The Potential for *Total Worker Health*® Approaches in State and Territorial Health Departments
A National Mixed-Methods Study

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Objective: To document the extent to which state and territorial health departments (SHDs) integrate their occupational safety and health (OSH) and workplace health promotion (WHP) activities consistent with a *Total Worker Health* (TWH) approach. **Methods:** Nationally representative survey of OSH and WHP practitioners at 56 SHDs followed by in-depth interviews. **Results:** Despite reporting limited awareness of the TWH initiative and TWH resources, most respondents (57% OSH, 64% WHP) reported collaboration between OSH and WHP staff in their departments. Collaborations were described in-depth. Barriers to OSH-WHP collaborations included resource insufficiencies, organizational structure in the SHD, and conflicting practices. Facilitators included knowledge of TWH approaches, proximity to TWH Centers of Excellence, proximity between OSH/WHP programs, and leadership initiative. Motivations for collaboration were enumerated. **Conclusions:** Strategies for building TWH capacity and activity among SHDs are discussed.

Keywords: Centers for Disease Control and Prevention, health promotion, National Institute for Occupational Safety and Health, occupational health, public health systems research, state government, state health department, *Total Worker Health*®

The *Total Worker Health* (TWH) approach is defined by the National Institute for Occupational Safety and Health (NIOSH) as "policies, programs, and practices that integrate protection from work-related safety and health hazards with promotion of injury and illness prevention efforts to advance worker well-being."[1] This integrated approach is motivated by a recognition that there are common workplace conditions that influence worker safety, injury, and illness rates, as well as health behaviors and experiences related to chronic disease risk and rates.[2] Workers with chronic diseases also have increased risk of occupational injury,[3] making it imperative to remove hazards and exposures at work to maintain their overall health and well-being. Emerging evidence also demonstrates that a TWH approach that protects workers and offers typical health promotion efforts produces better worker engagement and improved health outcomes.[4]

State health departments (SHDs) are the leading public health organizations in each state/territory, and many already include occupational safety and health (OSH) and/or workplace health promotion (WHP) programs.[5] As part of these programs, SHDs offer tools, training, and technical assistance to local businesses.[5] They also often provide WHP and safety services to employees of other state agencies.[6] State health departments that adopt a TWH approach are thus well-positioned to introduce this concept to workers and businesses in their states. Several city and county governments, including county health departments, have already moved in this direction and become members of the NIOSH TWH affiliate program.[7] To strengthen these services and to build capacity in the TWH approach within SHDs, it is important to understand what SHDs are currently doing and identify changes needed in SHDs to organize, fund, train, and evaluate their TWH efforts.

One potential impediment to coordinated TWH approaches in SHDs is the nonalignment of the Centers for Disease Control and Prevention's (CDC's) funding streams for OSH and WHP. For example, SHD OSH programs receive federal funds through NIOSH's State Occupational Health and Safety Surveillance program, which includes partnership and intervention objectives, but places a heavy emphasis on surveillance.[8] In comparison, the primary federal funding for WHP activities during the time of this study came through two nonrecurring State and Local Public Health Actions (1305[9] and 1422[10]) whose goals included improving environments in worksites to promote healthy behaviors, that is, intervention- and technical assistance–oriented goals. Reflecting these different priorities, results from the 2016 National Survey of State and Territorial Health Departments' Workplace Health and Safety Activities (the parent study to the TWH data presented in this article) found that OSH programs were most active in surveillance (92% of OSH respondents reporting at least some surveillance activity), but WHP programs were most active in "implementation support" (90% of WHP respondents reporting that they had given employers at least some support).[5] During the study period, TWH approaches were not a point of emphasis in either of these funding streams. This dynamic is part of a larger trend of siloed work within SHDs, often reinforced by fragmented funding streams.

Before this study, it was unknown whether and to what extent departments within SHDs collaborate to achieve TWH aims.[11] The purpose of this study was to address that gap. We documented the extent to which SHDs were aware of and engaged in TWH approaches and then identified factors that facilitated or presented challenges to SHD OSH-WHP collaborations. Given these results, we propose strategies to increase SHDs' involvement to build TWH capacity in the future.

