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Development of the National Institute for Occupational Safety and Health Worker Well-Being Questionnaire

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Objective: This article describes development of the National Institute for Occupational Safety and Health (NIOSH) Worker Well-Being Questionnaire (WellBQ). **Methods:** The NIOSH WellBQ was developed through literature reviews and expert panel recommendations. We drew from a representative sample of the civilian, noninstitutionalized, US working population to pilot the questionnaire. Psychometric analyses were performed on data from 975 respondents to finalize items and optimize the NIOSH WellBQ's psychometric properties. **Results:** The final questionnaire consists of 16 scales, 5 indices, and 31 single items across 5 domains: (1) work evaluation and experience; (2) workplace policies and culture; (3) workplace physical environment and safety climate; (4) health status; and (5) home, community, and society (experiences and activities outside of work). The instrument demonstrated adequate reliability and validity. **Conclusions:** The NIOSH WellBQ is a reliable and valid instrument that comprehensively measures worker well-being.

Keywords: worker well-being, occupational safety and health, survey development, measurement, policy and programming

In 2014, the National Institute for Occupational Safety and Health (NIOSH) *Total Worker Health*[®] program,¹ in partnership with the RAND Corporation, initiated an effort to define the concept of worker well-being and then operationalize it in the form of a new survey instrument intended to be broadly applicable across today's workplaces. This article describes the development of this instrument, the NIOSH Worker Well-Being Questionnaire (WellBQ, <https://www.cdc.gov/niosh/twh/wellbq/default.html>).²

Well-being, as it relates to working people, is defined and operationalized in diverse ways.³⁻⁶ As noted by Schulte et al,⁷ "...some definitions focus on the state of the individual worker, whereas others focus on working conditions, and some focus on life conditions."^(pe32)

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In the literature, different indicators of well-being are linked to a host of outcomes of value to individuals, organizations, and society, such as employee retention, financial success, workability, productivity, absenteeism, early retirement, physical and mental health, and happiness, among others.⁸⁻¹⁴ Although such evidence supports the importance of well-being for workers and organizations, the diversity and inconsistency in the way well-being has been conceived and operationalized in relation to workers present a real limitation for aggregating and evaluating research findings and translating them into individual, organizational, or larger policy actions.

The NIOSH effort to define and operationalize worker well-being arose as a natural product of the NIOSH *Total Worker Health* (TWH) program. The TWH program supports 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. In this regard, a TWH approach emphasizes a holistic approach to the safety and health of workers. This approach has gained a strong following¹⁵⁻¹⁷ and has become increasingly relevant in relation to changing work arrangements and workforce characteristics. For example, digital technologies and broadband Internet access have redefined the notion of "workplace,"¹⁸ making telework feasible for nearly one half of all workers in the United States. Although telework may be associated with certain salutogenic effects (eg, increased worker autonomy and flexibility), it may also blur work-nonwork boundaries and promote spillover of stressors between work and family.^{19,20} The dramatic increase in prevalence of remote work amid the COVID-19 pandemic underscores the significance of this concern.²¹ Situations of this nature beg for integrated, comprehensive prevention strategies that recognize circumstances and risk factors in both the work and nonwork domains.

A distinguishing feature, then, of the NIOSH effort to define and operationalize worker well-being is its holistic approach. Worker well-being is understood as a concept that encompasses the totality of factors relevant to the quality of workers' lives and, in this regard, may serve as a valuable endpoint for evaluating the extent to which individuals and workforces are able to thrive. In a prior article describing our conceptual approach to development of a worker well-being conceptual framework, we defined worker well-being as "an integrative concept that characterizes quality of life with respect to an individual's health and work-related environmental, organizational, and psychosocial factors. Well-being is the experience of positive perceptions and the presence of constructive conditions at work and beyond that enables workers to thrive and achieve their full potential."²² As detailed in this earlier article, an exhaustive review of the well-being and worker well-being theory and literature, and consultation with an expert panel informed this definition and our conceptual framework for worker well-being that comprises 5 domains: (1) work evaluation and experience; (2) workplace policies and culture; (3) workplace physical environment and safety climate; (4) health status; and (5) home, community, and society, which subsumes experiences and activities outside of work (Fig. 1). In keeping with well-being theory, these domains are framed in terms of both objective aspects of work, life, and health, and subjective appraisals of these conditions as discussed below and in our prior article. (More detail on these domains is provided in the methods section and in Chari et al.²²)



FIGURE 1. Worker well-being conceptual framework.

We identified core features of well-being concepts that we then used to guide our approach to operationalizing worker well-being within and across these domains. First, as discussed in the literature, well-being is multidimensional. For example, quality of social relationships, physical and mental health status, and life and job satisfaction have all been studied as aspects or types of well-being.^{23,24} Second, well-being comprises both subjective and objective components. The subjective approach defines well-being as an individual assessment of the quality of one's life, inclusive of both emotional (eg, positive and negative affect) and evaluative (eg, degree of life satisfaction and fulfillment) aspects.²⁵ The objective approach defines well-being as the freedom to pursue what one values in life.²⁶ Freedom is realized through the possession of capabilities (resources, goods, assets) that are essential for achieving desires (eg, physical health, safety, social relationships). Third, well-being is realized not only from the absence of threats to the quality of life but also by the presence of positive and constructive conditions that enable people to thrive. Finally, well-being integrates both work and nonwork contexts.

This holistic approach to defining and operationalizing worker well-being is similar conceptually to Gallup-Sharecare (previously Gallup-Healthways) efforts to develop a comprehensive framework and instrument to characterize population well-being.^{27,28} However, our approach differs substantively by giving fuller attention to work-related determinants and aspects of well-being, hence the expression "worker well-being." While methodologies exist to comprehensively assess certain aspects of worker lives, such as working conditions and/or health-relevant exposures beyond the workplace,^{29–31} we found no instrument that covered all the core qualities of well-being as identified from our literature review, could be self-administered in survey format, and was not unduly burdensome so as to prohibit practical application within organizations in addition to research and surveillance applications.

Based on our definition of worker well-being and core concepts observed in the well-being and worker well-being literature,²² we designed the NIOSH WellBQ according to the following principles: first, the instrument should include multiple, theory-based dimensions of worker well-being that encompass both work and nonwork domains. Second, positive, protective aspects of life and work, in addition to risk factors, should be captured across these domains. Third, both subjective

and objective approaches should be applied to measurement within these domains. Last, the instrument should allow for ready application for research and practical purposes.

