital framework to explore a broker's role in small employer wellness program uptake and implementation. *Am J Health Promot*. 2021;35(2):214–225.
19. Harris JR, Hammerback KR, Hannon PA, et al. Group purchasing of workplace health promotion services for small employers. *J Occup Environ Med*. 2014;56(7):765–770.
20. Kaiser Family Foundation and Health Research & Educational Trust. *Employer Health Benefits: 2021 Annual Survey*. Kaiser Family Foundation and Health Research & Educational Trust; 2021.
21. Kaiser Family Foundation and Health Research & Educational Trust. *Employer Health Benefits: 2020 Annual Survey*. Kaiser Family Foundation and Health Research & Educational Trust; 2020.
22. Smidt MN, Jimmieson NL, Bradley LM. Predicting employee participation in, and satisfaction with, wellness programs: the role of employee, supervisor, and organizational support. *J Occup Environ Med*. 2021;63(12):1005–1018.
23. Sherman BW, Addy C. Association of wage with employee participation in health assessments and biometric screening. *Am J Health Promot*. 2018;32(2):440–445.
24. Grossmeier J, Castle PH, Pitts JS, et al. Workplace well-being factors that predict employee participation, health and medical cost impact, and perceived support. *Am J Health Promot*. 2020;34(4):349–358.
25. Abraham JM. Employer wellness programs—a work in progress. *JAMA*. 2019;321(15):1462–1463.
26. Song Z, Baicker K. Effect of a workplace wellness program on employee health and economic outcomes: a randomized clinical trial. *JAMA*. 2019;321(15):1491–1501.
27. Jones D, Molitor D, Reif J. What do workplace wellness programs do? Evidence from the Illinois Workplace Wellness Study. *Q J Econ*. 2019;134(4):1747–1791.
28. Goetzel RZ. Commentary on the Study: "What Do Workplace Wellness Programs Do? Evidence

From the Illinois Workplace Wellness Study." *Am J Health Promot*. 2020;34(4):440–444.
29. Mattke S, Liu H, Caloyeras JP, et al. *Workplace Wellness Programs Study: Final Report*. RAND Corporation. 2013. RR-254-DOL. Accessed December 16, 2021. https://www.rand.org/t/RR254
30. Goetzel RZ, Henke RM, Tabrizi M, et al. Do workplace health promotion (wellness) programs work? *J Occup Environ Med*. 2014;56(9):927–934.
31. Research and Markets. US corporate wellness market—industry outlook and forecast 2021–2026. February 2021. Accessed December 16, 2021. https://www.researchandmarkets.com/reports/5239809
32. National Committee for Quality Assurance (NCQA). Wellness and health promotion accreditation/certification. 2022. Accessed February 7, 2022. https://www.ncqa.org/programs/health-plans/wellness-and-health-promotion-whp/
33. Lang JE, Mummert A, Roemer EC, Kent KB, Koffman DM, Goetzel RZ. The CDC Worksite Health ScoreCard: an assessment tool to promote employee health and well-being. *Am J Health Promot*. 2020;34(3):319–321.
34. Cluff LA, Lang JE, Rineer JR, Jones-Jack NH, Strazza KM. Training employers to implement health promotion programs: results from the CDC Work@Health(R) program. *Am J Health Promot*. 2018;32(4):1062–1069.
35. Grossmeier J. Updated employer tools identify practices associated with population health outcomes. *Am J Health Promot*. 2020;34(3):316–317.
36. Calitz C, Pham K. American Heart Association's Workplace Health Achievement Index. *Am J Health Promot*. 2020;34(3):317–318.
37. Rosenbaum E, Grossmeier J, Imboden M, Noeldner S. The HERO Health and Well-Being Best Practices Scorecard in collaboration with Mercer (HERO Scorecard). *Am J Health Promot*. 2020;34(3):321–323.
38. Martin S, Picarella R, Pitts JS. Measuring a whole systems approach to wellness with the Well Workplace Checklist. *Am J Health Promot*. 2020;34(3):323–326.
