

Measurement Tools for Integrated Worker Health Protection and Promotion: Lessons Learned From the SafeWell Project

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Objectives: To describe (a) a conceptual approach, (b) measurement tools and data collection processes, (c) characteristics of an integrated feedback report and action plan, and (d) experiences of three companies with an integrated measurement approach to worker safety and health. **Methods:** Three companies implemented measurement tools designed to create an integrated view of health protection and promotion based on organizational- and individual-level assessments. Feedback and recommended actions were presented following assessments at baseline and 1-year follow-up. Measurement processes included group dialogue sessions, walk-through, online surveys, and focus groups. **Results:** The approach and measurement tools generated actionable recommendations and documented changes in the physical (eg, safety hazards) and psychosocial (eg, health and safety culture) work environment between baseline and 1-year follow-up. **Conclusions:** The measurement tools studied were feasible, acceptable, and meaningful to companies in the SafeWell study.

Initiatives to simultaneously protect and promote worker health and safety represent an emerging area of study.¹⁻³ The National Institute for Occupational Safety and Health (NIOSH) evolved its earlier “WorkLife” program and launched the Total Worker Health (TWH) initiative in 2011. Under the TWH initiative, NIOSH provides leadership, research, and practice support for this integrated approach to worker health and safety (<http://www.cdc.gov/niosh/twh>).² In 2013, the Center for Work, Health, and Wellbeing (the Center) at the Harvard T.H. Chan School of Public Health, proposed a definition of an integrated approach to worker safety and health as being “a strategic and operational coordination of policies, programs, and practices designed to simultaneously prevent work-related injuries and illnesses and enhance overall workforce health and well-being.”³ This definition was accompanied by indicators and measures that may be used by researchers, consultants, health and safety vendor organizations, and employers to ascertain the degree of integration at a company. Recently, the validity of this specific tool to measure the degree of safety and

Learning Objectives

- Discuss the rationale for an integrated approach to worker health and safety, along with key steps in the development of this emerging field.
- Summarize the investigators’ conceptual model of metrics for assessing integration of occupational safety and workplace health promotion, including the four quadrants of the model and the six measurement tools evaluated.
- Discuss the findings of the new evaluation of the measurement tools and their impact effects on the physical and psychosocial work environment at the study companies.

health promotion integration was tested in a sample of small and medium sized companies and found to have acceptable psychometric properties.⁴ The integration score was positively associated with measures of occupational health and safety and health promotion supporting its convergent validity and also showed excellent reliability based on a Cronbach α coefficient of 0.94.

However, this emerging field of integrated health and safety at the workplace is in need of metrics and measurement tools to assess performance and outcomes. As part of a consensus-driven and eloquently presented overview and guidance on this topic, Loeppke and colleagues⁵ identified a need for a comprehensive and universally applicable system of metrics that could gauge the effectiveness of integrated approaches to worker health and safety. Efforts known to address this topic are described by Loeppke and colleagues⁵ and include the TWH program at NIOSH, an Institute of Medicine report describing the employee health programs at the National Space and Aeronautics Administration, the Global Healthy Workplaces Model from the World Health Organization, and several of the NIOSH TWH Centers of Excellence including the Center. Whereas the importance of evaluation is noted by all of these efforts, none provides a measurement system designed to do so. Loeppke et al⁵ propose a measurement approach building off the American College of Occupational and Environmental Medicine’s Corporate Health Achievement Award that could translate health and safety metrics into business value and used the Dow Jones Sustainability Index as a model for this work. Furthermore, they provide a roadmap for companies to better align organizational silos and focused on five essential elements including: planning, assessment, implementation, monitoring, and review. The assessment element of the roadmap briefly describes an approach to achieving a better understanding of a company’s current status in terms of health and safety and directs potential users to gather information from sources such as benefits, human resources, risk management, safety, operations management, and finance or payroll. Whereas an integrated health and safety index is outlined, specific tools used to gather various types of assessment data and organize feedback reports that may stimulate action towards improvement were not introduced.

Integrated approaches to occupational safety and health (OSH) and workplace health promotion (WHP) are multi-component and need to address factors that influence practices at multiple levels of the organization (Sorensen G, McLellan D, Dennerlein J, et al. Integrated approaches to protecting and promoting worker safety and health: a conceptual model for intervention and research. in review).¹⁻⁵ Individual-level insights as well as

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organizational perspectives and practices are both relevant to identifying and addressing conditions that relate to worker health and well-being. In addition, integrated approaches to OSH and WHP differ qualitatively from the occurrence of either of these approaches separately, and hence, should be assessed in its own right.^{3,4} When conceptualized in this manner, the need for a systematic and well-coordinated approach to data collection becomes necessary. The *Indicators of Integration*^{3,4} represents an organizational-level assessment tool that needs to be complemented with other tools to generate a multi-level (individual and organizational) view of integrated health and safety.