By measuring worker well-being, the NIOSH WellBQ can serve many research, practice, and policy purposes. It provides a way for organizations and researchers to evaluate the status of worker well-being in and across organizations, worker subpopulations, regions, and occupational and industry sectors; identify areas in which interventions may be needed; and evaluate the effectiveness of those actions with respect to important worker, organizational, and societal outcomes.

METHODS

Questionnaire Development and Measures

In previous research, we carried out a multidisciplinary literature review and sought guidance from an expert panel convened by RAND to develop the 5 domains that comprise our worker well-being framework (see Chari et al²² for more details on this approach). We defined the worker well-being domains as follows:

- Work evaluation and experience refer to individuals' assessment of the quality of their work life, including satisfaction with aspects of the job, meaningfulness of work, job engagement, and emotional state at work.
- Workplace policies and culture refer to organizational policies, programs, and practices that have the potential to influence worker well-being.
- Workplace physical environment and safety climate refer to factors that relate to physical aspects of workplaces and safety features (both physical and psychological) of the work environment.
- Health status refers to aspects of individuals' lives relating to their physical and mental health and functioning.
- Home, community, and society refer to the external context or aspects of individuals' lives that are situated outside work but may still influence their well-being.

To develop questionnaire content reflecting the 5 NIOSH WellBQ domains, we again took direction from the literature and the expert panel to identify subdomain constructs for each domain and then identify established scales or measurement instruments to derive content for each of these subdomains. We drew from publicly available instruments and items where possible. Our search for subdomain content returned 658 items across all subdomains. After a prioritization process based on judgments of item quality, we selected 135 items drawn from 27 sources (Table 1) that were organized into discrete subdomains (Table 2). Where necessary, we secured permission for use of items for noncommercial applications. Citations and conditions for use of the final instrument items are noted in the User Manual for the NIOSH WellBQ.²

In some instances, modest revision of item wording and responses was undertaken to maximize uniformity across the instrument. We also created 52 new items for a total of 187 items for the initial (pilot) questionnaire: work evaluation and experience = 42 items; organizational policies and culture = 59 items; workplace physical environment and safety climate = 25 items; health status = 43 items; and home, community, and society (experiences and activities outside of work) = 18 items. These 187 items comprised 23 subdomains and 66 subdomain constructs as shown in Table 2. Five additional (optional) items pertaining to employment status and characteristics (standard and nonstandard employment arrangements, full- or part-time job status, job tenure, industry type, and occupation type) were also included.

The pilot questionnaire first underwent cognitive testing with a convenience sample of nine individuals in a variety of RAND

TABLE 1. Sources Used to Develop the Pilot NIOSH WellBQ

Source	Reference
Quality of Worklife Questionnaire	Centers for Disease Control and Prevention ³²
1977 Quality of Employment Survey	Quinn and Staines ³³
Job Demands and Worker Health Questionnaire	Caplan et al ³⁴
Organization-Level Safety Climate scale	Zohar and Luria ³⁵
Hahn & Murphy safety climate scale	Hahn and Murphy ³⁶
Copenhagen Psychosocial Questionnaire–COPSOQ II	National Research Centre for the Working Environment ³¹
Workplace Incivility Scale	Cortina et al ³⁷
Minnesota Satisfaction Questionnaire	Vocational Psychology Research, University of Minnesota ³⁸
National Healthy Worksite Program Health and Safety Climate Survey	Centers for Disease Control and Prevention ³⁹
Survey of Perceived Organizational Support	Eisenberger et al ⁴⁰
Workplace/schedule flexibility measures	Shockley and Allen ⁴¹
Effort-Reward Imbalance Questionnaire	Siegrist et al ⁴²
Leiden Quality of Work Questionnaire	Van der Doef and Maes ⁴³
Multifaceted Organizational Health Climate Assessment scale	Zweber et al ⁴⁴
Generic Job Satisfaction Scale	Macdonald and MacIntyre ⁴⁵
Health status measures	Health Enhancement Research Organization and Population Health Alliance ⁴⁶
National Health and Nutrition Examination Survey	Centers for Disease Control and Prevention ⁴⁷
Patient Health Questionnaire 4 (PHQ-4)	Kroenke et al ⁴⁸
Health and Work Performance Questionnaire	World Health Organization ⁴⁹
Behavioral Risk Factor Surveillance System questionnaire	Centers for Disease Control and Prevention ⁵⁰
Job-Related Affective Well-being Scale	Van Katwyk et al ⁵¹
Job satisfaction questionnaire	Andrews and Withey ⁵²
Job satisfaction survey	Spector ⁵³
Work and Meaning Inventory	Steger et al ⁵⁴
Utrecht Work Engagement Scale	Schaufeli ⁵⁵
National Health Interview Survey	Centers for Disease Control and Prevention ⁵⁶
Sixth European Working Conditions Survey	European Foundation for the Improvement of Living and Working Conditions ³⁰

TABLE 2. Domain, Subdomain, and Subdomain Constructs Covered by the Pilot Questionnaire

Domain	Subdomain	Subdomain Constructs (No. Items in Parentheses)*
Work evaluation and experience	Satisfaction	Job satisfaction (1); wage satisfaction (2); benefits satisfaction (1); advancement satisfaction (2); supervisor satisfaction (1); coworker satisfaction (1)
	Support at work	Supervisor support (1); coworker support (1)
	Evaluation of work conditions	Job security (1); job autonomy (2); time paucity/work overload (1)
	Meaning	Meaningful work (2)
	Affect	Work-related positive affect (10); work-related negative affect (10)
Workplace policies and culture	Job engagement	Job engagement (absorption [1]; vigor [2]; dedication [3])
	Supportive work culture	Supportive work culture (respect [2]; recognition [1]; perceived organizational support [3]; management trust [1]; organizational pride [1]; coworker appreciation [1])
	Health culture at work	Health culture at work (2); availability of health programs at work (7); satisfaction with health programs (7)
Workplace physical environment and safety climate	Benefits	Availability of job benefits (14); satisfaction with types of job benefits (14)
	Organization of work and life	Work and nonwork conflict (2); workplace/schedule flexibility (2); management effectiveness (2)
Workplace physical environment and safety climate	Safety climate	Overall workplace safety (1); workplace safety climate (13)
	Physical work environment satisfaction	Physical work environment satisfaction (environmental conditions [1]; physical surroundings [1]; pleasantness [1]; disability and other accommodations [1])
	Interpersonal conflict and incivility	Discrimination (3); work-related sexual harassment (1); work-related physical violence (1); work-related bullying (2)
Health status	General health	Overall health (1)
	Physical health	Days of poor physical health (1); chronic health conditions (11)
	Mental health	Days of poor mental health (1); poor mental health (depression [2]; anxiety [2])
	Health behavior	Physical activity (2); tobacco use (5); alcohol consumption (2); healthy diet (1); overall stress (4); sleep hours (1); sleepy at work (1)
Home, community, and society	Functioning	Cognitive functioning limitations (1); general limitations (1); work limitations (1); productivity (4)
	Injury	Work-related injury (1); injury consequence (1)
	Life satisfaction	Life satisfaction (1)
	Financial insecurity	Financial insecurity (2)
	Social relationships	Support outside of work (1)
	Activities outside of work	Activities outside of work (7); satisfaction with activities outside of work (7)