39. Rothstein MA. The Occupational Safety and Health Act at 50: Introduction to the Special Section. *Am J Public Health*. 2020;110(5):613–614.
40. Michaels D, Barab J. The Occupational Safety and Health Administration at 50: Protecting Workers in a Changing Economy. *Am J Public Health*. 2020;110(5):631–635.
41. Howard J. NIOSH: a short history. *Am J Public Health*. 2020;110(5):629–630.
42. Kuempel E, Roberts JR, Roth G, et al. Current Intelligence Bulletin *70: Health Effects of Occupational Exposure to Silver Nanomaterials*. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health; 2021.
43. Institute of Medicine. *Safe Work in the 21st Century: Education and Training Needs for the Next Decade's Occupational Safety and Health Personnel*. National Academies Press; 2000.
44. Occupational Safety and Health Administration (OSHA). Recommended practices for safety and health. 2016. Accessed February 7, 2022. https://www.osha.gov/sites/default/files/publications/OSHA3885.pdf
45. Occupational Health and Safety Management Systems. *American National Standards Institute (ANSI) Z10-2019 Standard*. 2019. American Society of Safety Professionals, Secretariat.
46. US Department of Labor—Occupational Safety and Health Administration (OSHA). Commonly used statistics. 2021. Accessed February 7, 2022. https://www.osha.gov/data/commonstats
47. Levine DI, Toffel MW, Johnson MS. Randomized government safety inspections reduce worker injuries with no detectable job loss. *Science*. 2012;336(6083):907–911.
48. US Department of Labor, Bureau of Labor Statistics. Employer-reported workplace injuries and illnesses—2020. 2021. Accessed February 7, 2022. https://www.bls.gov/news.release/pdf/osh.pdf
49. Guerin RJ, Reichard AA, Derk S, Hendricks KJ, Menger-Ogle LM, Okun AH. Nonfatal occupational injuries to younger workers—United States, 2012–2018. *MMWR Morb Mortal Wkly Rep*. 2020;69(35):1204–1209.
50. US Department of Labor, Bureau of Labor Statistics. 25 years of worker injury, illness, and fatality case data. 2019. Accessed Feb 7, 2022. https://www.bls.gov/spotlight/2019/25-years-of-worker-injury-illness-and-fatality-case-data/pdf/25-years-of-worker-injury-illness-and-fatality-case-data.pdf
51. US Department of Labor, Bureau of Labor Statistics. Foreign-born workers: labor force characteristics—2020. May 18, 2021. Accessed February 7, 2022. https://www.bls.gov/news.release/pdf/forbrn.pdf
52. Steege AL, Baron S, Marsh SM, Menendez CC, Meyers JR. Examining occupational health and safety disparities using national data: a cause for continuing concern. *Am J Ind Med*. 2014;57:527–538.
53. Cunningham TR, Guerin RJ, Keller BM, Flynn MA, Salgado C, Hudson D. Differences in safety training among smaller and larger construction firms with non-native workers:

evidence of overlapping vulnerabilities. *Saf Sci*. 2018;103:62–69.
54. Weil D. The future of Occupational Safety and Health protection in a fissured economy. *Am J Public Health*. 2020;110(5):640–641.
55. Tamers SL, Streit J, Pana-Cryan R, et al. Envisioning the future of work to safeguard the safety, health, and well-being of the workforce: a perspective from the CDC's National Institute for Occupational Safety and Health. *Am J Ind Med*. 2020;63(12):1065–1084.
56. Teufer B, Ebenberger A, Affengruber L, et al. Evidence-based occupational health and safety interventions: a comprehensive overview of reviews. *BMJ Open*. 2019;9(12):e032528.
57. Richardson KM, Rothstein HR. Effects of occupational stress management intervention programs: a meta-analysis. *J Occup Health Psychol*. 2008;13(1):69–93.