The SafeWell Practice Guidelines, designed and coordinated by the Center, address approaches to worker safety, health, and well-being that coordinate and integrate efforts to ensure a safe and healthy work organization and environment and promote healthy behaviors. The SafeWell Practice Guidelines are supported by evidence^{6–11} and are downloadable at: http://centerforworkhealth.sph.harvard.edu/sites/default/files/safewell_guidelines/SafeWellPracticeGuidelines_Complete.pdf (Sorensen G, McLellan D, Dennerlein J, et al. Integrated approaches to protecting and promoting worker safety and health: a conceptual model for intervention and research. in review). The project described in this paper (referred to as the “SafeWell Project”) was based on the approach outlined in the SafeWell Practice Guidelines but specifically adapted to fit and align with the implementation processes of the collaborating well-being program vendor. Overarching messages that may be communicated within organizations as relevant to the SafeWell Project include: (a) a vision that supports strategic coordination of organizational policies, programs, and practices designed to prevent work-related injuries and illnesses and enhance workforce health and well-being concurrently, (b) multiple functions within an organization (eg, OSH, WHP, Human Resources, Facilities, Purchasing, etc) impact worker safety, health and well-being, and working together may streamline efforts, (c) the SafeWell approach engages the support of all levels of management, employees, and unions to improve health, safety, and well-being, and (d) addressing worker health comprehensively can have positive health and safety outcomes and improved efficiencies. One of the SafeWell Project’s main aims is to test the feasibility and acceptability of TWH interventions among small-to-medium sized companies (defined as having 750 or fewer employees). Such organizations tend to have fewer resources available to their workforce¹² and practical tools may be of particular importance to companies of this size.¹³

PURPOSE

The main goal of this paper is to expand the current knowledge of measurement tools for integrated approaches to safety and health. Our purpose is to describe (a) a conceptual approach for the measurement of integrated worker safety and health, (b) the measurement tools and the data collection processes used in the SafeWell Project, (c) the characteristics of an integrated feedback report and action plan derived from the assessments, and (d) the experiences of three SafeWell project companies with this integrated measurement approach. This research was designed to address the potential for wider dissemination of a TWH model using the infrastructure of a health and well-being vendor organization. Hence, the primary focus of this paper is related to the feasibility, acceptability, and practical use of the measurement tools, not the impact of the intervention, per se.

METHODS

Three small-to-medium size (less than 750 employees) manufacturing companies were recruited for this study from the customer base of HealthPartners, a not-for-profit, member-governed health system headquartered in Minneapolis, MN. All three companies used the measurement tools described below at baseline and at 1-year follow-up, and received integrated feedback reports at both

assessment periods. The focus of this paper is on the measurement tools and data collection processes as opposed to the year-long intervention components. However, due to the presence of an active intervention, we anticipated changes in the assessment data over the course of the study.

The intervention aimed at overlaying integrated approaches onto an existing health and well-being program at the sites to enhance organizational policies, programs, and practices relevant to worker safety and health, with an emphasis on reducing reported episodes of back pain. Briefly, intervention components operationalized the multi-level and integrated approaches suggested in the SafeWell Practice Guidelines and included consultation and seminars with managers and supervisors on collaborating with one another and with employees on safety and health initiatives, reducing physical hazards at the workplace, and providing their support to employees on safety and health practices. The intervention process also attempted to engage workers in programs designed to change safety and health behaviors (such as telephone-based and online health coaching programs), worksite-based campaigns and group challenges on topics related to personal/family safety, physical activity, back pain, and self-care. Our assessment approach included the use of dialogue sessions during which we collected data on the safety, well-being, and integration situation at the companies (further described below). During these dialogue sessions attendees (company staff and executive leaders) actively engaged in discussions and conversation to come to a consensus rating of answers to questions posed. This process may be considered more than an assessment only; it changed awareness and knowledge levels of what was happening within the company. As such, it may also be considered part of the intervention. To facilitate sharing of experiences and exchange of ideas among the three companies, a Learning Collaborative was organized approximately half-way through the intervention year.

Outcome measures related to worker-level objectives were included in the health assessment (HA) survey tool. The Harvard T.H. Chan School of Public Health’s Institutional Review Board (IRB) reviewed and approved the study protocol; the HealthPartners IRB ceded oversight to the Harvard IRB.

