National Institutes of Health Pathways to Prevention Workshop: Integrated Interventions for Improving Total Worker Health®

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Introduction

Nearly a half century ago (December 1970), the Occupational Safety and Health Act was signed into law to assure safe and healthful working conditions for men and women in the United States. In the years since 1970, we have seen a number of changes, including the distribution of workforce across various sectors, an aging and more diverse workforce, and progressively porous boundaries between work and home. An increasing segment of the population works part-time, many hold multiple jobs, and workers are employed on contract rather than as employees at their workplace. In 2014, 4,679 workers were killed on the job, and private industry reported nearly 3 million work-related nonfatal injuries and illnesses, underscoring the continued need for vigilant workplace safety, including protection from exposures to chemical, physical, and biological hazards.

With regard to worker health, there is increasing acknowledgment that the relationship between work and health is not unidirectional: work impacts health and health impacts work. Observational studies demonstrate that the average cost of workers' compensation for injury increases substantially for employees with comorbid conditions. Other analyses show an association between workers with chronic health conditions or high stress levels and a higher likelihood of experiencing a safety incident or injury on the job. Ensuring the safety, health, and well-being of workers may benefit from taking a broad view of the potential role of the workplace—not only in reducing work-related deaths, injuries, and illnesses,
but also in preventing and managing comorbid conditions that reduce workplace productivity as well as life expectancy.

The Total Worker Health® (TWH) concept—defined by the National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control and Prevention (CDC) 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”—encompasses this perspective. The TWH concept catalyzes the integration of previously “siloed” research and programmatic efforts in occupational safety and health and worksite health promotion, including studies that focus on developing and evaluating worksite initiatives that unite the two approaches. Expanding the focus of occupational health research to this broader agenda and applying a public health perspective that looks at contextual (e.g., organizational, environmental), as well as individual determinants of health risk, offer opportunities to develop a robust, evidence-based approach toward improving workplace health and well-being.

On December 9–10, 2015, the National Institutes of Health (NIH) convened a Pathways to Prevention Workshop: Total Worker Health—What’s Work Got to Do With It? The purpose of the workshop was twofold: (1) to ascertain the scientific evidence related to integrating worksite health promotion with occupational safety and health protection, including factors that influence the effectiveness of an integrated approach (e.g., what works and for whom) and (2) to develop
recommendations for future research to better understand the effectiveness of integrated interventions. An independent panel considered a commissioned systematic evidence review of the published research in integrated interventions, prepared by the RTI International-University of North Carolina Evidence-based Practice Center, along with opinions presented by a group of experts and workshop participants during the public meeting. The evidence synthesis and public workshop agenda focused on a set of key questions:

- What studies exist assessing integrated interventions?
- What are the known benefits and harms of integrated interventions?
- What are the characteristics of effective integrated interventions and programs?
- What factors influence the effectiveness of integrated interventions?

The panel weighed the evidence and developed a set of conclusions and recommendations for future intervention research. This report summarizes the panel’s main findings and recommendations.
The Current State of the Science in Integrated Interventions

What studies exist assessing integrated interventions? The current state of the literature on integrated interventions is somewhat sparse, and the effectiveness of this type of intervention is unclear. A comprehensive review revealed only 24 studies going back to 1990, the majority of which were conducted prior to NIOSH framing the Total Worker Health model in 2011. The studies examined varying worksites (e.g., manufacturing, health care, social service), contexts (e.g., small versus large businesses), business sectors (e.g., health care) and populations (blue collar versus white collar) across health outcomes (e.g., physical activity, worksite injury, diet, smoking). The content, approach to implementing, and outcomes of interventions also are inconsistent across studies.