58. Abraham JM. Taking stock of employer wellness program effectiveness—where should employers invest? *JAMA Intern Med*. 2020;180(7):960–961.
59. Pescud M, Teal R, Shilton T, et al. Employers' views on the promotion of workplace health and wellbeing: a qualitative study. *BMC Public Health*. 2015;15:642.
60. Passey DG, Hammerback K, Huff A, Harris JR, Hannon PA. The role of managers in employee wellness programs: a mixed-methods study. *Am J Health Promot*. 2018;32(8):1697–1705.
61. Pfeffer J, Vilendrer S, Joseph G, Kim J, Singer SJ. Employers' role in employee health: why they do what they do. *J Occup Environ Med*. 2020;62(11):e601–e610.
62. McCleary K, Goetzel RZ, Roemer EC, Berko J, Kent K, Torre H. Employer and employee opinions about workplace health promotion (wellness) programs: results of the 2015 Harris Poll Nielsen Survey. *J Occup Environ Med*. 2017;59(3):256–263.
63. Parrish AT, Hammerback K, Hannon PA, Mason C, Wilkie MN, Harris JR. Supporting the health of low socioeconomic status employees: qualitative perspectives from employees and large companies. *J Occup Environ Med*. 2018;60(7):577–583.
64. Dale AM, Enke C, Buckner-Petty S, et al. Availability and use of workplace supports for health promotion among employees of small and large businesses. *Am J Health Promot*. 2019;33(1):30–38.
65. Weiner BJ. A theory of organizational readiness for change. *Implement Sci*. 2009;4:67.
66. Weinstein M, Cheddie K. Adoption and implementation barriers for worksite health programs in the United States. *Int J Environ Res Public Health*. 2021;18(22):12030.
67. Stiehl E, Shivaprakash N, Thatcher E, et al. Worksite health promotion for low-wage workers: a scoping literature review. *Am J Health Promot*. 2018;32(2):359–373.
68. Hannon PA, Garson G, Harris JR, Hammerback K, Sopher CJ, Clegg-Thorp C. Workplace health promotion implementation, readiness, and capacity among midsize employers in low-wage industries: a national survey. *J Occup Environ Med*. 2012;54(11):1337–1343.
69. Tsai R, Alterman T, Grosch JW, Luckhaupt SE. Availability of and participation in workplace health promotion programs by sociodemographic, occupation, and work organization characteristics in US workers. *Am J Health Promot*. 2019;33(7):1028–1038.
70. Sherman BW, Kelly RK, Payne-Foster P. Integrating workforce health into employer diversity, equity and inclusion efforts. *Am J Health Promot*. 2021;35(5):609–612.
71. Castro FG, Yasui M. Advances in EBI development for diverse populations: towards a science of intervention adaptation. *Prev Sci*. 2017;18(6):623–629.
72. Monti S, Grosso V, Todoerti M, Caporali R. Randomized controlled trials and real-world data: differences and similarities to untangle literature data. *Rheumatology (Oxford)*. 2018;57(57)(suppl 7):vii54–vii58.
73. Escoffery C, Lebow-Skelley E, Udelson H, et al. A scoping study of frameworks for adapting public health evidence-based interventions. *Transl Behav Med*. 2019;9(1):1–10.
74. Baumann AA, Cabassa LJ, Stirman SW. Adaptation in dissemination and implementation science. In: Brownson RC, Colditz GA, Proctor EK, eds. *Dissemination and Implementation Research in Health: Translating Science to Practice*. 2nd ed. Oxford University Press; 2017:285–300.
75. Tabak RG, Strickland JR, Stein RI, et al. Development of a scalable weight loss intervention for low-income workers through adaptation of interactive obesity treatment approach (iOTA). *BMC Public Health*. 2018;18(1):1265.
76. Moore JE, Mascarenhas A, Bain J, Straus SE. Developing a comprehensive definition of sustainability. *Implement Sci*. 2017;12(1):110.