METHODS

Description of Study Design

These data are from the National Survey of State Health Departments' Workplace Health and Safety Activities. As described previously,[5] we applied a two-staged "sequential embedded" mixed-methods design (an adaptation of Creswell and Creswell's[12] "concurrent embedded" design). In the first stage, we conducted an online national survey of state and territorial health departments covering the OSH and WHP activities of SHDs, SHDs' capacity for these activities, ideas for increasing OSH and WHP capacity, collaborations between OSH and WHP, and knowledge of TWH. For stage 2, we conducted follow-up in-depth interviews with a subsample of the survey respondents. The interview guide was created after analysis of the survey data, and the interviews were used to gather more rich data about OSH-WHP collaborations (among other study themes). We also used the interviews to ask respondents to explain some of their survey responses, improving our interpretation of the quantitative findings. This mixed-methods design allowed us to capture a representative cross section of SHDs' situation, identify findings in the quantitative data that could be further explored via qualitative inquiry, and proceed to collect rich anecdotes and examples on themes that were prominent in the quantitative findings.

Recruitment

Survey

As described previously,[5] we obtained a list of potential OSH survey respondents from NIOSH's "Occupational Safety and Health Contacts at State and Territorial Health Departments" directory.[13] Note that in a handful of states, the OSH contact worked in a state agency outside of the SHD (eg, state Department of Labor) or was a bona fide agent of the SHD working in a research university.[13] Our list of potential WHP respondents was obtained by reviewing health department Web sites and the National Association of Chronic Disease Directors' Membership Directory.[14] We included all 50 states and 5 inhabited territories as well as the District of Columbia. We called each of the 112 (56 OSH and 56 WHP) potential respondents to confirm they were the "person with the best knowledge of [OSH or WHP, respectively] activities being performed by your Department" or receive a referral. In two states, the individual we confirmed as most knowledgeable about OSH was also confirmed as most knowledgeable about WHP, giving a final list of 110 nonduplicative contacts. All contacts received a presurvey announcement via e-mail, followed by a link to the survey. We sent two additional e-mails and made two follow-up calls to nonresponders.

Interview

The interview sample frame was derived from a list of survey respondents who gave their permission to be contacted for a follow-up interview (n = 51; 24 OSH and 27 WHP). From this list, we used quota sampling[5] to create a sample of 27 interview participants (14 OSH and 13 WHP) with variation in the range of WHP and/or OSH activities (as determined by survey responses).

Ethics Approval and Consent to Participate

This study was approved by the Office of Human Research Ethics at the University of North Carolina at Chapel Hill (study #15-2771). Survey respondents provided informed consent via an online form, whereas interview respondents provided verbal consent via phone.

Data Collection Instruments and Key Measures

Survey

We developed and pilot tested the survey with expert input by both OSH and WHP specialists.[5] Except where otherwise indicated, response options were given on a five-point nominal scale.

Familiarity With TWH Concepts and Resources

We asked OSH and WHP respondents to rate their level of familiarity with NIOSH's TWH initiative, from "not familiar at all" to "extremely." They were also asked to indicate if they were (*a*) not aware of, (*b*) aware of but had not used, or (*c*) had used each of 10 TWH resources (eg, the NIOSH TWH in Action! eNewsletter).

Knowledge of Collaborators' Activities

We asked OSH respondents to rate their knowledge about WHP activities being performed by their SHD, from "know nothing" to "extremely knowledgeable." The WHP respondents were asked the same about OSH activities.

Level of Collaboration

We asked OSH respondents if they "ever collaborate with WHP staff in your health department on workplace safety and/or health promotion activities?" The WHP respondents were similarly asked about OSH staff. Respondents who collaborated were asked to indicate the level of collaboration from "very low" to "very high" and describe an example.

Attitudes Toward Collaboration

We asked both OSH and WHP respondents to rate their level of agreement, from "strongly disagree" to "strongly agree," with the following two statements: "Collaboration between OSH and WHP staff [helps/would help] my health department achieve our aims for workplace safety and health promotion" and "Collaboration between OSH and WHP staff in my Health Department [is/would be] easy." We also asked respondents to describe the top three challenges to effective collaboration.

Interview Guide

We developed and pilot tested the interview guide with input of both OSH and WHP practitioners.[5] Interviews were conducted over the phone and lasted 45 to 60 minutes on average. Information was prepopulated from the participants' survey responses so that we could probe on specific survey findings. The exact number of interview questions varied per participant based on what they reported in the survey; there were 38 base questions, plus probes.

Analysis

We used SAS (SAS Institute, Cary, NC) to calculate descriptive statistics for all survey responses and conventional content analysis[15] to analyze the interview data. As part of the content analysis, the research team grouped the OSH-WHP collaborations that respondents described into four types (inductively identified during the coding process) and coded the motivations for, barriers to, and facilitators of collaboration for each type.