What are the known benefits and harms of integrated interventions? Of the 24 identified studies, 15 met methodological inclusion criteria and assessed intermediate and health outcomes. Nine of these investigated health and safety outcomes, while eleven addressed intermediate health outcomes assumed to have a long-term health benefit. Health and safety outcomes considered for the evidence review included workplace safety, quality of life, physical and psychological well-being, self-rated health, health complaints, and stress. The intermediate outcomes included tobacco cessation, decreased use of alcohol and other drugs, body mass index, body weight, blood pressure level, cholesterol level, physical activity, healthy eating behavior, hazardous work exposures, and near-miss hazard events. The panel considered two-thirds of
the studies to have a high risk of bias, using standardized criteria appropriate
to the study design. No studies in this review were assessed to have a low risk
of bias. The outcomes with evidence showing a medium risk of bias included
quality of life, stress, self-rated health, smoking cessation, healthy eating, and
physical activity. Other reported outcomes were derived from studies with a
high risk of bias. Overall, the strength of the body of evidence regarding all
health and intermediate outcomes was low, meaning that the reviewers had
low confidence that the evidence reflected the true effect. For outcomes other
than health, no studies in the review addressed health care utilization
outcomes (e.g., primary care visits, delay in seeking needed health care,
hospitalization, emergency department visits) or potential harms of
interventions (e.g., adverse effects on work or family life, violation of privacy).

*What are the characteristics of effective integrated/combined interventions and
programs?* With few effective integrated interventions identified, it is challenging to
describe their key characteristics. Even among the few studies that demonstrated
benefits, information on intervention development, implementation, and outcomes
was limited. Thus, the feasibility, quality, effectiveness, and scalability (ability to
implement interventions in various size work settings) of interventions were difficult
to assess. Highlighted in the few reports of scalability was the common feature that
workers participated in the planning, design, development, or implementation of
the intervention. The potentially effective interventions were multicomponent,
complex, and well disseminated.
What factors influence the effectiveness of integrated interventions? Given the variety of contexts in which TWH can be implemented and studied—with variation in factors including employers, work environments, and worker populations—understanding factors that influence the effectiveness of integrated interventions is important. Although a small number of studies reported on contextual factors (e.g., union membership, health insurance, co-occurring worksite safety interventions), no study included a formal analysis of possible variation in intervention effectiveness according to contextual (e.g., individual, worksite, organizational, community) factors. Thus, there is currently no evidence on factors that influence intervention effectiveness and scalability.
Future Directions and Recommendations

Most existing integrated intervention studies were conducted prior to 2011, when NIOSH formally articulated the Total Worker Health construct. In essence, these studies were “retrofitted” to the TWH model to inform questions regarding intervention effectiveness. Hence, it is not surprising to find a limited evidence base and a lack of peer-reviewed empirical studies showing the effectiveness of integrated interventions beyond a small number of studies of medium rigor that show effects on a few behavioral risk factors (e.g., smoking cessation, consumption of fruits and vegetables, physical activity participation). The current state of the science offers insufficient evidence to determine the overall harms or benefits of integrated interventions. In the absence of evidence for benefits, it is not possible to describe the characteristics of effective integrated interventions or contextual factors that influence effectiveness.

Although some may find the paucity of evidence related to integrated interventions discouraging, the field of TWH is young and growing. The presentations, comments, and questions at the workshop demonstrated the passion, commitment, and engagement of researchers, businesses, labor representatives, and federal agencies alike. The collective goal was to ensure that future evidence-based approaches would optimize the safety and health of workers in the United States. There was clear consensus that application of the TWH framework to integrated interventions requires research that extends beyond the lens of individual-level behavioral risk factor reduction. Several experts called for studies to optimize the
working conditions and the work environment (e.g., psychosocial stressors, job demands, family-work balance) to reduce health risks and promote well-being.

This is an opportune time for policymakers and funders to shape the field by setting research priorities and agendas. The panel was struck by the similarity among the research needs across the four guiding questions. To accelerate the progress of interventions for TWH, we recommend the following overarching research strategies:

1. **Convene a meeting of stakeholders to set research priorities for integrated interventions.** NIH and CDC—along with other interested funders and stakeholders (e.g., private-sector organizations, foundations)—should engage key stakeholders to identify and prioritize research needs. As part of the strategic planning process to support integrated interventions, a consensus is needed on high-priority research, development, and evaluation efforts. For a national research program to advance what is known about integrated interventions, it is essential to identify priority research studies and topic areas as a starting point. Such priorities will focus resources and attract interventionists, researchers, worker advocates, and business leaders into collaborating around common research goals. The priorities are intended to define the most urgent research studies needed to determine effective strategies in worker health and safety improvement and to intensify research efforts. Prior to convening stakeholders, there is a need to define consistent terminology, to achieve
consensus on the intended purpose for engagement, and to identify
stakeholder groups explicitly. A number of methods exist for engaging
stakeholders for research prioritization, including mixed-methods
approaches, in-person venues, and electronic and web-based
communication approaches.