*Numbers in parentheses reflect number of items representing each construct.

office-related occupations (administration, mail services, helpdesk, conference services), plant engineering, and custodial operations to probe participants' comprehension and interpretation of questionnaire items and ensure understandability and consistency with our intent. Findings from cognitive testing resulted in only minor revisions or clarification regarding wording of items and response scales. The questionnaire was then pretested with a sample of 25 from GfK's KnowledgePanel[®] (described hereinafter) to ensure that users were able to answer survey items (assessed by monitoring item nonresponse) and the survey length (ie, time to complete) was not excessive. No changes were made to the instrument after the pre-test.

Pilot Testing of the Questionnaire

The pilot questionnaire and pilot test protocol were approved for data collection for purposes of psychometric assessment on June 1, 2018, by the US Office of Management and Budget in compliance with the Paperwork Reduction Act. The study was reviewed and approved by the RAND Corporation's Institutional Review Board (FWA00003425, effective until February 18, 2026). Participants viewed an electronic consent form and agreed to participate before beginning the survey.

The pilot questionnaire was fielded online in a large sample to gather data for psychometric evaluation and associated further refinement of the questionnaire. The pilot test was administered through GfK's KnowledgePanel[®], a probability-based, online panel that is designed to be representative of the civilian, noninstitutionalized US population.⁵⁷ KnowledgePanel[®] includes approximately 55,000 adults randomly recruited using home address-based sampling methods. Based on expected KnowledgePanel[®] response rates, the questionnaire was sent to 1894 panelists to ensure a sample sufficient to power the psychometric analyses. As part of participation in the Knowledge Panel, the panelists had already reported to be older than 18 years and currently being employed (including self-employment) full- or part-time. This employment information was verified by the inclusion of 5 questions pertaining to employment arrangement, full- or part-time status, tenure in present job, and present occupation and industry. The questionnaire was fielded for 2 weeks between June 20 and July 4, 2018. Invitations to participate were sent via email. Up to 3 email reminders to nonrespondents were sent 3, 6, and 9 days after the invitation. As an incentive, participants who completed questionnaires became eligible to win prizes through a monthly GfK sweepstakes. GfK provided RAND with deidentified questionnaire data, including previously acquired data on panelists' sex, race/ethnicity, education, household income, and region.

Psychometric Analyses

To construct a psychometrically sound questionnaire that measures key constructs of worker well-being, we used a mixed-method approach—combining quantitative results from statistical modeling with expert judgment—which is commonly used when evaluating candidate items.^{58–61} The questionnaire development stage included descriptive analyses, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), checking internal consistency for reliability, and evaluating item- and scale-level characteristics via item response theory (IRT) analyses. We then examined correlations among items and scales to investigate concurrent, convergent, and discriminant validity. The responses for most of the items are ordered categorical in nature, for example, from 1 to 4, with 1 being strongly disagree and 4 being strongly agree. Scale scores at the validation stage were computed as the average score among the scale items. Some of the scales, referred to as “indices,” were not subjected to factor analysis as they were more characteristic of formative scales (eg, health programs available at work). Scores for these indices were computed as the sum of affirmative responses to the constituent items. Lastly, single-item measures were scored according to the value of the responses selected or provided, except for the items corresponding to days of

poor physical and mental health, which were scored as follows: 0 = zero days; 1 = 1–2 days; 2 = 3–5 days; 3 = 6–14 days; 4 = >15 days.

Exploratory Factor Analysis

For each domain, we used EFA to explore the underlying dimensionality of the domains and identify possible factors within each domain that represent subdomain constructs. The EFA was conducted using weighted least squares and Geomin rotation using Mplus⁶² for categorical data assuming correlated factors. The EFA results allowed us to (1) assess dimensionality, (2) determine whether extracted factors were theoretically meaningful and corresponded to our predefined concepts for each subdomain, and (3) identify items for deletion or retention based on factor loading structure.

We evaluated multiple criteria to determine the number of factors to retain in each domain and the number of items to retain for each factor, including eigenvalues and scree plots (eg, retaining factors with eigenvalues >1.0),⁶³ pattern of item loadings, and interpretability of the factors.⁶⁴ Low-performing items (those that showed factor loadings <0.3 or cross-loadings on more than 1 factor) were considered candidates for deletion unless there was strong theoretical justification for retention in a factor or as single-item measures.

Confirmatory Factor Analysis and IRT

Based on EFA results and a reduced set of items for each domain, we followed up with multidimensional CFA in Mplus within each domain to further evaluate evidence of construct validity for the identified factors that represented each subdomain construct. To make sure the CFA models had a good fit to the data, we used criteria such as root mean squared error of approximation (RMSEA) of 0.08 or less, Tucker-Lewis index (TLI) of 0.95 or greater, and Comparative Fit Index (CFI) of 0.90 or greater cut points that indicate adequate or reasonable fit.^{65–67}

The results of these analyses yielded sets of candidate items that were intended to measure underlying unidimensional constructs. Sets that consisted of at least 3 items were called “scales.” We then used IRTPRO⁶⁸ to obtain additional psychometric information for these scales at both item and scale levels, which Mplus does not provide. This scale development process primarily involved fitting a unidimensional IRT model to the candidate items that defined the construct of the scale. Local dependence statistics were used to remove redundant items. Item characteristic curves were investigated to compare candidate items based on their psychometric performance. Test information functions were also examined to evaluate the degree of measurement precision across different levels of the construct being measured. Lastly, Cronbach α was computed as a measure of internal consistency among the selected items to ensure reliability of the final scale.

