

OPEN

Development of the NIOSH Worker Well-Being Questionnaire (WellBQ)

Ramya Chari, PhD¹, Steven L. Sauter, PhD², Elizabeth L. Petrun Sayers, PhD^{1,3}, Wenjing Huang, PhD⁴, Gwenith G. Fisher, PhD^{5,6}, Chia-Chia Chang, MPH, MBA⁷

¹RAND Corporation, Arlington, VA, USA

²Advanced Technologies and Laboratories International, Inc, Gaithersburg, MD, USA

³Food and Drug Administration, Silver Spring, MD, USA

⁴RAND Corporation, Santa Monica, CA, USA

⁵Colorado State University, Fort Collins, CO, USA

⁶Colorado School of Public Health, Aurora, CO, USA

⁷National Institute for Occupational Safety and Health, Washington, DC, USA

Corresponding author:

Chia-Chia Chang

National Institute for Occupational Safety and Health

395 E St SW, 9200

Washington, DC 20201

202-245-0656

cuc8@cdc.gov

Funding source:

National Institute for Occupational Safety and Health (NIOSH). NIOSH provided funding for consultation services by Sauter and Fisher. NIOSH provided funding for a contract with RAND, under which work was completed by Chari, Petrun Sayers, and Huang.

Conflict of interest:

None declared

Acknowledgements:

The authors would like to thank the members of NIOSH, the RAND Corporation, and the expert panelists who contributed to the development of the worker well-being framework and questionnaire. Funding for this study was provided by the National Institute for Occupational Safety and Health.

Ethical considerations & disclosures:

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention. The study was reviewed and approved by the RAND Corporation Institutional Review Board (FWA00003425, effective until February 18, 2026). Participants viewed an electronic consent form prior to beginning the survey.

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

ACCEPTED

Abstract

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, U.S. working population to pilot the questionnaire. Psychometric analyses were performed on data from 975 respondents to finalize items and optimize validity.

Results: The final questionnaire consists of 16 scales, five indices, and 31 single items across five 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

Introduction

In 2014, the National Institute for Occupational Safety and Health (NIOSH) *Total Worker Health*[®] (TWH) 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 paper 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.^{3,4,5,6} As noted by Schulte et al, "...some definitions focus on the state of the individual worker, whereas others focus on working conditions, and some focus on life conditions (p. e32)."⁷ 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.^{8,9,10,11,12,13,14} 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 presents 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 following^{15,16,17} 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 U.S. Although telework may be associated with certain salutogenic effects (e.g., increased worker autonomy and flexibility), it may also blur work-non-work boundaries and promote spillover of stressors between work and family.^{19,20} The dramatic increase in prevalence of remote work amidst 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 non-work 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 paper describing our 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 paper, 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 is comprised of five 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 (Figure 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 paper. (More detail on these domains is provided in the methods section and in Chari et al.²²)

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 is comprised of 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 (e.g., positive and negative affect) and evaluative (e.g., 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 (e.g., physical health, safety, social relationships). Third, well-being is realized not just 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 non-work 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,^{29,30,31} 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 upon 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 non-work 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. Lastly, 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 sub-populations, 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 five domains that comprise our worker well-being framework (see Chari et al.²² for more details on this approach). We defined the worker well-being domains as follows:

- Work evaluation and experience refers 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 refers 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 refers 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 five 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. Following a prioritization process based upon judgements 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 were 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; 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 non-standard 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 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 pre-tested with a sample of N=25 from GfK's KnowledgePanel® (described below) to ensure that users were able to answer survey items (assessed by monitoring item non-response) and the survey length (i.e., time to complete) was not excessive. No changes were made to the instrument following 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 U.S. 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 prior to 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 administrated through GfK's KnowledgePanel®, a probability-based, online panel that is designed to be representative of the civilian, noninstitutionalized U.S. population.³² KnowledgePanel® includes approximately 55,000 adults randomly recruited using home address-based sampling methods. Based upon expected KnowledgePanel® response rates, the questionnaire was sent to 1,894 panelists to ensure a sample sufficient to power the psychometric analyses. As part of participation

in the KnowledgePanel®, the panelists had already reported to be 18+ years of age and currently being employed (including self-employment) full- or part-time. This employment information was verified by the inclusion of five questions pertaining to employment arrangement, full- or part-time status, tenure in present job, and present occupation and industry. The questionnaire was fielded for two weeks between June 20 and July 4, 2018. Invitations to participate were sent via email. Up to three email reminders to non-respondents were sent three, six, and nine days following the invitation. As an incentive, participants who completed questionnaires became eligible to win prizes through a monthly GfK sweepstakes. GfK provided RAND with de-identified 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.^{58,59,60,61} 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, e.g., 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 (e.g., 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 (EFA)