RESULTS

Sample

The sample for this study has been described previously.[5] Briefly, 70% (n = 39) of OSH survey contacts and 71% (n = 40) of WHP survey contacts responded to the survey. For 52% (n = 29) of the states and territories, we received responses from both the OSH and WHP contact in that state.

The OSH survey respondents most commonly worked in divisions of surveillance/epidemiology, environmental health, occupational health, and health promotion/chronic disease prevention. The WHP survey respondents most commonly worked in divisions of health promotion/chronic disease prevention, nutrition, physical activity, and family or community health. Overall, respondents in both groups typically held leadership positions (eg, bureau director, division chief), worked in program managerial positions, or worked as the state epidemiologist or other epidemiologist (OSH only).[5]

As intended by quota sampling, WHP interview respondents were from SHDs with either broad (seven SHDs) or narrow range/no (six SHDs) WHP activities; OSH interview respondents were from SHDs with either broad (six SHDs) or narrow range/no (eight SHDs) OSH activities. Although this was not a goal of our quotas, in six states we were able to interview both the OSH and WHP respondent for that state.

Familiarity With TWH

In general, OSH respondents were more familiar with the TWH initiative than were WHP respondents. Almost half (46% [n = 17]) of the OSH respondents said that they were very or extremely familiar with TWH. In comparison, only 15% (n = 6) of the WHP respondents said the same (Table 1).

We asked respondents about their use and awareness of a variety of TWH resources. The most commonly used TWH resources were the TWH webinar series, with 27% (n = 10) of OSH and 16% (n = 6) of WHP respondents saying they had used this resource, and the TWH in Action! eNewsletter, with 22% (n = 8) of OSH and 11% (n = 4) of WHP respondents saying they had used this resource. The majority of other TWH resources had been used by less than 5% of respondents (see Table, Supplemental Digital Content 1, http://links.lww.com/JOM/B184, for complete data on use of TWH resources).

Level of Collaboration Between OSH and WHP

Fifty-seven percent (21) of OSH respondents said that they collaborated with WHP staff, and 64% (n = 25) of WHP respondents said that they collaborated with OSH staff on workplace safety and/or health promotion activities. Among respondents who collaborated, the level of collaboration reported was predominantly moderate (OSH: 48% [n = 10]; WHP: 40% [n = 10]) or very low/low (OSH: 38% [n = 8]; WHP: 56% [n = 14]). Few reported a high/very high level of collaboration (OSH: 14% [n = 3]; WHP: 4% [n = 1]). The majority of both OSH (62% [n = 23]) and WHP (62% [n = 24]) respondents reported that they knew some or a moderate amount about their SHD's activities in the other worksite specialty.

Types of OSH-WHP Collaborations

During interviews, 21 respondents described their OSH-WHP collaborations in depth. The research team characterized the collaborations into four types (Table 1): data sharing, data-to-intervention, consultation, and network collaborations. For data sharing collaborations, respondents participated in collaborations where OSH and WHP staff together created data collection instruments that contained both OSH and WHP indicators. In data-to-intervention collaborations, respondents described a collaboration where one partner took primary responsibility for identifying the workplace health and safety issue (working on survey design/methodology, data analysis, and surveillance), whereas the other took responsibility for intervening to address it (doing direct outreach/education/providing technical assistance with employers). Consultation collaborations involved one partner taking the lead on development and implementation of the intervention and consulting with their OSH/WHP counterpart to benefit from their knowledge, feedback, effort, training, and/or resources. Both OSH and WHP approaches were applied in a single intervention in this type of collaboration. In network collaborations, OSH and WHP partners were connected to one another by either establishing or participating in a committee where relationships exist over time, attended regular meetings, and may or may not have had an active project. Networks could generate other, more project-focused types of collaborations. State health departments could have more than one type of collaboration ongoing. Data-to-intervention and network collaborations were slightly more commonly reported than the other two types.

Attitudes Toward OSH-WHP Collaboration

Ease of Collaboration

Perceptions that OSH-WHP collaboration was "easy" varied based on whether a respondent reported collaborating. Among OSH respondents who reported collaborating, 57% (n = 12) agreed that collaboration was easy, whereas among those who did not collaborate, there were none who agreed that it would be easy. Forty-four percent (11) of WHP respondents who reported collaborating agreed that collaboration was easy, whereas only 28% (n = 4) of those who did not collaborate thought that it would be easy.