Single-Item Measures

After scale development, we examined the remaining single items. If an item was removed from a potential scale, we either deleted it or used expert judgment to decide whether it should be retained as a single-item measure⁶⁹ based on the following criteria: (1) there was theoretical justification for the item based on extant literature, (2) item content was not already captured by other items in the questionnaire, and (3) the distribution of the item in the sample population was not highly skewed.

Associations Among Questionnaire Measures

Finally, we assessed concurrent, convergent, and discriminant validity of questionnaire measures by examining relationships among the final items and scales. We assessed both Pearson and polychoric correlations, depending on the response distributions of the variables.

RESULTS

Sample Characteristics

A total of 975 participants completed the questionnaire for a response rate of 52%. The median time to questionnaire completion was 22 minutes. Table 3 displays information on sample demographics and work arrangements, which are comparable with the working population on many of these measures.

The respondents ranged in age from 18 to 84 years. The sample was closely representative of the employed population 16 years and older with respect to sex (52.3% and 53.2%, respectively, for males) and for Black race of non-Hispanic ethnicity (10.5% and 11.3%, respectively).⁷⁰ However, the sample was modestly overrepresented with respect to White race of non-Hispanic ethnicity (71.3% vs 62.4%) and more noticeably underrepresented with respect to Hispanic ethnicity alone (10.9% vs 17.6%; Bureau of Labor Statistics, unpublished data, personal communication, 2021).

Nearly all respondents (94.5%) completed high school, and 43.8% possessed a bachelor's or higher degree. Most respondents were in standard work arrangements (80.6%) and worked full-time (76.7%). Nearly 46% of the respondents reported working in their present job between 1 and 10 years. Based on US Bureau of Labor Statistics data, our sample closely mirrored the US national workforce in most of these characteristics. In 2016, 92% and 39% of the US workforce 25 years and older completed high school or held a bachelor's or higher degree, respectively.⁷¹ In 2017, 89.9% of workers (aged >16 years) reported a standard work arrangement and 77.8% worked full-time.^{72,73} In addition, based on 2020 data, 68% of employed

workers (aged >16 years) claimed 9 or fewer years of tenure with their current employer.⁷⁴

The 5 most frequently reported industries among the 24 categories in which the respondents worked included: health care and social assistance (11.4%); educational services (10.8%); retail trade (7.5%); manufacturing (7.3%); and professional, scientific, and technical services (7.3%). Three of these industry sectors (health care and social assistance; professional, scientific, and technical services; retail trade) also ranked among the most frequently populated industry sectors for employed workers 16 years and older in 2020.⁷⁰ The 5 most frequently reported occupations in our sample included: management (11.5%); education, training, and library (9.0%); sales and related (8.6%); office and administrative support (7.1%); and business and financial operations (5.6%). Three of these occupations (office and administrative support; sales and related; management) also ranked among the most frequently populated occupations for employed workers older than 16 years in 2020.⁷⁵

Psychometric Analyses

Results from the EFA models indicated the possibility of numerous scales that were then subjected to CFA in Mplus and IRT using IRTPRO to further investigate and refine models for scales within each domain and subdomain. Table 4 shows the final content of the scales we derived and the final structure of the NIOSH WellBQ, including all scales, indices, and single-item constructs. The CFI and TLI values ranged from 0.93 to 1, indicating adequate to excellent fit. The RMSEA—another commonly used model fit statistic—varied from close fit (<0.06) to suboptimal (>0.08) in several cases, but the latter outcome could be subject to several conditions as addressed more fully in the discussion. Cronbach α values exceeded 0.8 in most cases and fell below 0.7 for only 1 scale, indicating sound internal consistency of scales.

Table 5 presents the coefficients for correlations of all but 2 of the full set of questionnaire measures (experience of workplace physical violence and injury were excluded for reason of low affirmative responses) with select satisfaction, health, safety, and performance measures. Also included in Table 5 is a single-item measure of job stress, which is not a stand-alone questionnaire measure, but rather an element of the "Overall Stress" measure. Inspection of Table 5 reveals meaningful correlations⁷⁶ among many of these measures, providing examples of concurrent, convergent, and discriminant validity of questionnaire items. We summarize and interpret these correlations in the discussion.

The final instrument consists of 126 items. Sixty-one items were removed from the pilot version of the instrument based on the interpretation of results from the psychometric analyses. As shown in Table 4, the final 126 items are divided among 24 subdomains and 52 subdomain constructs. Altogether, we developed 5 indices and 16 scales that included at least 2 items. The final instrument also includes 31 single items across the 5 domains.

In summary, the work evaluation and experience domain includes 4 scales and 10 single items. The workplace policies and culture domain includes 3 scales, 2 indices, and 3 single items. The workplace physical environment and safety climate domain includes 4 scales and 3 single items. The health status domain includes 4 scales, 2 indices, and 13 single items. Finally, the home, community, and society domain includes 1 scale, 1 index, and 2 single items.

Compared with the pilot questionnaire, the final questionnaire retained all subdomains and most of the subdomain constructs. The main changes involved deletions of items pertaining to the following subdomain constructs: organizational pride, coworker appreciation, satisfaction with health programs and benefit types, satisfaction with supervisors and coworkers, and satisfaction with engagement in activities outside of work. These items were removed for 1 or more of the following reasons: (1) poor statistical quality as described previously,

TABLE 3. Sample Characteristics*

Characteristic	Demographic category	n	%
Age	18–29 yr	163	16.7
	30–44 yr	273	28.0
	45–59 yr	345	35.4
	>60 yr	194	19.9
Sex	Male	510	52.3
	Female	465	47.7
Race/ethnicity	Non-Hispanic White	695	71.3
	Non-Hispanic Black	102	10.5
	Non-Hispanic other	72	7.4
	Hispanic	106	10.9
Education	Less than high school	54	5.5
	High school	232	23.8
	Some college	262	26.9
	Bachelor's degree or higher	427	43.8
Household income	<\$25,000	76	7.8
	\$25,000–\$74,999	340	34.8
	\$75,000–\$149,999	353	36.2
	≥\$150,000	206	21.1
Region	Northeast	190	19.5
	Midwest	208	21.3
	South	347	35.6
	West	230	23.6
Work arrangement	Independent or freelance	151	15.5
	On-call only	14	1.4
	Temporary	10	1.0
	Contract worker	14	1.4
	Standard work arrangement	786	80.6
Full or part-time	Full-time	748	76.7
	Part-time	227	23.3
Job duration	<1 yr	191	19.6
	1–10 yr	448	45.9
	11–20 yr	217	22.3
	>20 yr	119	12.2

*Data were obtained from the GFK KnowledgePanel®.