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 (e.g., 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 one 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 (CFA) and Item Response Theory 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 model had a good fit to the data, we used criteria such as Root Mean Squared Error of Approximation (RMSEA) ≤ 0.08 , Tucker–Lewis index (TLI) ≥ 0.95 , and Comparative Fit Index (CFI) ≥ 0.90 cut points that indicated adequate or reasonable fit.^{65,66,67}

The results of these analyses yielded sets of candidate items that were intended to measure underlying unidimensional constructs. Sets that consisted of at least three 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’s alpha was computed as a measure of internal consistency among the selected items to ensure reliability of the final scale.

Single item measures

Following 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 upon the following criteria: (1) there was theoretical justification for the item based upon 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%. 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.

Respondents ranged in age from 18 to 84 years. The sample was closely representative of the employed population aged 16 and older with respect to sex (52.3% and 53.2% respectively for males)⁷⁰ and for Black race of non-Hispanic ethnicity (10.5% and 11.3% respectively). However,

the sample was modestly over-represented with respect to white race of non-Hispanic ethnicity (71.3% vs. 62.4%), and more noticeably under-represented with respect to Hispanic ethnicity alone (10.9% vs. 17.6%) (Bureau of Labor Statistics, unpublished data, personal communication, 2021).

Nearly all respondents (95.4%) completed high school and 43.8% possessed a bachelor's or higher degree. The majority of respondents were in standard work arrangements (80.6%) and worked full-time (76.7%). Nearly 46% of respondents reported working in their present job between 1-10 years. Based on U.S. Bureau of Labor Statistics (BLS) data, our sample closely mirrored the U.S. national workforce in most of these characteristics. In 2016, 92% and 39% of the U.S. workforce aged 25 and older completed high school or held a bachelor's or higher degree, respectively.⁷¹ In 2017, 89.9% of workers (aged 16+) reported a standard work arrangement and 77.8% worked full-time.^{72,73} And, based on 2020 data, 68% of employed workers (aged 16+) claimed nine or fewer years of tenure with their current employer.⁷⁴

The five most frequently reported industries among the 24 categories in which 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 aged 16 and older in 2020.⁷⁰ The five 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 aged 16+ 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. CFI and TLI values ranged from 0.93 to 1, indicating adequate to excellent fit. RMSEA – another commonly used model fit statistic – varied from close fit (<0.06) to sub-optimal (> 0.08) in several cases, but the latter outcome could be subject to several conditions as addressed more fully in the discussion. Cronbach alpha values exceeded 0.8 in most cases and fell below 0.7 for only one scale, indicating sound internal consistency of scales.

Table 5 presents the coefficients for correlations of all but two 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 is comprised 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 five indices and 16 scales that included at least two items. The final instrument also includes 31 single items across the five domains.

In summary, the Work Evaluation and Experience domain includes four scales and 10 single items. The Workplace Policies and Culture domain includes three scales, two indices, and three single items. The Workplace Physical Environment and Safety Climate domain includes four scales and three single items. The Health Status domain includes four scales, two indices, and 13 single items. Finally, the Home, Community, and Society domain includes one scale, one index, and two single items.

Compared to 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 one or more of the following reasons: (1) poor statistical quality as described above, (2) redundancy with other included constructs (e.g., coworker appreciation or satisfaction overlapped with coworker support), and (3) weak associations with other questionnaire measures with which they would be expected to correlate. We also created two 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 upon 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: five 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 below, factor analyses yielded constructs with strong fit and internal consistency. And lastly, as described below, 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 model fit statistics with CFI and TLI tend to be very good ($>.95$). Although RMSEA values vary from a close fit (<0.06) to sub-optimal (> 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 upon 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.^{78,79,80,81} Due to 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 1-3 (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 non-work conflict; work-related bullying; and discrimination). These observations are highly consistent with conventional wisdom in work, stress, and health research,^{78,79,80,81} 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 1-3 measures of working conditions in all but three cases (availability of job benefits, non-work to work conflict, and work-related sexual harassment) are stronger than the correlations of life satisfaction with these measures. And 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 1-3 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 1-3 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 1-3 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 1-3 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: .50, -.50 and -.38 respectively. But the correlation magnitudes of supportive work culture with overall stress and days of poor physical and mental health diminish to -.31, -.14, and -.14 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. And 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 .42 to .82. Yet, 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 (-.41 and -.39 respectively), and between the number of chronic conditions and ratings of overall health (-.32).