Helpfulness in Achieving Aims

The OSH respondents who reported collaborating were more likely than those who did not collaborate to view OSH-WHP collaborations as helpful. Eighty-six percent (18) of OSH respondents who reported collaborating agreed that it helped their department achieve its aims for workplace safety and health promotion, whereas only 33% (n = 5) of OSH respondents who did not collaborate agreed. In comparison, the majority of WHP respondents agreed that collaboration was helpful to achieving aims for workplace safety and health promotion, irrespective of whether they reported collaborating (56% [n = 14] agreed) or not (64% [n = 9] agreed).

Motivations for Collaborating

Both OSH and WHP respondents reported a variety of different motivations for engaging in OSH-WHP collaborations (see Table 2 for select quotes). Some wanted to collaborate to simultaneously target chronic disease and occupational risk to prevent negative outcomes in one from leading to negative outcomes in the other. Others believed that collaboration was important for engaging low-wage workers, as these workers face both high occupational risk and chronic disease burdens. Other respondents thought that the SHD should "lead by example" and model the new TWH initiative for employers in their state. Still others thought that treating "the whole worker" in a holistic approach (instead of independently focusing on health behaviors or workplace exposures) was important. The idea of reducing "silos" in the health department, either to stimulate more innovative interdisciplinary approaches or to help colleagues learn how important work is as a social determinant of health, was another motivation. Benefitting from colleagues' different skill sets was another. Some respondents were influenced by action at the federal level; either they were aware that CDC was promoting the TWH initiative and wanted to keep up-to-date with CDCs' latest recommendations, or they started collaborating as a result of NIOSH's push to have states include industry and occupational indicators in Behavioral Risk Factor Surveillance System. Other respondents mentioned that the

TABLE 1. Familiarity With and Engagement in TWH Approaches

	OSH (n = 37)	WHP (n = 39)
Familiarity with NIOSH's TWH initiative		
Very extremely familiar	46% (n = 17)	15% (n = 6)
Slightly to moderately familiar	38% (n = 14)	31% (n = 12)
Not familiar at all	16% (n = 6)	54% (n = 21)
Knowledge of OSH or WHP counterpart's activities		
Substantial knowledge to extremely knowledgeable	24% (n = 9)	18% (n = 7)
Some to moderate knowledge	62% (n = 23)	62% (n = 24)
Know nothing	14% (n = 5)	21% (n = 8)
Collaborate with OSH or WHP counterpart in SHD		
	57% (n = 21)	64% (n = 25)
Types of OSH-WHP collaboration, with examples		
Data sharing	"They [WHP] conduct a worksite wellness survey every couple of years… it's a survey of businesses and worksites in the state to assess their prevalence of wellness and health policies and practices. We worked with them to integrate and add a section about asking a couple of questions about worker health and safety. For example, whether the employer or worksite provides a worksite safety committee? And, whether they have policies related to seatbelt use, and so forth. So we've worked on them to collaborate and add certain questions to that survey, and help them analyze that. And we've also used that survey, and their data for example, the worksite wellness data in our activities in presentations." (R1)	
Data-to-intervention	"…we do have an Office of Health Promotion and Health Equity. They have an injury prevention program. So, the program education piece is through this office. You know, our office… we do not have staff or funding to do the outreach… they have the program people, but they do not have data people… So maybe the two programs may not be exactly identical, but we can somehow work together. One of the things is related to heat related injury. It is one of the indicators that our occupational surveillance requires. During the summer in [state], it is a very hot area, so we'll be able to generate something for them to distribute to potential partners." (R2)	
	"…when we were first developing the questions for the Worksite Wellness Survey, we contacted different programs within the Chronic Disease and Health Promotion Section to see if there were any questions that they would be interested in adding to this survey… then before implementing the survey, we had the idea, what if employers who completed the survey, if they were interested in having follow back or technical assistance for developing their own policy at the worksite. And our health promotion staff, they thought it was a great idea, so as part of this survey, those employers who would like to be contacted for help developing a policy such as a smoking policy, for example, or if they want assistance on how to train their staff on CPR, first aid, we will provide that employer's contact information to the appropriate health promotion staff, and they'll get that follow back." (R3)	
Consultation	"…right now [we] have a… worksite health promotion program specifically looking at individual level interventions, like awareness education and behavioral change programs. And we are working with occu pational safety and health to integrate more of the occupational safety and health components into this program, particularly because we wanna create more of a comprehensive initiative… And [they're] helping us make decisions on who we want to target, right? If we want to be specific industries or specific employers with certain characteristics or occupations." (R4)	
	"This idea of a resource inventory had been discussed and one of the early adopters of that was a staff member in the occupational health and safety at the division of public health…she reviewed all of the questions in that section of the CDC ScoreCard and identified resources she felt as best for providing information and support for anyone who is trying to answer or respond to that particular question." (R5)	
Network	"…So we worked with that small group…and then the person at the Injury Prevention Center and myself worked on a call to action document to promote this new initiative in [state]… we started having monthly phone calls. And so, really you could say we connected the safety organization and the Department for Public Health and we formed the committee… and then we had regular discussions with people that were interested, and the goal was to eventually build this collaborative where we can find more people from across the state that were interested in advancing *Total Worker Health*." (R6)	