TABLE 4. Final Items and Scales and Reliability and Model Fit Statistics for the NIOSH WellBQ

Subdomain	Construct	Item(s)	α^*	RMSEA	CFI	TLI
Domain 1: Work evaluation and experience						
Satisfaction	Job satisfaction	Single item				
	Wage satisfaction	Single item				
	Benefits satisfaction	Single item				
	Advancement satisfaction	Single item				
Support at work	Supervisor support	Single item				
	Coworker support	Single item				
Evaluation of work conditions	Job security	Single item				
	Job autonomy	Single item				
	Time paucity/work overload	Single item				
Meaning	Meaningful work	2-item scale	0.84			
Affect	Work-related positive affect	4-item scale	0.87	0.22	0.98	0.93
	Work-related negative affect	4-item scale	0.79	0.15	0.98	0.94
Fatigue	Work-related fatigue	Single item				
Job engagement	Job engagement (absorption; vigor; inspiration)	3-item scale	0.80		NA†	
Domain 2: Workplace policies and culture						
Supportive work culture	Supportive work culture (respect; recognition; perceived organizational support)	5-item scale	0.91	0.08	0.99	0.99
Health culture at work	Management trust	Single item				
	Health culture at work	2-item scale	0.78			
	Availability of health programs at work	7-item index	NA‡			
Benefits	Availability of job benefits	14-item index	NA‡			
Organization of work and life	Work to nonwork conflict	Single item				
	Nonwork to work conflict	Single item				
	Workplace/schedule flexibility	2-item scale	0.71			
Domain 3: Workplace physical environment and safety climate						
Safety climate	Overall workplace safety	Single item				
	Workplace safety climate	6-item scale	0.90	0.10	0.99	0.99
Physical work environment satisfaction	Physical work environment satisfaction (environmental conditions; physical surroundings; pleasantness; disability and other accommodations)	4-item scale	0.87	0.08	1.0	0.99
Interpersonal conflict and incivility	Discrimination	3-item scale	0.82		NA†	
	Work-related sexual harassment	Single item				
	Work-related physical violence	Single item				
	Work-related bullying	2-item scale	0.61			
Domain 4: Health status						
General health	Overall health	Single item				
Physical health	Days of poor physical health	Single item				
	Chronic health conditions	9-item index	NA‡			
	Insomnia	Single item				
Mental health	Days of poor mental health	Single item				
	Overall stress (health, finance, relationships, work)	4-item scale	0.80	0.02	1.0	1.0
	Poor mental health (feeling depressed, anxious)	4-item scale	0.85	0.15	0.99	0.97
Health behavior	Physical activity	2-item scale	0.78			
	Tobacco use	5-item index	NA‡			
	Alcohol consumption	Single item				
	Risky drinking	Single item				
	Healthy diet	Single item				
	Sleep hours	Single item				
	Sleepy at work	Single item				
	Cognitive functioning limitations	Single item				
Functioning	Work limitations	Single item				
	Productivity	4-item scale	0.87	0.23	0.98	0.95
	Work-related injury	Single item				
Injury	Work-related injury	Single item				
	Injury consequence	Single item				
Domain 5: Home, community, and society						
Life satisfaction	Life satisfaction	Single item				
Financial insecurity	Financial insecurity	2-item scale	0.80			
Social relationships	Support outside of work	Single item				
Activities outside of work	Activities outside of work	7-item index	NA‡			

* α calculated for scales with 2 or more items.

†Model fit could not be calculated because model is saturated.

‡ α and model fit not available because the measure is an index.