77. Hailemariam M, Bustos T, Montgomery B, Barajas R, Evans LB, Drahota A. Evidence-based intervention sustainability strategies: a systematic review. *Implement Sci*. 2019;14(1):57.
78. Shelton RC, Lee M. Sustaining evidence-based interventions and policies: recent innovations and future directions in implementation science. *Am J Public Health*. 2019;109(S2):S132–S134.

79. Lowensteyn I, Berberian V, Berger C, Da Costa D, Joseph L, Grover SA. The sustainability of a workplace wellness program that incorporates gamification principles: participant engagement and health benefits after 2 years. *Am J Health Promot*. 2019;33(6):850–858.
80. Viester L, Verhagen E, Bongers PM, van der Beek AJ. Effectiveness of a worksite intervention for male construction workers on dietary and physical activity behaviors, body mass index, and health outcomes: results of a randomized controlled trial. *Am J Health Promot*. 2018;32(3):795–805.
81. Phillips EK, Conaway MR, Jagger JC. Percutaneous injuries before and after the Needlestick Safety and Prevention Act. *N Engl J Med*. 2012;366(7):670–671.
82. Sorensen G, Dennerlein JT, Peters SE, Sabbath EL, Kelly EL, Wagner GR. The future of research on work, safety, health and wellbeing: a guiding conceptual framework. *Soc Sci Med*. 2021;269:113593.
83. Miller P, Haslam C. Why employers spend money on employee health: interviews with occupational health and safety professionals from British industry. *Saf Sci*. 2009;47(2):163–169.
84. Verbeek J. The economic dimension of occupational health and safety. *Scand J Work Environ Health*. 2009;35(6):401–402.
85. Kvorning LV, Hasle P, Christensen U. Motivational factors influencing small construction and auto repair enterprises to participate in occupational health and safety programmes. *Saf Sci*. 2015;71:253–263.
86. Schulte PA, Cunningham TR, Nickels L, et al. Translation research in occupational safety and health: a proposed framework. *Am J Ind Med*. 2017;60(12):1011–1022.
87. Zhang Y, Flum M, West C, Punnett L. Assessing organizational readiness for a participatory occupational health/health promotion intervention in skilled nursing facilities. *Health Promot Pract*. 2015;16(5):724–732.
88. Robertson MM, Tubbs D, Henning RA, Nobrega S, Calvo A, Murphy LA. Assessment of organizational readiness for participatory occupational safety, health and well-being programs. *Work*. 2021;69(4):1317–1342.
89. Nobrega SM, Morocho C, Robertson MM, et al. Using a mixed method approach to tailor the implementation of a participatory Total Worker Health® program in public healthcare facilities. *Preprint, Dec 30, Research Square*. 2020. doi:https://doi.org/10.21203/rs.3.rs-135537/v1
90. von Thiele Schwarz U, Hasson H, Lindfors P. Applying a fidelity framework to understand adaptations in an occupational health intervention. *Work*. 2015;51(2):195–203.
91. Cagno E, Masi D, Leao CP. Drivers for OSH interventions in small and medium-sized enterprises. *Int J Occup Saf Ergon*. 2016;22(1):102–115.
92. Herrera-Sanchez IM, Leon-Perez JM, Leon-Rubio JM. Steps to ensure a successful implementation of Occupational Health and Safety interventions at an organizational level. *Front Psychol*. 2017;8:2135.
93. Flynn MA, Keller B, DeLaney SC. Promotion of alternative-sized personal protective equipment. *J Safety Res*. 2017;63:43–46.
94. Kotejoshyer R, Zhang Y, Flum M, Fleishman J, Punnett L. Prospective evaluation of fidelity, impact and sustainability of participatory workplace health teams in skilled nursing facilities. *Int J Environ Res Public Health*. 2019;16(9):1494.
95. Tabak RG, Khoong EC, Chambers DA, Brownson RC. Bridging research and practice: models for dissemination and implementation research. *Am J Prev Med*. 2012;43(3):337–350.