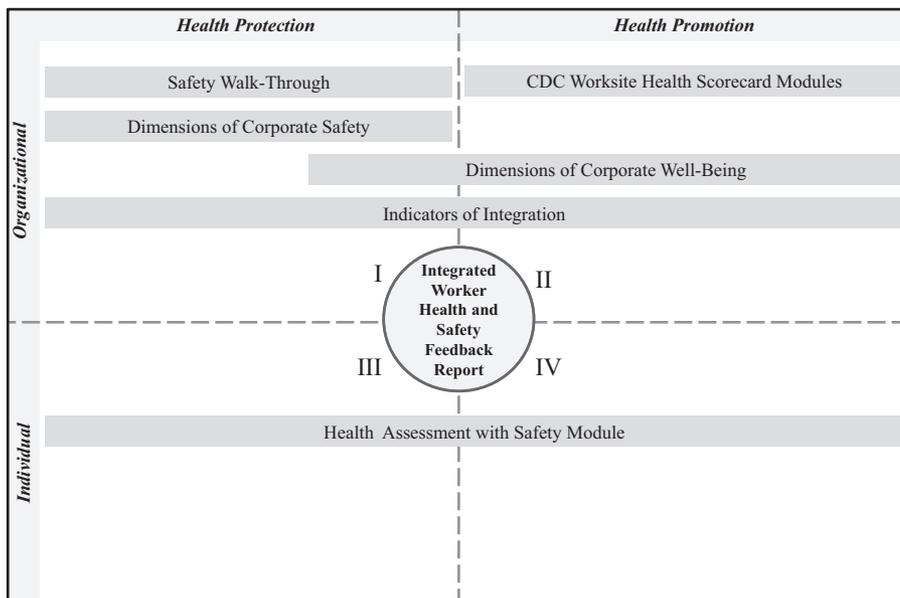
CONCEPTUAL APPROACH TO INTEGRATED MEASUREMENT

The SafeWell Project was designed as a dissemination project. We felt that a highly practical measurement approach based on a clear conceptual model would facilitate dissemination efforts. The model was designed to include (1) organizational-level assessment of health protection or safety, (2) organizational-level assessment of health promotion, (3) individual-level assessment of health protection or safety, and (4) individual-level assessment of health promotion. Both individual-level assessments rely on data obtained directly from workers and include their perceptions of safety and health programs, practices, and commitment at the workplace. The organizational-level assessments rely on data obtained from measurements of safety hazards at the workplace via document review and direct observation as well as the informed opinions of organizational leaders based on a group process (described below). This conceptual approach to measurement generates various “views” of the organization’s safety and health situation that, taken together, provide a comprehensive and integrated perspective that may inform the prioritization and decision-making process related to the allocation of resources and action plans.

Conceptual Model

Figure 1 shows the conceptual framework organized around four quadrants and the areas covered by each of the six measurement

FIGURE 1. Measurement tools to assess the Integration of Occupational Safety and Worksite Health Promotion—A Conceptual Model. The six measurement tools referred to in this graphic are placed in the respective quadrants that they assess. The Safety Walk-Through and the Dimensions of Corporate Safety were limited to assessment of a single quadrant, that is, the organizational-level health protection assessment. The CDC Worksite Health Scorecard modules deployed in this study were limited to assessment of a single quadrant, that is, the organizational-level health promotion assessment. The Dimensions of Corporate Well-Being and Indicators of Integration measurement tools spanned both the organizational-level health protection and promotion quadrants. The health assessment was used to assess both individual-level health protection and promotion. The Integrated Feedback Report brings together insights from each of the measurement tools and is designed to cover all four quadrants.



tools (described below) created or adapted for this study. It indicates that some of the tools are focused on one of the four quadrants, others cover multiple quadrants. For example, the *Dimension of Corporate Well-Being* scorecard was adapted from the NIOSH’s “Essential Elements of Effective Workplace Programs and Policies for Improving Worker Health and Wellbeing” list (described below), which covers organizational health promotion but also includes some safety indicators; hence, it covers quadrant II and part of quadrant I. By design, the *Indicators of Integration* and the HA with safety module include both health protection (at the organizational level) and health promotion (at the individual level). The “*Safety Walk-Through*” assessment and the *Dimension of Corporate Safety* scorecard were solely focused on organizational-level safety and worker health protection. On the other hand, the Centers for Disease Control and Prevention (CDC) *Worksite Health Scorecard* modules used in this project focused on organizational health promotion, although the full CDC Scorecard includes modules specific to safety. Finally, the integrated feedback report is depicted at the center of the framework as it brings together the results of each of the measurement tools representing each of the quadrants. The center of the grid represents an integrated perspective of multiple assessments at both organizational- and individual-levels of health protection and health promotion—a view presented back to the companies in the form of an integrated feedback report. Figure 1 depicts our conceptual approach to assessment and measurement of the integration of OSH and WHP.