To summarize, while we cannot rule out some inflation of the sizes of the correlations featured here or shown in Table 5 due to the cross-sectional nature of the data set, the NIOSH WellBQ measures behave largely as expected based upon 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 upon extant concepts of well-being. The instrument is comprised 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 just the negative threats to quality of life and work life (e.g., financial insecurity and time paucity/work overload), but also positive aspects and health assets that promote thriving (e.g., 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 (e.g., 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 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.

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 (e.g., absenteeism, presenteeism, organizational performance, 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.

Additionally, 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. Yet, 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 non-standard 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 suffers from 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

Conclusion

The development and application of the NIOSH WellBQ represents 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 encompasses 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 judgements 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.

References

- 1 National Institute for Occupational Safety and Health (NIOSH), NIOSH *Total Worker Health* Program [CDC NIOSH *Total Worker Health* Program website], November 7, 2018, Available at: <https://www.cdc.gov/niosh/twh/default.html>. Accessed September 27, 2020.
- 2 National Institute for Occupational Safety and Health (NIOSH). NIOSH worker well-being questionnaire (WellBQ). By Chari R, Chang CC, Sauter SL, Petrun Sayers EL, Huang W, Fisher GG. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2021-110 (revised 5/2021); 2021.
- 3 Harvard T.H. Chan School of Public Health, Shine Sustainability and Health Initiative for NetPositive Enterprise [Harvard Shine Initiative website], no date, Available at: <https://shine.sph.harvard.edu/research/well-being-metrics/>. Accessed November 12, 2021.
- 4 Pronk N, Malan D, Gillian C, Hajat C, Yach D. Health and well-being metrics in business: the value of integrated reporting. *J Occup Environ Med*. 2018;60:19-22.
- 5 Pronk NP. Public health, business, and the shared value of workforce health and wellbeing. *Lancet*. 2019;4:E323.
- 6 Pronk NP, Stiefel MC. Leveraging the rest of society: aligning Healthy People 2030, well-being in the nation, and other national health indicators with workplace health and well-being. *Am J Health Promot*. 2020;34:461-465.
- 7 Schulte PA, Guerin RJ, Schill AL, et al. Considerations for incorporating “well-being” in public policy for workers and workplaces. *Am J Public Health*. 2015;105:e31-e44.
- 8 Kesavayuth D, Shangkhum P, Zikos V. Subjective well-being and healthcare utilization: a mediation analysis. *SSM - Popul Health*. 2021;14:100796.

- 9 Martín-María N, Miret M, Caballero FF, et al. The impact of subjective well-being on mortality: a meta-analysis of longitudinal studies in the general population. *Psychosom Med*. 2017;79:565-575.
- 10 Gandy WM, Coberley C, Pope JE, Wells A, Rula EY. Comparing the contributions of well-being and disease status to employee productivity. *J Occup Environ Med*. 2014;56:252-257.
- 11 Attridge M. Measuring and managing employee work engagement: a review of the research and business literature. *J Workplace Behav Health*. 2009;24:383-398.
- 12 Nielsen K, Nielsen M, Ogbonnaya C, Kansala M, Saari E, Isaksson K. Workplace resources to improve both employee well-being and performance: a systematic review and meta-analysis. *Work Stress*. 2017;31:101-120.
- 13 Robertson I, Cary C. *Well-being: productivity and happiness at work*. London: Palgrave Macmillan; 2011.
- 14 Adams JM. The value of worker well-being. *Public Health Rep*. 2019;134:583-586.
- 15 Hymel PA, Loeppke RR, Baase CM, et al. Workplace health protection and promotion: a new pathway for a healthier -and safer-workforce. *J Occup Environ Med*. 2011;53:695-702.
- 16 Hudson HL, Nigam JAS, Sauter SL, Chosewood C, Schill AL, Howard J. *Total Worker Health*. Washington, DC: American Psychological Association; 2019.
- 17 Institute of Medicine. *Integrating employee health: a model program for NASA*. Washington, DC: The National Academies Press; 2005.
- 18 U.S. Bureau of Labor Statistics. The number of people who can telework is higher than was estimated [Monthly labor review website], June 2020, Available at: <https://www.bls.gov/opub/mlr/2020/beyond-bls/the-number-of-people-who-can-telework-is-higher-than-was-estimated.htm>. Accessed September 28, 2020.