TABLE 5. Correlations Among Select Scales and Items in the NIOSH WellBQ

	Job Satisfaction*	Life Satisfaction*	Work-Related Positive Affect	Work-Related Negative Affect	Job Stress Single Item*	Overall Stress	Poor Mental Health	Days of Poor Mental Health*	Days of Poor Physical Health*	Overall Health*	Overall Workplace Safety*	Productivity (Low)
Domain 1: Work evaluation and experience												
Job satisfaction*	1.00	0.49	0.53	-0.43	-0.39	-0.28	-0.26	-0.28	-0.18	0.27	0.38	-0.21
Wage satisfaction*	0.55	0.40	0.31	-0.28	-0.23	-0.24	-0.18	-0.17	-0.15	0.22	0.35	-0.12
Benefit satisfaction*	0.42	0.39	0.27	-0.21	-0.14	-0.18	-0.19	-0.17	-0.14	0.24	0.35	-0.07
Advancement satisfaction*	0.63	0.41	0.37	-0.33	-0.31	-0.29	-0.25	-0.28	-0.18	0.22	0.34	-0.18
Supervisor support*	0.52	0.21	0.28	-0.27	-0.26	-0.15	-0.17	-0.18	-0.12	0.13	0.38	-0.13
Coworker support*	0.40	0.28	0.30	-0.26	-0.23	-0.18	-0.17	-0.13	-0.05	0.14	0.26	-0.12
Job security*	0.44	0.28	0.31	-0.23	-0.22	-0.21	-0.19	-0.18	-0.08	0.19	0.32	-0.16
Job autonomy*	0.44	0.24	0.29	-0.21	-0.16	-0.11	-0.11	-0.16	-0.05	0.16	0.26	-0.09
Time paucity/work overload*	-0.15	-0.06	-0.18	0.28	0.30	0.16	0.11	0.13	0.05	-0.04	-0.08	0.22
Meaningful work	0.50	0.27	0.44	-0.25	-0.15	-0.14	-0.12	-0.14	-0.08	0.15	0.16	-0.17
Work-related positive affect	0.53	0.37	1.00	-0.36	-0.26	-0.20	-0.28	-0.24	-0.16	0.27	0.21	-0.23
Work-related negative affect	-0.43	-0.33	-0.36	1.00	0.60	0.56	0.49	0.40	0.21	-0.25	-0.23	0.42
Work-related fatigue*	-0.32	-0.28	-0.15	0.59	0.48	0.41	0.31	0.29	0.25	-0.21	-0.21	0.25
Job engagement	0.55	0.37	0.69	-0.29	-0.18	-0.17	-0.21	-0.18	-0.09	0.25	0.24	-0.20
Domain 2: Workplace policies and culture												
Supportive work culture	0.58	0.30	0.50	-0.50	-0.38	-0.31	-0.24	-0.21	-0.14	0.21	0.44	-0.20
Management trust*	0.58	0.27	0.41	-0.43	-0.37	-0.26	-0.18	-0.19	-0.09	0.20	0.49	-0.16
Health culture at work	0.46	0.31	0.42	-0.39	-0.29	-0.28	-0.24	-0.20	-0.11	0.18	0.38	-0.15
Availability of job benefits	0.11	0.13	0.09	-0.01	0.08	-0.02	-0.13	-0.07	-0.07	0.09	0.09	-0.13
Availability of health programs at work	0.12	0.09	0.07	-0.05	0.01	-0.05	-0.07	-0.03	-0.06	0.12	0.10	-0.07
Work to nonwork conflict*	-0.23	-0.21	-0.14	0.40	0.51	0.39	0.22	0.24	0.14	-0.11	-0.17	0.24
Nonwork to work conflict*	-0.09	-0.14	-0.05	0.24	0.28	0.29	0.20	0.27	0.19	-0.04	-0.02	0.32
Workplace/schedule flexibility	0.25	0.17	0.20	-0.21	-0.18	-0.16	-0.08	-0.09	-0.01	0.10	0.25	0.01
Domain 3: Workplace physical environment and safety climate												
Overall workplace safety*	0.38	0.25	0.21	-0.23	-0.16	-0.12	-0.13	-0.07	-0.17	0.14	1.00	-0.09
Workplace safety climate	0.37	0.23	0.31	-0.29	-0.25	-0.21	-0.18	-0.15	-0.13	0.18	0.49	-0.12
Physical work environment satisfaction	0.39	0.30	0.38	-0.36	-0.30	-0.24	-0.22	-0.19	-0.17	0.20	0.48	-0.16
Discrimination	-0.23	-0.21	-0.26	0.21	0.13	0.12	0.26	0.09	0.06	-0.07	-0.30	0.20
Work-related sexual harassment*	-0.13	-0.36	-0.10	0.08	0.11	0.05	0.11	0.08	0.10	0.11	-0.35	0.02
Work-related bullying	-0.29	-0.20	-0.15	0.31	0.33	0.32	0.30	0.27	0.15	-0.09	-0.22	0.18
Domain 4: Health status												
Overall health*	0.27	0.43	0.27	-0.25	-0.24	-0.37	-0.30	-0.39	-0.41	1.00	0.14	-0.19
Days of poor physical health*	-0.18	-0.31	-0.16	0.21	0.30	0.35	0.32	0.56	1.00	-0.41	-0.17	0.19
Chronic health conditions	-0.04	-0.15	-0.02	0.17	0.16	0.27	0.30	0.24	0.23	-0.32	-0.03	0.14
Insomnia*	-0.15	-0.35	-0.08	0.16	0.23	0.25	0.24	0.27	0.33	-0.41	-0.11	0.16
Days of poor mental health*	-0.28	-0.48	-0.24	0.42	0.49	0.52	0.63	1.00	0.56	-0.39	-0.07	0.33
Overall stress	-0.28	-0.39	-0.20	0.56	0.80	1.00	0.55	0.52	0.37	-0.37	-0.12	0.48
Poor mental health	-0.26	-0.42	-0.28	0.49	0.46	0.55	1.00	0.64	0.32	-0.30	-0.13	0.37
Physical activity	0.08	0.13	0.13	-0.04	-0.06	-0.10	-0.04	-0.03	-0.03	0.30	0.03	-0.04
Tobacco use	-0.06	-0.19	-0.06	0.14	0.10	0.16	0.24	0.10	0.08	-0.16	-0.08	0.24

Continued next page

TABLE 5. (Continued)

	Job Satisfaction*	Life Satisfaction*	Work-Related Positive Affect	Work-Related Negative Affect	Job Stress Single Item*	Overall Stress	Poor Mental Health	Days of Poor Mental Health*	Days of Poor Physical Health*	Overall Health*	Overall Workplace Safety*	(Low) Productivity
Alcohol consumption (heavy drinking in a week)*	-0.05	-0.10	0.01	0.06	0.17	0.03	0.05	0.12	0.05	-0.09	-0.07	0.05
Risky drinking (on a single day in the past year)*	-0.11	-0.16	-0.03	0.16	0.19	0.16	0.09	0.17	0.06	-0.06	-0.02	0.09
Healthy diet*	0.06	0.23	0.16	-0.04	0.01	-0.02	-0.08	-0.06	-0.04	0.26	0.11	-0.08
Sleep hours (risky sleep hours)*	-0.14	-0.18	-0.09	0.08	0.10	0.10	0.13	0.24	0.19	-0.23	-0.15	0.08
Sleepy at work*	-0.25	-0.26	-0.23	0.33	0.37	0.39	0.33	0.41	0.46	-0.26	-0.19	0.36
Cognitive functioning limitations*	-0.27	-0.50	-0.28	0.40	0.42	0.46	0.61	0.66	0.46	-0.44	-0.20	0.46
Work limitations*	-0.15	-0.46	-0.16	0.21	0.25	0.28	0.38	0.44	0.46	-0.47	-0.16	0.31
(Low) productivity	-0.21	-0.26	-0.23	0.42	0.40	0.48	0.37	0.33	0.19	-0.19	-0.09	1.00
Domain 5: Home, community, and society												
Life satisfaction*	0.49	1.00	0.37	-0.33	-0.30	-0.39	-0.42	-0.48	-0.31	0.43	0.25	-0.26
Financial insecurity	-0.27	-0.48	-0.27	0.32	0.33	0.54	0.40	0.36	0.23	-0.34	-0.18	0.27
Support outside of work*	0.28	0.54	0.30	-0.21	-0.20	-0.23	-0.30	-0.27	-0.10	0.31	0.27	-0.16
Activities outside of work	0.16	0.29	0.28	-0.06	-0.04	-0.05	-0.15	-0.11	-0.03	0.21	0.11	0.05

Cell n exceeds 950 in the vast majority of cases and does not fall below 775. Statistically significant coefficients (ie, $P < 0.05$) are denoted by bold font. These coefficients are highly significant ($P < 0.001$) in the vast majority of cases. Correlations between variables with asterisks are polychoric correlations; all others are Pearson product-moment correlations.