Measurement Tools

The data gathered to create these views come from six separate measurement tools. Each of these tools is described below.

Dimensions of Corporate Integration (DCI)

The DCI is a compilation of three individual tools described below (ie, Dimensions of Corporate Safety, Dimensions of Corporate Well-being, and the Indicators of Integration). The DCI was conducted using a facilitated in-person group process (“dialogue

sessions”) with managers and company leaders responsible for safety and health at the worksites. The DCI measurement tool is available for download at the Center’s Web site (<http://centerforworkhealth.sph.harvard.edu/dimensions-corporate-integration>).

Dimensions of Corporate Safety (DCS)

To assess the organizational-level safety program, we adapted content from the OSHA Form 33 (see: <https://www.osha.gov/SLTC/etools/safetyhealth/form33i.html>) into a scorecard format. The DCS scorecard consisted of a total of 20 questions related to essential safety elements that were identified under seven major safety dimensions including: (1) leadership and management, (2) hazard anticipation, prevention, detection, and control, (3) injury management and disability prevention, (4) safety and health training, (5) employee participation, (6) administration and supervision, and (7) planning and evaluation. Each question across all dimensions was set up as a 6-point Likert scale (“0” = “does not apply at all” through “5” = “fully applies”) for a maximum score of 100 points. In addition, an “overall synthesis” question was asked that reflected upon the team’s perception of the overall safety system at the company.

Dimensions of Corporate Well-Being (DCW)

To assess the organizational-level health and well-being situation, we adapted content from the NIOSH “Essential Elements of Effective Programs” list (see: <http://www.cdc.gov/niosh/twh/essentials.html>) into a scorecard format. A total of 20 questions related to each essential element were categorized into: (1) organizational culture and leadership, (2) program design, (3) program implementation and resources, and (4) program evaluation. Each question was set up as a 6-point Likert scale (“0” = “does not apply at all” through “5” = “fully applies”) for a maximum possible score of 100 points.

Indicators of Integration

To assess the level of OSH and WHP integration, we used the indicators of integration and associated measures that were

proposed based on our earlier work³ and this specific measurement tool has recently been validated.⁴ A total of 23 measures were presented in a scorecard format. Each question was set up as a 3-point Likert scale (“0” = absent; “1” = partially adopted; “2” = fully achieved) for a maximum possible score of 46 points.

CDC Worksite Health Scorecard

The CDC Worksite Health Scorecard (see: http://www.cdc.gov/dhbsp/pubs/docs/HSC_Manual.pdf), was designed to assist companies in the assessment of their health promotion programs, identify gaps, and prioritize high-impact strategies to prevent heart disease, stroke, and related conditions. This scorecard has recently been updated with a Version II, however the questions used in this project stem from Version I. Whereas this scorecard includes 16 different modules (eg, modules on tobacco control, lactation support, stress management, diabetes, vaccine-preventable diseases, occupational health and safety, etc), we only used the organizational support (18 questions), physical activity (9 questions), and nutrition (13 questions) modules. The modules are scored separately and comparison scores are available. The decision to only use three of the available modules was made to avoid an impractical increase in the number of questions that would be added to the overall assessment. The three selected modules were relevant to our intervention and the content of the occupational health and safety module of this scorecard was already addressed as part of the other tools we used with the companies.

Occupational Safety and Health Assessment—the “Safety Walk-Through”

The purpose of the Safety Walk-Through measurement tool was to identify and evaluate hazards present in the work environment and to help prioritize actions for risk reduction. The tool was designed with the intent to be used by a company’s safety officer, independent of outside expert consultation, or assistance. However, in the current study, the walk-through was conducted by trained occupational health physicians and project researchers with the company’s safety officer in attendance. The process starts with a review of illness and injury data (ie, OSHA 300 Log, workers’ compensation claims data) to help identify pertinent hazards present in the workplace, followed by an in-person walk-through to determine additional hazards. Any hazard or injury-related observations were noted on the “Hazard Types Evaluation Tables”, listing each

hazard present as well as the number and types of injuries related to the hazard. For each observed hazard, the estimated scale, degree, and level of control were rated on a scale of 1 to 3 (using the Hazard Estimation Table provided as part of the tool).

To inform prioritization when addressing the observed hazards, each identified hazard was assigned an *a priori* determined “review level” of I, II, III, or IV where: I = probably a low contributor to injury/illness risk; II = may potentially contribute to injury/illness risk; III = high risk hazard—careful consideration of this hazard is needed; and IV = very high risk hazard—urgent review and management needed. Finally, documentation of the presence or absence of a relevant and sufficient occupational safety policy pertaining to that hazard was reviewed. The results of this walk-through were intended to provide guidance and to support prioritization of safety practices.