NIOSH, National Institute for Occupational Safety and Health; OSH, occupational safety and health; SHD, state and territorial health department; TWH, *Total Worker Health®*; WHP, workplace health promotion.

growing evidence base behind TWH approaches motivated them to consider collaboration.

Barriers to and Facilitators of OSH-WHP Collaboration

Several barriers to OSH-WHP collaborations emerged during the interviews, including resource insufficiencies, organizational structure in the SHD, and conflicting practices in the two fields. Many respondents reported that inadequate funding was a significant barrier; there was little funding specifically designated for OSH-WHP collaborative projects, and existing OSH and WHP funding streams did not have aligned objectives. Relatedly, respondents also reported having insufficient staff to support this type of collaboration. Some

respondents observed that staff turnover was a barrier to forming lasting interdepartmental relationships. For others, physical and/or organizational distance between OSH and WHP programs prevented communication and collaboration. Others perceived that there was a long-standing tendency of public health professionals to work in silos that was difficult to overcome. Bureaucracy and the slow nature of state work (eg, challenges of coordinating state-level organizations; inertia in starting new projects) prevented projects from getting off the ground when there was interest in collaborating. Respondents also felt there was a lack of resources showcasing best practices for collaboration between OSH and WHP. During collaboration, conflicting approaches to employer engagement (using regulations + compliance checks vs using incentives to encourage employers to adopt safety/

TABLE 2. Select Examples of Respondents' Motivations for Engaging in OSH-WHP Collaboration

"…hypertension, diabetes and other chronic diseases are serious public health concerns in and of themselves, but there is obviously also the evidence that these chronic conditions may increase risks for workplace injury and wellness, so to the extent that you can improve people's lives both by working on chronic diseases and by improving the conditions under which they are working, that's a win-win." (R7)

"…we also want to engage more low wage workers and at-risk populations, and we know that for particular groups, you know, injury and safety is one of their top priorities in addition to the worksite health promotion piece." (R4)

"…we can't work in silos ourselves and then ask employers to not do that in their programs…" (R6)

"Trying to find ways to integrate approaches across the division, finding out where people are already doing work that's aligned with this and seeing if we can enhance that in some way that doesn't overtax them in fulfilling their mission, but would allow them to do an innovative approach to stimulate different thinking." (R8)

"I don't think occupational health should be practiced in any way, shape or form in a silo. It's part of public health, and I think a lot of people think that it belongs to OSHA or it belongs to business and industry, that's there no role for the health department… Work is a social determinant of health. You know we spend at least 8 hours a day at work every day and what we do can affect and impact our health outcomes." (R9)

"…[collaboration] makes use of the data. I mean analyzing data and producing reports sometimes doesn't feel like we're making a real impact to me. So you know when we collaborate with others that can actually go and do stuff directly, it makes it feel like we're making a difference." (R3)

OSH, occupational safety and health; OSHA, Occupational Safety and Health Administration; WHP, workplace health promotion.

wellness practices) also could slow the process of getting both parties to support an intervention strategy.

Several factors were identified that facilitated OSH-WHP collaborations. Knowing about the TWH program encouraged respondents to consider collaboration. Proximity to the NIOSH-funded TWH Centers of Excellence (COEs) was also a facilitator, as COE staff provided guidance on initiating TWH projects, educated OSH/WHP staff about key concepts in the collaborator's field as well as on TWH, offered pilot project funding, and/or helped SHDs publish TWH-related findings. Physical and/or organizational proximity between OSH and WHP programs allowed for staff to be aware of one another's activities and thus identify opportunities for collaboration. Finally, leadership initiative (leadership that brings OSH and WHP staff together in meetings, dedicates time to act as a liaison between programs, or specifically requests that staff consider a TWH approach) was mentioned by multiple respondents as the factor that sparked collaboration.