- 19 Standen P, Daniels K, Lamond D. The home as a workplace: Work-family interaction and psychological well-being in telework. *J Occup Health Psychol.* 1999;4:368-381.
- 20 Tavares AI. Telework and health effects review. *Int J Healthc.* 2017;3:30-36.
- 21 Nobrega S, Adigwe A. COVID-19 workplace preparedness resources: a *Total Worker Health* perspective. *Newsletter for the Society for Occupational Health Psychology.* 2020;23(Summer Edition):5-6.
- 22 Chari R, Chang CC, Sauter SL, et al. Expanding the paradigm of occupational safety and health: a new framework for worker well-being. *J Occup Environ Med.* 2018;60:589-593.
- 23 Cooke PJ, Melchert TP, Connor K. Measuring well-being: a review of instruments. *Couns Psychol.* 2016;44:730-757.
- 24 Weziak-Bialowolska D, Bialowolski P, Sacco PL, VanderWeele TJ, McNeely E. Well-being in life and well-being at work: which comes first? Evidence from a longitudinal study. *Front Public Health.* 2020;8:103.
- 25 National Research Council. Subjective well-being: measuring happiness, suffering, and other dimensions of experience. Washington, DC: The National Academies Press; 2013.
- 26 Sen AK. Development as freedom. Oxford, UK: Oxford University Press; 1999.
- 27 Sears LE, Agrawal S, Sidney JA, et al. The well-being 5: development and validation of a diagnostic instrument to improve population well-being. *Popul Health Manag.* 2014;17:357-365.
- 28 Harter JK, Gurley VF. Measuring well-being in the United States. *Observer Magazine, Association for Psychological Science*; September 2008.

- 29 Maestas N, Mullen KJ, Powell D, von Wachter T, Wenger JB. Working conditions in the United States: results of the 2015 American working conditions survey. Santa Monica: RAND Corporation; 2017:1-79.
- 30 European Working Conditions Survey (EWCS), About Eurofound surveys [Eurofound website], 2020, Available at: <https://www.eurofound.europa.eu/surveys/about-eurofound-surveys/>. Accessed September 27, 2020.
- 31 Copenhagen Psychosocial Questionnaire (COPSOQ), COPSOQ – what is it? [COPSOQ international network website], 2020, Available at <https://www.copsoq-network.org/>. Accessed September 27, 2020.
- 32 Ipsos, Public Affairs: KnowledgePanel [IPSOS KnowledgePanel website], 2020, Available at <https://www.ipsos.com/en-us/solutions/public-affairs/knowledgepanel>. Accessed September 27, 2020.
- 33 National Institute for Occupational Safety and Health (NIOSH), Quality of Worklife Questionnaire [CDC NIOSH Workplace safety and health topics website], August 29, 2013, Available at <https://www.cdc.gov/niosh/topics/stress/qwlquest.html>. Accessed September 27, 2020.
- 34 Quinn RP, Staines GL. The 1977 quality of employment survey: descriptive statistics, with comparison data from the 1969-70 and the 1972-73 surveys. Ann Arbor, Michigan: Institute for Social Research; 1979.
- 35 Caplan RD, Cobb S, French Jr JRP, Harrison RV, Pinneau Jr SR. Job demands and worker health: main effects and occupational differences. Washington, DC: CDC NIOSH; 1975.
- 36 Zohar D, Luria G. A multilevel model of safety climate: cross-level relationships between organization and group-level climates. *J Appl Psychol*. 2005;90:616-628.