Health Assessment

The HealthPartners “Achieve Your Health Potential” HA was used to assess individual-level worker health and well-being. This measurement tool has been used to document significant relationships between health factors and chronic conditions,^{14–16} disease incidence,¹⁴ health care costs,^{17,18} and productivity indicators.^{19,20} We added a “worker safety” module, which included worker perceptions of the organizational safety climate, to the HA to capture individual-level worker safety information.^{21,22}

Data Collection Processes

We used a variety of data collection processes including, at the organizational-level, an in-person, facilitated group dialogue process (as applied to the DCI and CDC Scorecard) and in-person inspection of the physical work environment (as applied to the Safety Walk-Through), and at the individual-level, an online survey methodology (as applied to the HA). Instead of relying upon the perspective of a single employee assigned to complete an organizational-level assessment, we intentionally deployed a dialogue process for the DCI and CDC Scorecard to ensure a consensus-based assessment of the organizational reality. This measurement process was noted to generate improved communications between the various departments represented at the table and reflected some level of commitment to recognition and mitigation of hazards. Table 1 provides an overview of the implementation processes involved for each of the measurement tools deployed.

TABLE 1. Overview of the Measurement Tool Implementation Processes

Measurement Tool	Implementation Process for Data Collection
HA	The HA is an online, self-reported questionnaire which assesses a comprehensive set of self-reported health factors, provides personalized feedback, and connects the participant to health promotion program options. The HA data collection period was generally set for 4–6 weeks before the feedback report was created
Dimensions of Integration Scorecard: Dimensions of Corporate Safety; Dimensions of Corporate Well-Being; Indicators of Integration	The “Dimensions of Integration Scorecard” assessments (the DCS, DCW, and Indicators of Integration) were all conducted as part of a 1.5-to-2 hours group-based dialogue session where between five and ten corporate leaders with direct responsibility for safety, health promotion, human resources, operations, and quality assurance deliberated each element of the “Dimensions” scorecards. Each element was scored based on a consensus rating
CDC Worksite Health Scorecard	This assessment is a checklist with “Yes/No” answer options that was completed at the end of the “Dimensions of Integration” group-based dialogue session. As such, the modules of this scorecard were completed by a group of corporate leaders, not by a single individual and the “Yes/No” response was based on group consensus
Occupational Safety and Health Assessment—“Safety Walk-Through”	The safety walk-through was conducted by trained occupational health physicians and guided by the company’s safety officer. The walk-through assessments lasted approximately 3–3.5 hours and included an end-of-assessment debrief that provided the safety officer with immediate high-level feedback and results

HA, health assessment; DCS, dimensions of Corporate Safety; DCW, dimensions of Corporate Well-Being.

Finally, we collected qualitative data on the experiences of each company related to the SafeWell Project. After the post-assessments were completed, we conducted several focus groups with company staff and key informant interviews to capture insights related to the implementation process and feedback related to the overall experience.

Integrated Feedback Report and Associated Decision-Making

Following data collection, an “Integrated Feedback Report” was created using information gleaned from each of the measurement tools from each quadrant of the model. This report was generated by a single investigator for all companies using all available data and finalized following review and editing by others on the research project team. The HA report was “auto-generated” using existing algorithms and report rules as part of the ongoing health and well-being services implemented by HealthPartners. All other reports, including the Integrated Feedback Report, were “custom-generated” as part of this project. To make the feedback report relevant for management, it was intentionally designed to be brief (four to five pages) and included a one-page dashboard summary of aggregate results, a gap analysis, and a set of recommendations for action. The dashboard was a high-level summary of aggregate results at baseline and 1-year follow-up with comparisons to the HealthPartners book of business or national statistics, where applicable. Each observation in the dashboard was linked to an icon intended to indicate whether the observation was a notably positive finding, a finding that warranted attention, or a finding that needed monitoring and improvement. The gap analysis specifically focused on areas of integration^{3,23} and included notable observations with specific reference to the following areas of focus (Sorensen G, McLellan D, Dennerlein J, et al. Integrated approaches to protecting and promoting worker safety and health: a conceptual model for intervention and research. In review):

- Safety/health training, goal setting, planning, measurement/evaluation, and performance reviews.
- Safety- or health-related practices.
- Leadership development.
- Systems review and inventory and assessment of how to integrate across most relevant systems.
- Communications.
- Participatory practices.
- Incentives.
- Environmental and policy level intervention.

A short list of no more than three or four recommendations for action was generated based on the goal of pursuing integration of safety and health but also considered overall interests and needs of the company. Action recommendations included topics that should be continued based on success noted to date, as well as topics that should be considered for exploration or expansion of the program. In addition to the four-to-five-page integrated feedback report, appendices were provided with detailed data specific to all six measurement tools.