See Table 3 for selected examples of OSH-WHP collaboration barriers and facilitators.

DISCUSSION

Over the past 17 years, NIOSH's TWH initiative has clarified a research agenda,[11] grown a network of 10 COEs,[16] and developed an affiliate network with more than 50 members nationally.[7] Recent reviews have found that integrated TWH interventions improve health behaviors,[17] reduce risk factors for work-related injury,[18] and improve health outcomes.[19] Yet, little is known about how the public health infrastructure, particularly state health departments (SHDs), is prepared to engage in TWH interventions. The purpose of this study was to document the extent to which SHDs were aware of and engaged in TWH approaches and then identify factors that facilitate or present challenges to OSH-WHP collaborations within SHDs.

Results indicate that many SHD respondents were not familiar with the TWH initiative, and lack of awareness was higher for WHP (vs OSH) respondents. There are several reasons why this might be true. First, the TWH field is still emerging, and thus SHD awareness may be relatively low. Case examples of what TWH practices could look like in the SHD setting have not been published to date, as the field has not been established long enough to generate targeted resources for all potential implementing partners (such as SHDs). Second, because the TWH initiative has historically been directed by NIOSH, and funding for WHP primarily comes from branches of the CDC other than NIOSH (eg, the National Center for Chronic Disease Prevention and Health Promotion), it makes sense that fewer WHP respondents (than OSH respondents) would be aware of the TWH program. Low awareness and use of TWH resources such as

the NIOSH TWH in Action! eNewsletter may also be due to the limited number of organizations, such as TWH COEs, actively disseminating TWH resources. However, increasing training and education opportunities can make an impact. The TWH COEs already provide training and education through their Outreach Cores, including webinars, trainings, and print/digital materials. Since the time of our survey and interviews, NIOSH has funded four new COEs, moving from 6 to 10, expanding national capacity for TWH training and education. In addition, TWH certificate and graduate programs are being offered by several universities. Expanding beyond the academic sphere, relevant professional associations such as ASTHO and SOPHE can host TWH workshops at annual meetings; they can also disseminate TWH educational materials. In 2020, NIOSH and partners published a seminal article identifying a proposed set of TWH core competencies that standardize the skills public health professionals will need to understand, implement, and evaluate TWH best practices.[20] This article, along with NIOSH's National TWH Research Agenda[11] goals around capacity building (eg, Intermediate Goal 4.1), emphasizes the priority NIOSH places on building TWH capacity through training and provides guidance on how to shape these trainings.

Despite low levels of awareness, more than half of SHD respondents reported that their SHD engaged in OSH-WHP collaborations, and respondents' attitudes toward these collaborations were generally positive. This was somewhat surprising and heartening at the same time. Continuing to learn about the type of collaborations and showcasing effective examples should be a primary point of emphasis for NIOSH. The CDC has previously highlighted tobacco control activities as a Web site feature that proved quite helpful as a catalyst for networking and sharing best practices. State health department representatives could similarly build a database of effective TWH interventions for each SHD to showcase their relevant work. Respondents are eager to hear about TWH activities from other SHDs and what has worked most effectively. This could serve to increase the number and type of activities, as well as promote information sharing on a national basis.

The SHD respondents identified other important facilitators of collaborations. For example, we learned that several types of organizational structures might work to foster more OSH and WHP collaborations. Specifically, a small department where everyone knows each other could facilitate working together. In addition, respondents told us that more collaborations took place when OSH and WHP units and personnel were both located in the same physical space or as part of the same functional unit. Another facilitator of OSH-WHP TWH collaborations was being in close proximity to a TWH COE, in part because of their ability to educate SHD staff about key concepts in TWH. In addition to providing training, COEs also support pilot project funding and thus could engage SHDs in new TWH research. We also learned that collaborations were more likely to

TABLE 3. Selected Examples of Barriers to and Facilitators of OSH-WHP Collaboration