2. Develop a consensus-based conceptual framework to guide future
    intervention research. Discussion at the workshop identified a lack of
theoretical or conceptual models for the effects of proposed TWH
interventions as a major limitation. A presentation of one literature review
noted that only about half of the articles incorporated a theoretical model
and rationale. Proposed studies should include robust and validated
conceptual frameworks. A comprehensive framework would address
multiple levels of influence on worker safety and well-being, different
avenues for intervention from policy to individual levels, and a clear set of
meaningful TWH outcomes. A common, multilevel framework will provide
an organizing resource that can facilitate consistency in constructs and
measures, help to prioritize research questions, guide study design, and
facilitate replication as well as aggregation of research findings. The panel
notes that the presenters shared several conceptual frameworks that could
serve as starting points in a consensus meeting.
3. **Develop a core set of measures and outcomes that are incorporated into all integrated intervention studies.** Building from a common conceptual framework, the core set of measures for exposures and outcomes needs to reflect the priorities of stakeholders. Common measures are needed to determine baseline, intermediate, and long-term impacts across studies. This includes using valid and reliable measures of intermediate factors, such as high blood pressure, high cholesterol, and risk behaviors such as tobacco use, unhealthy eating, and health outcomes. Outcome measures should be harmonized where possible and limited within domains. This will promote less heterogeneity in future systematic reviews and provide opportunities to pool findings in meta-analyses.

Defining important contextual factors for the field of TWH is a critical element for research planning and execution. Precedent exists for consensus-building by professional disciplines to define key contextual factors in specific domains. The evidence review and workshop highlighted several important domains, including the policy environment, worker populations, worksite characteristics, employer characteristics, financial context, health care access, and community and neighborhood contexts.

4. **Use a transdisciplinary and participatory process for intervention development.** Involving a range of disciplinary experts and TWH stakeholders in the process of intervention development is a critical
component of what is called “designing for dissemination.” Key characteristics of interventions should consider community participation, buy-in, and trust (from workers, employers, human resources, and other stakeholders). Given the interests in improving worker health in both the public and private sectors, public-private partnerships could lead to more effective implementation. A participatory process can help ensure the development of interventions that reduce rather than enhance existing health and safety inequities. Formative work such as focus groups and intervention mapping can guide the participatory process. Transdisciplinary research teams can contribute to a broader range of robust and rigorous approaches to intervention evaluation. Engaging a transdisciplinary team at the start of the intervention design process will facilitate greater alignment between intervention design and evaluation.

5. **Ensure that future intervention studies represent an appropriate range of worker populations and settings.** Given the heterogeneity of worksites, the future TWH research portfolio should comprise a reasonably representative cross-section of worker populations. Factors such as baseline risk of occupational exposures or incidence of relevant outcomes may guide the selection of populations. Additional considerations could be the selection of populations based on prospective risk using modeling (e.g., cardiovascular risk scores) or composite risk scores for both lifestyle and occupational safety. Health equity also should drive decisions regarding population selection. Studies should include diverse populations.
that reflect not only those at greatest risk of adverse outcomes, but also those at risk on the basis of income, education, race, ethnicity, rurality, and social disadvantage.

Worksites and worker population composition often are highly correlated, but separate consideration should be given to features of worksites. Small businesses are severely underrepresented in the TWH literature and should be included in future research studies. Worksites also can be highly centralized or decentralized or involve mobile workers; the effectiveness of TWH should be tested in each of these settings. Individual industry type (e.g., manufacturing, construction, service) may be tied to a diverse set of risk exposures and potential outcomes. Ultimately, the selection of a combination of worksites and the worker populations in those worksites should yield information regarding a diverse set of exposures and outcomes.