RESULTS

Summary results for selected variables are provided for each company at both baseline and 1-year follow-up and presented in Table 2. We observed variability among the safety and health measures across companies. The three companies were at varying stages in their efforts to improve the culture of health and safety at their respective organizations. Corporate leaders rated their company from a safety perspective based on two metrics; namely, the DCS and the self-rating of the company’s overall safety system. These two metrics showed similar changes between baseline and follow-up by company (improvements in Companies A and C and a slight reduction in Company B). Within each company, at each assessment, the DCS and self-rated safety system scores were very similar suggesting that leaders seemed to have a good sense of how

TABLE 2. Data Samples Based on the Six Measurement Tools Used in the SafeWell Project

Assessment Tool and Key Variables	Company A	Company A	Company B	Company B	Company C	Company C	Comparison
	Pre (%)	Post (%)	Pre (%)	Post (%)	Pre (%)	Post (%)	
Health assessment							
Response rate	74	77	23	36	63	67	–
Employee-rated health and well-being culture	80	80	77	82	89	92	–
Employee-rated safety culture	86	88	65	82	90	88	–
Job always gets in the way of safety rules	8	7	3	4	18	17	–
Back pain	39	39	37	37	36	33	41*
Obese	16	17	27	28	24	25	29*
Tobacco use	8	7	7	5	8	6	10*
Dimensions of Corporate Safety scorecard	66	84	77	74	93	100	–
Self-rated safety system	68	85	80	75	88	90	–
Dimensions of corporate well-being	67	75	74	74	99	98	56*
Dimensions of corporate integration	26	83	67	35	96	98	–
CDC worksite health scorecard							
Organizational support	73	100	47	73	100	100	–
Physical activity	88	100	88	88	88	88	65 [†]
Nutrition	76	95	43	68	73	95	52 [†]
“Safety Walk-Through”[‡]							
Review Level I (low risk)	23	57	None	35	58	100	–
Review Level II (potential/moderate risk)	57	43	None	57	42	None	–
Review Level III (high risk)	17	None	100	8	None	None	–
Review Level IV (very high risk)	None	None	None	None	None	None	–

*Reflects comparison to HealthPartners book of business average.

[†]Reflects CDC Worksite Health Scorecard national comparison data.

[‡]Review level I (probably a low contributor to injury/illness risk), II (may potentially contribute to injury/illness risk), III (high risk hazard—careful consideration of this hazard is needed), or IV (very high risk hazard—urgent review and management needed).

all safety elements work together when considering them as a whole. These two metrics, representing a management's perspective of organizational safety, were relatively consistent with the workers' individual-level assessment of the safety culture at all three organizations, particularly at follow-up (even though Company A at baseline showed an almost 20% lower score for leaders compared with employees). A similar observation was noted for the health and well-being components (employee-rated culture of health and well-being and DCW scorecard). Workers' self-report of the companies' safety and health cultures were generally high at baseline and either improved or stayed about the same over the course of the year.

The organizational assessment of integration (Indicators of Integration scorecard) showed a large improvement in one company, a large decline in another due to organizational changes, and maintenance of a high score in the third. Qualitatively, these changes in organizational assessment scores appeared to reflect the degree of change in integration the companies achieved during the course of the year.

As a checklist of available resources, the CDC Worksites Health Scorecard produced scores reflecting an increase in available resources for all three companies between pre- and post-assessments. This checklist documents the absence or presence of specific, directly observable items in the corporate environment that relate to health and well-being. The resultant increase in scores at all three companies suggested they acted upon presentation of baseline assessment data and improved or maintained high scores for organizational support systems, physical activity resources, and nutrition services.

The Safety Walk-Through was well-received and helped companies determine what they were doing well and what should be prioritized as, for example, indicated by input obtained from focus groups at Company A. The Safety Walk-Through prompted action in all companies based on presentation of results, and we noted improvements in scores at follow-up for every company. As highlighted in Table 2, every company shifted the distribution of environmental hazards to lower levels between baseline and follow-up measurement (the more hazards in lower review levels, the better). Review Level I reflects the notion that hazards may exist in the workplace; however, they are well-controlled, systems are in place to minimize risk exposure for workers, and they are considered a low contributor to injury or illness risk. Hence, the ideal situation is represented by company C where at baseline 42% of hazards fall into Review Level II and 58% in Review Level I but at follow-up 100% of noted workplace hazard fall into Review Level I. Company B, on the other hand, shows improvement as the hazard distribution shifts from 100% in Review Level III at baseline to 8% at follow-up with the remainder in Review Levels II and I.