96. Guerin RJ, Glasgow RE, Tyler A, Rabin BA, Huebschmann AG. Methods to improve the translation of evidence-based interventions: a primer on dissemination and implementation science for occupational safety and health researchers and practitioners. *Saf Sci*. 2022;152.
97. Moullin JC, Dickson KS, Stadnick NA, et al. Ten recommendations for using implementation frameworks in research and practice. *Implement Sci Commun*. 2020;1(1):42.
98. Shelton RC, Chambers DA, Glasgow RE. An extension of RE-AIM to enhance sustainability: addressing dynamic context and promoting health equity over time. *Front Public Health*. 2020;8:134.
99. Etherington C, Rodrigues IB, Giangregorio L, et al. Applying an intersectionality lens to the theoretical domains framework: a tool for thinking about how intersecting social identities and structures of power influence behaviour. *BMC Med Res Methodol*. 2020;20(1):169.
100. Allen M, Wilhelm A, Ortega LE, Pergament S, Bates N, Cunningham B. Applying a race(ism)-conscious adaptation of the CFIR framework to understand implementation of a school-based equity-oriented intervention. *Ethn Dis*. 2021;31(suppl 1):375–388.
101. Guerin RJ, Harden SM, Rabin BA, et al. Dissemination and implementation science approaches for occupational safety and health research: implications for advancing Total

Worker Health. *Int J Environ Res Public Health*. 2021;18(21):11050.
102. Feltner C, Peterson K, Palmieri Weber R, et al. The effectiveness of Total Worker Health interventions: a systematic review for a National Institutes of Health Pathways to Prevention Workshop. *Ann Intern Med*. 2016;165(4):262–269.
103. Punnett L, Cavallari JM, Henning RA, Nobrega S, Dugan AG, Cherniack MG. Defining "integration" for Total Worker Health®: a new proposal. *Ann Work Expo Health*. 2020;64(3):223–235.
104. Tamers SL, Chosewood LC, Childress A, Hudson H, Nigam J, Chang CC. Total Worker Health® 2014–2018: the novel approach to worker safety, health, and well-being evolves. *Int J Environ Res Public Health*. 2019;16(3):321.
105. Anger WK, Elliot DL, Bodner T, et al. Effectiveness of total worker health interventions. *J Occup Health Psychol*. 2015;20(2):226–247.
106. Katare B, Marshall MI, Valdivia CB. Bend or break? Small business survival and strategies during the COVID-19 shock. *Int J Disaster Risk Reduct*. 2021;61:102332.
107. Michaels D, Wagner GR. Occupational Safety and Health Administration (OSHA) and worker safety during the COVID-19 pandemic. *JAMA*. 2020;324(14):1389–1390.
108. Do DP, Frank R. US frontline workers and COVID-19 inequities. *Prev Med*. 2021;153:106833.
109. *Stress in America: One Year Later, a New Wave of Pandemic Health Concerns* [Press release]. American Psychological Association; March 2021.
110. Bryant-Genevier J, Rao CY, Lopes-Cardozo B, et al. Symptoms of depression, anxiety, post-traumatic stress disorder, and suicidal ideation among state, tribal, local, and territorial public health workers during the COVID-19 pandemic—United States, March–April 2021. *MMWR Morb Mortal Wkly Rep*. 2021;70(48):1680–1685.
111. Guerin RJ, Barile JP, Thompson WW, McKnight-Eily L, Okun AH. Investigating the impact of job loss and decreased work hours on physical and mental health outcomes among US adults during the COVID-19 pandemic. *J Occup Environ Med*. 2021;63(9):e571–e579.