Barriers	
Inadequate funding	"Yeah, so I have to say that [collaboration] has been one of our more challenging activities because the wellness folks have been focused really exclusively on issues related to chronic disease prevention, and we have… tried to figure out where there are mutual areas of interest, such as asthma, and that would be one area where they understand that it's not inconsistent with their funding mandate and it's certainly consistent with ours. But I would say that in part due to what our funding guidance and objectives on the part of the funders it has been not easy necessarily to get projects off the ground with the wellness folks." (R7)
Insufficient staff	"…we'd like to help them more, but… we only have one FTE working on occupational health here at the state and so, a lot of my activities, a lot of my time is stretched thin and… I wasn't able to devote a lot of time to it. It was just kind of extra on the side help." (R1)
Lack of resources describing best practices for collaboration	"…if there were more examples put out there about what that collaboration looks like. I think people wanna collaborate, but sometimes they don't have a picture of what that would look like, or could look like, in practice…" (R10)
Conflicting approaches to employer engagement	"there's some interesting issues… occupational health is mandated, right? …They have to have health and safety committees in construction, let's say… and so, when we thought about giving incentives to employers for implementing programs, mainly tax credits, there's this weird thing where you don't want to be rewarding employers for doing things they're already mandated by law to do." (R11)
Facilitators	
Proximity to TWH COEs	"…I think's a challenge for traditional occupational health people to have the vocabulary and information they need to interface with the worksite wellness people, and probably vice versa from their perspective… part of the *Total Worker Health* grant [university]… one of their funded activities… is to…provide some materials, giving us some good crib sheets on for example…how shift work effects health, how work overload effects health…" (R11)
Physical proximity/ organizational integration and leadership initiative	"Two or three years ago… the occupational health surveillance program joined the bureau of community health and prevention, where the worksite health promotion work sits, and that was a very intentional decision on the part of the bureau director. And I think, I mean it's interesting how just literally being organized that way increases collaboration, increases awareness of what each program is working on and increases opportunities to really work together." (R4)

OSH, occupational safety and health; TWH COE, National Institute for Occupational Safety and Health Center of Excellence for *Total Worker Health*®; WHP, workplace health promotion.

occur with new SHD leadership of TWH initiatives and/or when key leaders possessed in-depth knowledge of TWH.

Even though some collaborations are taking place, and important facilitators of these collaborations were identified, respondents revealed several critical barriers to OSH-WHP collaborations. Specifically, the key barriers most often mentioned were having insufficient resources, "siloed" SHD organizational structures that limit contact between OSH and WHP staff, and an unmet need to see examples of TWH programming carried out by SHDs.

Insufficient funding is a barrier to the initiation, growth, and sustainability of many programs. No interview respondents reported having funding available specifically for TWH projects. This lack of dedicated TWH funding existed against a background of limited funding for OSH and WHP activities overall.[5] As a result, many respondents said their SHDs were unable to support staff to initiate or coordinate TWH collaborations. Respondents also commented that existing OSH and WHP funding streams had such different objectives that they struggled to find areas where they could align goals that would yield fruitful TWH collaborations. This comment is supported by comparing the objectives of the State OHS Surveillance Program[8] and the State Public Health Actions 1305 and 1422.[9,10] For example, none of the 22 occupational health indicators that SHDs were funded to analyze in 2016 through the OHS Surveillance Program covered diabetes, stroke, or other chronic diseases focused on in the 1305 and 1422 funding streams. This lack of alignment remains a problem in 2022, with the exception that influenza vaccination coverage among health care workers, a potential target of WHP initiatives, is now being tracked as an occupational health indicator.[21] To further complicate the situation, the State Public Health Actions that were funding WHP work at the time of this study are now discontinued. Recently collected data show that state and local health department representatives perceive that current funding mechanisms have little focus on WHP and provide little support for health promotion projects in workplaces.[22] It would be extremely helpful if CDC leaders could create budget and funding language that serves as a catalyst for TWH projects so that SHDs that desire to move in that direction are able and incentivized to do so. The existing

cases of OSH-WHP collaboration, even in the absence of integrated funding, show that SHDs are interested in breaking down these silos, and these successes should be capitalized on.