The organizational-level DCI data collection process used an in-person, group-based dialogue method in which corporate leaders with primary accountability for worker health protection, health promotion, and human resources functions generated consensus-based scores. Participants reported that the convening process of these dialogue sessions proved valuable as it brought about agreement among company leaders, including top corporate executive leaders, on existing gaps and opportunities for action since the scores reflect a consensus rating and the level of the score may identify a gap or an opportunity to address.

All companies reported at year-end focus groups and interviews that the measurement process had been one of the most engaging and valuable components of the project and had allowed them to focus on specific actions steps, suggesting that the approach was feasible, acceptable and actionable. The companies liked the walk-through and HA and reported that these tools helped them determine what they were doing well and what they needed to work on as well as determine priorities. It was helpful that the project provided the resources to pull the results together for them. They

noted that the integrated feedback report provided a more comprehensive view of their organization than any other data-based report any of the organizations had available to them (from a safety or health perspective) and the ability to use it in offsetting prioritization for action steps was mentioned specifically as a high-value resource. Qualitatively, statements that supported these observations included: "The assessments and reports were very helpful, they really helped bring focus to what we can do to become stronger as an organization" and "The Safety Walk-Through, the back health seminars, the integration of wellness and safety committees, and the Learning Collaborative were all very beneficial. These activities resulted in fewer workplace injuries, which saved us money and our employees are starting to think more about safety now."

DISCUSSION

This description of measurement and reporting experiences of an integrated OSH and WHP approach at three small-to-medium size manufacturing companies indicates that newly designed measurement tools were acceptable, feasible, actionable, and overall well-received by the organizations involved. The conceptual model that guided our approach appeared to be simple and effective in organizing a method to the measurement of integrated OSH and WHP. The creation of a succinct integrated feedback report provided each company with a unique and comprehensive view of their organization that was considered to be of high-value by company leadership.

The combination of the six measurement tools used in the current project may appear to be a relatively intensive way to provide feedback and monitor progress of TWH-type projects. However, from a practical perspective, this relatively intense approach provides a thorough baseline and it may not be necessary to repeat all assessments annually, but rather align periodic assessments with amount of implementation effort. Once a baseline integrated feedback report is received, a company may be able to coordinate its organizational decision-making along with other sources of data. Most organizational-level measurement tools rely on single-person response processes,²⁴ whereas the current approach involved group-process, consensus ratings, and dialogue which often generated new corporate insights and learnings that were useful and actionable for the attendees—even though they were not necessarily specific to the goals of the project. These assessments should be implemented more than once as some improvement may be generated following an assessment, but it is unlikely that all problems noted can be resolved with a single effort. Rather, an improvement model with follow-up assessments is recommended.

Whereas follow-up assessments are recommended, alignment of assessment frequency with implementation plans seems an appropriate way to determine how often and how soon to reassess. Given the economic and social costs of injury and disease and relevance and importance of worker safety and health to the company, the commitment of dedicated leadership time during the dialogue sessions does not seem to be excessive. Occupational safety performance and the health and well-being of workers is recognized as an economic benefit for many enterprises, so intentional focus on this issue by corporate leaders seems appropriate from a worker health and safety perspective (Sorensen G, McLellan D, Dennerlein J, et al. Integrated approaches to protecting and promoting worker safety and health: a conceptual model for intervention and research. In review).^{1-3,5,9,16,24,25}

Additional refinement of the measurement process could include documenting the "voice of the employee" by having a representative from front-line workers included in the dialogue sessions. In our project, we asked all employees about their perceptions of health and safety cultures at their organizations as part of the HA process. We learned that their conclusions at these

specific enterprises were similar to those from the management teams. This observation may be relevant to the generalizability of our findings, since not all research corroborates this. Although some studies indicate agreement,²⁶ others note a divergence between worker and managerial perceptions of organizational health and safety.²⁵ The alignment of management and worker perceptions may reflect a common understanding of commitment and reasonable pre-existing communication. This is likely to vary among enterprises.

The observed differences in how the companies rated themselves on integration between baseline and follow-up appeared to be related to the degree to which companies appeared to be committed to making changes, how much organizational change the company experienced, and how much improvement towards integration they were able to affect. For example, Company C had a decade-long experience in making safety, health, and well-being an integral part of their culture and had structures in place to address concerns or act on opportunities quickly. As a result, they were able to score high on many of the SafeWell metrics. On the other hand, Company B was very interested in improving their safety and health program but due to significant organizational change at this company, including turnover among staff responsible for the SafeWell Project, a change in top leadership, and merger with another company, they rated much lower.