6. Expand research and evaluation design options to include a range of rigorous methodologies. Use of rigorous research and evaluation methodology is critical to establishing the harms and benefits of integrated interventions. In the existing literature, study design has been a stumbling block in the assessment of integrated interventions. Conducting rigorous research to evaluate integrated interventions is challenging for a variety of reasons, including the complexity of the interventions, the inability to randomize many of the factors that may affect outcomes, the inability to "blind" participants to study groups, the variety of relevant contextual factors,
the challenges in identifying suitable control groups, and the lengthy follow-up time necessary to observe changes in important outcomes. In this setting, randomized controlled trials will not always be feasible.

The panel recommends considering a wide range of options for conducting rigorous assessment of the effectiveness of integrated interventions that go beyond traditional randomized controlled trials. Researchers should explore novel data linkages to facilitate formative research using existing administrative and survey data. As employers initiate new interventions for health promotion and occupational safety and health, these programs may offer opportunities for conducting quasi-experimental studies using a variety of rigorous analytic techniques.

The growing literature on pragmatic trials also provides ideas for innovative research designs, including novel cluster-randomized trial designs, which may be beneficial in the study of integrated interventions. When possible, future studies also should use factorial designs that allow for explicit evaluation of the added benefit of integration above and beyond the benefit of the individual health promotion and occupation safety and health components of the intervention.

7. **Develop effective strategies for timely dissemination of findings to a wide variety of stakeholders.** Research on how new information informs
policy and practice shows that, to be effective, dissemination of new knowledge must be active and thought out in advance. Findings from integrated interventions in TWH should maximize the use of the knowledge generated by research among various stakeholders, including the research, business, and policy communities. Dissemination and implementation research is increasingly recognized as an important function of community intervention research and is a growing priority of funders. In fact, dissemination and implementation research is linked to one of the goals included in the strategic plan of the U.S. Department of Health and Human Services, which is to identify key factors influencing the scaling up of research-based evidence across large networks of service systems, such as businesses, primary care, social services, and community organizations.

There is also a growing interest in how to better link researchers and policymakers to improve the evidence base for worker health and safety policy. Given the growing importance of translating research into practice and policy, as well as research that results in improved population health (T4 translational research), dissemination should include well-developed knowledge transfer and diffusion strategies beyond the traditional passive ways of sharing lessons learned (e.g., peer-reviewed scientific publications, conference presentations). TWH research should identify additional innovative and effective ways of amplifying reach to various stakeholders.
relevant to improving worker health and safety as well as the scalability and translation of integrated interventions.

8. Make investments in research infrastructure and assets to develop population-based laboratories for TWH research.

Given the complexities of designing and implementing research in this area, the panel recommends that foundational investments are needed to enable a quantum jump in the quality and volume of research. Investments should be considered to build population-based “laboratories” that enable longitudinal and experimental trial research with long-term follow-up.

Similar to the Health Care Systems Research Collaboratory funded by NIH—where health systems are linked to provide robust research infrastructure, data, and populations—the TWH field could convene a similar novel network of employers, unions, insurers, health systems, and others to assemble linked administrative datasets for retrospective studies, as well as populations eligible to participate in pragmatic intervention trials and cohort studies. This network, leveraging existing CDC/NIOSH and NIH investments with centers devoted to studying injury and health outcomes, could be uniquely positioned to address salient questions raised in this report.
Conclusion

Based on the evidence review and workshop presentations, the panel could not determine the effectiveness of integrated interventions. Our recommendations plot a course to support continued development of the science of integrated interventions in Total Worker Health. Included in these recommendations is the critical need for investment in infrastructure to support the development of a seminal body of research.

The future of Total Worker Health integrated intervention research builds on a long and rich tradition of workplace intervention research. As noted in the evidence review and at the workshop, existing studies of workplace wellness and occupational safety and health extend beyond the scope of the evidence review.

Although the TWH concept is broad and the research challenges are substantial, the existing research portfolio demonstrates an opportunity to create partnerships among academics, employers, workers, and organized labor to ensure wide stakeholder participation in further developing this important area of inquiry. Moreover, there is a strong bench of highly skilled researchers, passionate and committed representatives of a diverse workforce, and a willingness on the part of the TWH community to acknowledge and engage around difficult questions.

NIH and CDC took an important step toward creating a high-impact research program by convening this workshop and panel. The panel identified eight priority
recommendations relevant to moving the field forward. What remains is the need
to transform these research recommendations into investments and actions.