(2) redundancy with other included constructs (eg, coworker appreciation and satisfaction overlapped with coworker support), and (3) weak associations with other questionnaire measures with which they would be expected to correlate. We also created 2 new, single-item constructs in the final questionnaire: insomnia and work-related fatigue. Items representing these constructs were originally embedded within the chronic health conditions index (insomnia) and the work-related negative affect (fatigue) scale in the pilot questionnaire, but we separated them to elevate their importance as indicators of worker well-being. For some items, we made minor revisions to wording based on an overall assessment of the instrument and expert judgment to further improve item clarity and consistency across the entire instrument.

The final NIOSH WellBQ content and coding algorithms are shown in the “NIOSH WellBQ User Guide and Codebook” (<https://www.cdc.gov/niosh/twh/wellbq/default.html>).² Also included with the instrument are 15 optional items: 5 covering employment status and characteristics and 10 pertaining to worker demographic characteristics.

DISCUSSION

This article describes the development and validation of the NIOSH WellBQ as a self-report survey instrument to broadly assess worker well-being. The occupational safety and health field has witnessed growing interest in well-being as a multidimensional concept that broadly reflects the overall quality of workers’ lives. An assessment tool for worker well-being would find numerous applications in research, policy, and practice. It would provide an ability to better understand overall quality of life across different worker populations, organizations, occupations, and industrial sectors, and it would allow for investigation of the effects of policy and practice interventions to improve worker well-being. However, a widely agreed-upon framework and tool for characterizing worker well-being has yet to emerge. The NIOSH WellBQ was developed to address this gap.

Several attributes of the NIOSH WellBQ speak to its psychometric quality. First, questionnaire items were drawn from well-established instruments for measurement of constructs of interest (face validity). Second, items captured a broad cross-section of recognized indicators of well-being (content validity). Third, as detailed hereinafter, factor analyses yielded constructs with strong fit and internal consistency. Lastly, as described hereinafter, relationships among questionnaire measures were consistent with theory and expectations from the literature (concurrent, convergent, and discriminant validity).

As seen in Table 4, values for measures of scale internal consistency (α) are strong, and CFI and TLI model fit statistics tend to be very good (>0.93). Although RMSEA values vary from a close fit (<0.06) to suboptimal (>0.08), this inconsistency is not overly concerning. The NIOSH WellBQ item responses are mostly categorical, and there is some precedent that the RMSEA measure of model fit is more appropriate for continuous data than for categorical data.⁷⁷ Monroe and Cai⁷⁷ further show that the magnitude of RMSEA estimates is highly dependent on the number of response categories, which is small for most of the NIOSH WellBQ items.

The bivariate associations between scales and items shown in Table 5 are consistent with theory and observations from extant occupational health research.^{78–81} Because of space constraints, we do not interpret all these correlations here; rather, we focus on addressing the associations that are especially relevant to establishing validity of the instrument. Inspection of Table 5 shows, for example, that job satisfaction had moderate to reasonably strong positive correlations with most positive aspects of working conditions across domains 1 to 3 (wage, benefit, and advancement satisfaction; supervisor and coworker support; job security and autonomy; meaningful work; job engagement; supportive work culture; management trust; health culture at work; workplace/schedule flexibility; safety climate; and physical environment satisfaction). Job satisfaction also had moderate negative correlations with most negative aspects of work across these domains (work

to nonwork conflict; work-related bullying; and discrimination). These observations are highly consistent with conventional wisdom in work, stress, and health research^{78–81} and therefore supportive of concurrent validity.

Similarly, Table 5 shows modest to reasonably strong associations in expected directions between life satisfaction and domain 5 indicators of conditions external to work. Life satisfaction is positively associated with the degree of support outside of work and breadth of activities outside of work and negatively associated with financial insecurity. As would be expected, life satisfaction also bears a reasonably strong association with overall health and moderate to strong negative associations with many measures of poor physical and mental health and with cognitive and work limitations. Of interest regarding discriminant validity, correlations of job satisfaction with domain 1 to 3 measures of working conditions in all but 3 cases (availability of job benefits, nonwork to work conflict, and work-related sexual harassment) are stronger than the correlations of life satisfaction with these measures. In addition, correlations of life satisfaction with domain 5 measures of circumstance outside of work are all stronger than the correlations of job satisfaction with these measures.

The pattern of correlations for work-related positive affect across domains 1 to 3 perfectly parallels the pattern seen for job satisfaction, with moderate to reasonably strong positive correlations for most positive features of work and modest negative correlations for most negative features. As would be expected, the pattern of correlations for work-related negative affect was the mirror image of that seen for work-related positive affect, showing moderate negative correlations with most positive features of work and moderate positive correlations with most negative features.

The pattern of associations of job satisfaction and work-related affect with domain 1 to 3 measures of working conditions repeats for all other health measures. Except for the association with sexual harassment, the polarity of correlations of overall health with all domain 1 to 3 measures aligns perfectly with the polarity of correlations of job satisfaction and positive affect with these measures, although the magnitude is reduced. The polarity of the remaining measures corresponding to stress and poor physical and mental health align almost perfectly with the polarity of work-related negative affect with these measures. In relation to these findings, what is of further interest from a validity perspective is that the correlations between domain 1 to 3 measures of working conditions and health outcomes tend to weaken for downstream or more distal health outcomes. As exemplars of this trend, the correlations between supportive work culture and work-related positive affect, negative affect, and the single job stress item are strong: 0.50, –0.50, and –0.38, respectively. However, the correlation magnitudes of supportive work culture with overall stress and days of poor physical and mental health diminish to –0.31, –0.14, and –0.21, respectively.

Evidence of concurrent validity comes too from associations among other measures, a sampling of which includes the following. Consistent with observations from previous research,^{82,83} job satisfaction bears a strong positive association with work-related positive affect and negative association with work-related negative affect. Workers' perceptions of workplace safety were positively and strongly associated with a supportive work culture, management trust, a strong safety climate, and satisfaction with the physical work environment. In addition, low productivity is strongly associated with higher levels of work limitations, cognitive limitations, sleepiness at work, and high levels of job stress and overall stress.