Whereas large companies may bring a variety of data and resources to the integrated measurement for health and safety, small-to-medium size business are often limited to less rich data.^{4,12,13,27} This apparent advantage may be offset in some cases by the inherent organizational complexities of larger companies that could potentially delay or preempt optimal integration. The approach outlined here brings together a set of measurement tools that provide ready access to information and are relatively easy to use in small-to-medium size businesses. It is not unreasonable to assume that such measurement activity may have a potentially positive business impact among such companies and place them in the vanguard of business leaders committed to a TWH approach. Furthermore, whereas the dialogue sessions related to the DCI (including the DCS, DCW, and Indicators of Integration) were facilitated with external support, the Safety Walk-Through measurement tool is designed to be an organizational self-assessment to be completed by the company's safety officer. This particular tool may support companies in their efforts to ensure ongoing compliance with existing safety regulations and may also be used to prompt additional actions to improve safety policies, programs, and practices and ultimately disease and injury prevention.

The need for measurement tools related to the integration of safety and health has been recognized by others.^{2,3,5} Practical and valid measurement can be used to establish a baseline against which to evaluate the impact of future changes. Results of the assessment can provide impetus for organizational action and help set priorities. Measurements over time will allow for analyses that relate management changes in policies and practices to outcomes and provide a level of confidence and plausibility that action resulted in improvements. At the individual-level, using assessment tools such as assessments of health risks with feedback may increase awareness of health risks. However, as noted by the systematic reviews on this topic, successful health improvement does not appear to occur in the absence of follow-up programs to address such health risks.²⁸ At the organizational-level, assessment tools associated with company recognition may be strong motivators for improvement.²⁴ It has also been observed that organizational assessments conducted via an external audit and involving a group process generate higher scores than organizational self-assessments.²⁹ Based upon such observations, executive leaders should consider what type of assessment tools and measurement process and frequency are optimal for their company.

The results of this project extend the work of others, as summarized by Loepcke and colleagues,⁵ regarding the need for tools that measure the effectiveness of worker health and safety integration efforts. We have presented specific tools that may be used to gather relevant data that may be organized into an integrated view of health and safety at the organizational level. This approach, as depicted in Fig. 1, may generate a comprehensive view or, alternatively, may be used in parts so as to add to already existing corporate measurement approaches.

From a research-related perspective, measurement provides key insights into the association between integration efforts and levels of observed outcomes. Additionally, such data support the identification of predictors of integration and prompt new hypotheses to be investigated. The current project was specifically informed by our previous investigations on integrated measurement (Sorensen G, McLellan D, Dennerlein J, et al. Integrated approaches to protecting and promoting worker safety and health: a conceptual model for intervention and research. In review).^{3,4,9,13} However, the implementation of these ideas had to be made practical and informative to business as it was tested in a real-world setting where measurement by itself is unlikely to occur in the absence of an intervention. Hence, the observation that the measurement concept and tools provided the participating companies with services perceived to be of high-value provides important feedback for efforts to translate this approach into services that will enable dissemination of the TWH model more broadly.

LIMITATIONS AND STRENGTHS

It is important to note several limitations of the current study. The project was implemented with only three companies located in a limited geographical area of the upper Midwest in the United States. It is therefore not necessarily broadly generalizable across the country even though the external validity of the project was high due to the real-world implementation. The project may also have suffered from a participation bias; worksites willing to participate in this effort may be different from others, and may represent early adopters of integrated approaches to worker health. Furthermore, the process to facilitate many of the measurement approaches may depend on the skill of the service delivery team. Finally, the assessments indicated consistency between manager and employee perceptions of commitment to health and safety which may be an indication that good pre-existing communications made these companies more ready to participate than others.

Limitations of the current study should be balanced against several notable strengths of the project. First, the current project allowed for a relatively unique year-long intervention to be implemented in three companies providing an in-depth look at challenges and opportunities related to efforts to measure the integration of safety and health. Due to the year-long program that included a pre- and post-assessment, we were able to quantify actual changes in the work environment that might have served to "validate" survey results. For example, the Safety Walk-Through tool scored directly observable changes in the physical work environment and clear shifts in the Review Levels score distribution were noted between pre- and post-assessments (see Table 2). Finally, participating companies reported that the measurement process had been engaging and valuable suggesting that the measurement tools deployed in the study were especially relevant to the organizations and the goals of integrating worker health and safety.

CONCLUSIONS

This article presents a conceptual model to guide the measurement for integrated worker health protection and promotion and describes a set of measurement tools using multiple process methods for data collection along with an integrated feedback report and action plan. The approach may be considered a unique and

innovative way to provide companies with current state and change indicators related to integrated worker safety and health. Furthermore, the approach was well-received and able to document change among the small-to-medium size organizations in the study. Results of this study may inform additional efforts to support integrated health and safety programs and stimulate additional research in the area of TWH measurement methods.

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