As mentioned previously, interview respondents noted that they needed to see specific examples of how TWH approaches might be applied in the unique SHD setting. State health departments have specific public health responsibilities, and this influenced the types of collaborative activities that they tended to undertake. For example, two of the primary ways that respondents reported collaborating involved surveillance activities: "data sharing" collaborations, where WHP and OSH teams cocreated data collection tools that could be used for TWH surveillance; and "data-to-intervention" collaborations, where one partner conducted surveillance and the other intervened based on findings. State health departments are central to national surveillance programs (eg, occupational health indicators, Behavioral Risk Factor Surveillance System), and TWH surveillance work is critically important and directly supports NIOSH's National TWH Research Agenda[11] objectives (see, eg, Activity/Output goal 1.1.1). However, respondents felt that there was a shortage of resources or best practices for how TWH surveillance could best be accomplished. This highlights an opportunity for the CDC and extramural partners to develop resources (roundtables, trainings, materials) that provide guidance on the types of surveillance projects that would support TWH collaborations and capacity building. Other TWH activities that SHDs are well-positioned to start include training local businesses on how to integrate OSH and WHP functions and adopt the TWH approach and educating the public about TWH services at relevant community health events (eg, advertising relevant occupational health, safety and well-being services available to the public during a community flu vaccine clinic). State health departments would be better positioned to engage in these activities if CDC-NIOSH provided them with relevant training and resources, with a focus on case studies.

In addition to the strategies discussed thus far, another potential way to build TWH capacity among SHDs is to encourage more SHDs to join the TWH affiliate network. Affiliates work to increase the visibility and practice of TWH and to attract new researchers and

partners to TWH.[7] As of 2022, more than 50 organizations—universities, workers' compensation organizations, labor groups, trade associations, health systems, and others—are TWH affiliates. State health departments are not yet represented among these participants. State health departments who become affiliate members would gain access to a network of peers who share the case studies and practical lessons learned they seek.

The majority of both OSH and WHP respondents in our study said that they collaborate with one another. By addressing some of their identified barriers, there are excellent opportunities for increasing TWH collaborations. State health department representatives we spoke with are motivated to collaborate, and most reported that they thought collaboration would help their departments achieve their aims for workplace safety and health promotion. Respondents' motivations for collaboration included an interest in dismantling silos in public health, a desire to stimulate innovation through interdisciplinarity, and a view that low-wage workers' needs should be addressed in a holistic fashion. These motivations serve as a jumping-off point for increasing public health practitioners' interest in TWH, informing the development of TWH workforce training opportunities, and sharing resources/information about TWH available from CDC/NIOSH, COEs, and affiliates.

This is the first national study to characterize the collaborative efforts between OSH and WHP programs in SHDs. These results are used to suggest ways to improve the types of training, financial support, and mentorship needed to grow the TWH movement among SHDs. Strengths of this study are that all study instruments were developed by a team of researchers from the Workplace Health Research Network (a CDC-funded research group with extensive experience in workplace safety and health research and practice)[23] with input from state and county health department practitioners. The survey had more than a 70% response rate from both OSH and WHP respondents. In-depth follow-up interviews allowed the team to provide rich descriptions of the collaborative activities in SHDs, and a rigorous, iterative qualitative analysis strengthened and enhanced our understanding of the survey results.

Several study limitations are noteworthy. Our sampling method sought to identify individuals in the SHD who were "most knowledgeable" about the WHP or OSH activities being performed by the department. However, despite several checks with key professional groups/organizations, we cannot be certain respondents were the most appropriate contact at their department. Nevertheless, we checked our OSH respondent list against the key contact list for the Council of State and Territorial Epidemiologists and were encouraged that only three of our OSH respondents did not match the Surveillance Subcommittee point-of-contacts list. Our qualitative component included information from only 21 SHDs, so we cannot be certain that they were fully representative of all states. Yet, we did specifically recruit SHDs that varied by level of OSH and WHP activity to help ensure we did not have a biased sample of only high-performing states in the interview data. Finally, our data were collected before the onset of the COVID-19 pandemic, and it is unknown how many of the collaborations described here are still ongoing. We believe our study strengths far outweigh these limitations.

With the COVID pandemic, our public health infrastructure has been under siege. State health departments remain on the frontline for maintaining and/or improving the health of whole populations, as well as working adults. Now more than ever, the TWH approach is being embraced because it considers the safety and health of workers and workplaces using a more holistic, interdisciplinary lens. Increasing the knowledge, awareness, and use of available TWH resources among SHD staff should help increase collaborations on TWH projects and build TWH capacity among SHDs to meet the present and future needs of worker health and well-being. As training, education, and outreach opportunities increase, periodic reassessments of SHD activities such as this national mixed-methods study can help identify barriers and facilitators to focus future CDC/NIOSH funding and information sharing on best practices and build the TWH workforce capacity.

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