Finally, evidence for validity is seen too in the convergence of NIOSH WellBQ measures. Inspection of Table 5 shows, for example, that intercorrelations among measures tapping different aspects of negative mental health (work-related negative affect, single job stress item, overall stress, poor mental health, and days of poor mental health) are strong in most cases, ranging from 0.42 to 0.80. However, they are sufficiently distant from unity to ensure that they are conceptually different. Respectable correlations are also seen between days of poor

physical and mental health and ratings of overall health (–0.41 and –0.39, respectively) and between the number of chronic conditions and ratings of overall health (–0.32).

To summarize, although we cannot rule out some inflation of the sizes of the correlations featured here or shown in Table 5 because of the cross-sectional nature of the data set, the NIOSH WellBQ measures behave largely as expected based on theory and extant literature, which strongly supports the validity of the instrument.

Summary of NIOSH WellBQ Strengths

There are considerable strengths to the NIOSH WellBQ and its approach toward the measurement of worker well-being. The instrument content is theoretically driven and based on extant concepts of well-being. The instrument is composed of a broad cross-section of well-being measures across multiple dimensions, both work related and not, following from an expansive review of the occupational stress, health, and well-being literature and consultation with a panel of subject-matter experts. This framework for the NIOSH WellBQ is consistent with contemporary understanding of well-being as a multifaceted phenomenon as opposed to a singular construct and lends itself to a “dashboard” approach to characterizing well-being as opposed to a composite metric.⁸⁴ In this sense, it mirrors Seligman's conceptualization of well-being as a construct like the weather,⁸⁵ that is, to understand weather, no single metric suffices. Rather, multiple indicators or dimension are assessed, such as ambient temperature, cloud cover, precipitation, humidity, and others.

Also consistent with well-being theory, the NIOSH WellBQ captures not only the negative threats to quality of life and work life (eg, financial insecurity and time paucity/work overload) but also positive aspects and health assets that promote thriving (eg, activities outside of work and meaningful work). Both subjective and objective measures were also included in the instrument. Life satisfaction, affective states at work, and job satisfaction are examples of subjective evaluations of quality of life and work life, and direct ratings of conditions at work and outside of work (eg, job autonomy and support outside of work) are examples of objective measures that represent resources essential to achieving well-being. Yet the instrument is brief enough to enable and encourage practical workplace application as well as research use and it is sufficiently generic to have application across multiple occupations, industry sectors, and worker populations.

Finally, as described, the NIOSH WellBQ exhibits strong psychometric properties. Scale reliability (internal consistency) and most model fit statistics exceed thresholds for adequacy, and relationships among measures conform nicely with theory and experience, providing evidence of concurrent, convergent, and discriminant validity for the instrument, in addition to the instrument face and content validity.

The NIOSH WellBQ Limitations and Future Directions

The NIOSH WellBQ has certain limitations that can be addressed through further use and application of the questionnaire in a variety of workplace settings and worker populations. Current evidence for the instrument's validity rests upon psychometric analyses and inspection of correlations among measures intrinsic to the questionnaire using cross-sectional data from our pilot study. Further application of the NIOSH WellBQ in diverse worker populations and workplace settings is recommended to verify its psychometric properties. Prospective studies to investigate its association with individual, organizational, or societal outcomes (eg, absenteeism, presenteeism, organizational performance, and health care costs and utilization) would be useful to further establish its predictive validity and reliability. In relation to this, further psychometric study of the instrument might lead to elimination of less salient items and shortening of the instrument.

In addition, although well-being theory and the dashboard approach toward characterizing well-being argue against composite measures of well-being, data gathered from further application of the

NIOSH WellBQ may allow for the development of algorithms to reduce its complexity and facilitate interpretation by creation of summary or higher-order measures within domains. Accumulation of NIOSH WellBQ data would also aid data interpretation by enabling the development of norms and comfort zones for values of measures across industries, occupations, and worker populations. At present, inferences regarding the status of worker well-being and intervention needs can be drawn only from examination of worker responses to individual questions and scale scores and from profiles of these values across NIOSH WellBQ measures of interest. It is worth noting that many of these types of limitations are commonly seen with new instruments at this current stage of development.

To develop the questionnaire, we performed a broad-level literature review and consulted with subject-matter experts as noted to identify instruments, scales, and questions that would be inclusive of salient constructs generally applicable across occupations, industries, and worker populations. However, despite our efforts to be comprehensive, the NIOSH WellBQ might lack specificity regarding key well-being indicators in some circumstances at work or outside of work. For example, industries such as construction or agriculture that have high injury rates may benefit from the addition of more targeted items on safety and injury, and emerging conditions of work, such as nonstandard work, may require some future adjustment of instrument content as well. We fully appreciate that these circumstances may rightfully call for judicious changes to the NIOSH WellBQ content as situations demand. We emphasize “judicious” because addition of items could result in a questionnaire that becomes unduly burdensome and have low response rates or is seldom used, and tinkering with NIOSH WellBQ content may diminish comparability of observations with normative data or data obtained in other settings. Only through further application of the NIOSH WellBQ will the need for adaptation of its organization and content be revealed.

CONCLUSIONS

The development and application of the NIOSH WellBQ represent the next step in an exciting new area for worker safety, health, and well-being research and practice. The NIOSH WellBQ is a comprehensive instrument for measuring multiple dimensions of worker well-being. It comprises many established and validated scales in the literature and draws from multiple theories about the nature of well-being as well as fundamental principles of occupational safety and health. The NIOSH WellBQ is intended for organizations, workers, researchers, and anyone interested in a holistic understanding of worker well-being. It was developed to be a tool for assessment as well as policy and program development, implementation, and evaluation. It is important to note, however, that the instrument does not allow, nor was it designed to make, absolute or clinical judgments of well-being at the individual worker level, nor are there firm thresholds for scores that would signal actions to affect worker well-being. Although the NIOSH WellBQ has been rigorously designed and evaluated, research that adds to the validation findings would only strengthen its application. As the world of work grows more uncertain, especially in light of the COVID-19 pandemic, the investments organizations make in their workforce become even more important for individuals, organizations, communities, and society. Implementing the measurement of well-being may help ensure that workers everywhere can flourish and thrive.

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