112. Childress R. New data shows how COVID-19 has changed the workplace. *Associations Now*. September 22, 2021. Accessed January 28, 2022. https://associationsnow.com/2021/09/new-data-shows-how-covid-19-has-changed-the-workplace/
113. US Securities and Exchange Commission. Form 10-K, Dow Chemical Company. 2020. Accessed January 24, 2022. https://www.sec.gov/Archives/edgar/data/29915/000175178821000010/dow-20201231.htm
114. Dow Chemical Company. Intersections, 2020 environmental, social and governance report. 2020. Accessed Jan 24, 2022. https://corporate.dow.com/en-us/esg/report.html
115. American Heart Association. Workplace health playbook: the Dow Chemical Company—Total Worker Health. 2021. Accessed December 17, 2021. https://playbook.heart.org/the-dow-chemical-company-total-worker-health
116. Dow Chemical Company. Employee health and wellness. 2022. Accessed Feb 7, 2022. https://corporate.dow.com/en-us/esg/report/health-and-safety/employee-wellness.html
117. American Heart Association. My Life Check—Life's Simple 7. 2022. Accessed February 7, 2022. https://www.heart.org/en/healthy-living/healthy-lifestyle/my-life-check--lifes-simple-7
118. National Institute for Occupational Safety and Health (NIOSH). Total Worker Health in action: December 2017—creating value at Dow Chemical through Total Worker Health initiatives. December 2017. Accessed February 7, 2022. https://www.cdc.gov/niosh/twh/newsletter/twhnewsv6n4.html#Promising
119. Aikens KA, Astin J, Pelletier KR, et al. Mindfulness goes to work: impact of an online workplace intervention. *J Occup Environ Med*. 2014;56(7):721–731.
120. Hannon PA, Helfrich CD, Chan KG, et al. Development and pilot test of the workplace readiness questionnaire, a theory-based instrument to measure small workplaces' readiness to implement wellness programs. *Am J Health Promot*. 2017;31(1):67–75.
121. Hannon PA, Hammerback K, Kohn MJ, et al. Disseminating evidence-based interventions in small, low-wage worksites: a randomized controlled trial in King County, Washington (2014–2017). *Am J Public Health*. 2019;109(12):1739–1746.
122. Harris JR, Hammerback K, Brown M, et al. Local health jurisdiction staff deliver health promotion to small worksites, Washington. *J Public Health Manag Pract*. 2021;27(2):117–124.
123. Harris JR, Cheadle A, Hannon PA, et al. A framework for disseminating evidence-based health promotion practices. *Prev Chronic Dis*. 2012;9:E22.
124. Hannon PA, Hammerback K, Allen CL, et al. HealthLinks randomized controlled trial:

design and baseline results. *Contemp Clin Trials*. 2016;48:1–11.
125. Laing SS, Hannon PA, Talburt A, Kimpe S, Williams B, Harris JR. Increasing evidence-based workplace health promotion best practices in small and low-wage companies, Mason County, Washington, 2009. *Prev Chronic Dis*. 2012;9:E83.
126. Allen CL, Hammerback K, Harris JR, Hannon PA, Parrish AT. Feasibility of workplace health promotion for restaurant workers, Seattle, 2012. *Prev Chronic Dis*. 2015;12:E172.
127. Hammerback K, Hannon PA, Parrish AT, Allen C, Kohn MJ, Harris JR. Comparing strategies for recruiting small, low-wage worksites for community-based health promotion research. *Health Educ Behav*. 2018;45(5):690–696.
128. Brown MC, Kava C, Bekemeier B, et al. Local health departments' capacity for workplace health promotion programs to prevent chronic disease: comparison of rural, micropolitan, and urban contexts. *J Public Health Manag Pract*. 2021;27(5):E183–E188.
129. Linnan LA, Leff MS, Martini MC, et al. Workplace health promotion and safety in state and territorial health departments in the United States: a national mixed-methods study of activity, capacity, and growth opportunities. *BMC Public Health*. 2019;19(1):291.
130. Steensma JT, Kreuter MW, Casey CM, Bernhardt JM. Enhancing dissemination through marketing and distribution systems: a vision for public health. In: Brownson RC, Colditz GA, Proctor EK, eds. *Dissemination and Implementation Research in Health: Translating Science to Practice*. 2nd ed. Oxford University Press; 2018:191–200.