- 37 Hahn SE, Murphy LR. A short scale for measuring safety climate. *Saf Sci*. 2008;46:1047-1066.
- 38 Cortina LM, Magley VJ, Williams JH, Langhout RD. Incivility in the workplace: incidence and impact. *J Occup Health Psychol*. 2001;6:64-80.
- 39 Vocational Psychology Research, Minnesota Satisfaction Questionnaire (MSQ) [MSQ questionnaire website], 2020, Available at <http://vpr.psych.umn.edu/instruments/msq-minnesota-satisfaction-questionnaire>. Accessed September 27, 2020.
- 40 U.S. Centers for Disease Control and Prevention (CDC), Workplace health promotion [CDC assessment tools website], January 22, 2020, Available at <https://www.cdc.gov/workplacehealthpromotion/tools-resources/workplace-health/assessment-tools.html>. Accessed September 27, 2020.
- 41 Eisenberger R, Huntington R, Hutchinson S, Sowa D. Perceived organizational support. *J Appl Psychol*. 1986;71:500-507.
- 42 Shockley KM, Allen TD. When flexibility helps: another look at the availability of flexible work arrangements and work-family conflict. *J Vocat Behav*. 2007;71:479-493.
- 43 Siegrist J, Li J, Montano D. Psychometric properties of the effort-reward imbalance questionnaire. Germany: Duesseldorf University; 2014.
- 44 Van der Doef M, Maes S. The Leiden quality of work questionnaire: its construction, factor structure, and psychometric qualities. *Psychol Rep*. 1999;85:954-962.
- 45 Zweber ZM, Henning RA, Magley VJ. A practical scale for multi-faceted organizational health climate assessment. *J Occup Health Psychol*. 2016;21:250-259.
- 46 Macdonald S, MacIntyre P. The generic job satisfaction scale: scale development and its correlates. *Employee Assistance Quarterly*. 1997;13:1-16.

- 47 Health Enhancement Research Organization (HERO) and Population Health Alliance, HERO scorecard [HERO scorecard website], 2020, Available at <https://hero-health.org/hero-scorecard/>. Accessed September 27, 2020.
- 48 U.S. Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS), National Health and Nutrition Health Examination Survey (NHANES) [NCHS NHANES website], September 17, 2020, Available at <https://www.cdc.gov/nchs/nhanes/index.htm>. Accessed September 27, 2020.
- 49 Kroenke K, Spitzer RL, Williams JBW, Lowe B. An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics*. 2009;50:613-621.
- 50 Kessler RC, Barber C, Beck AL, et al. The World Health Organization health and work performance questionnaire (HPQ). *J Occup Environ Med*. 2003;45:156-174.
- 51 U.S. Centers for Disease Control and Prevention (CDC), Behavioral Risk Factor Surveillance System (BRFSS) [CDC BRFSS website], August 31, 2020, Available at <https://www.cdc.gov/brfss/index.html>. Accessed September 27, 2020.
- 52 Van Katwyk PT, Fox S, Spector PE, Kelloway EK. Using the job-related affective well-being scale (JAWS) to investigate affective responses to work stressors. *J Occup Health Psychol*. 2000;5:219-230.
- 53 Andrews FM, Withey SB. Social indicators of well-being: Americans' perceptions of life quality. New York: Plenum Press; 1976.
- 54 Spector PE. Measurement of human service staff satisfaction: development of the job satisfaction survey. *Am J Community Psychol*. 1985;13:693-713.
- 55 Steger MF, Dik BL, Duffy RD. Measuring meaningful work: the work and meaning inventory (WAMI). *J Career Assess*. 2012;20:322-337.

- 56 Schaufeli WB, Bakker AB, Salanova M. The measurement of work engagement with a short questionnaire: a cross-national study. *Educ Psychol Meas.* 2006;66:702-716.
- 57 U.S. Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS), National health interview survey [CDC NCHS website], September 23, 2020, Available at <https://www.cdc.gov/nchs/nhis/index.htm>. Accessed September 28, 2020.
- 58 Cella D, Gershon R, Lai JS, Choi S. The future of outcomes measurement: item banking, tailored short-forms, and computerized adaptive assessment. *Qual Life Res.* 2007;16:133-141.
- 59 DeWalt DA, Rothrock N, Yount S, Stone AA. Evaluation of item candidates: the PROMIS qualitative item review. *Med Care.* 2007;45:S12-S21.
- 60 DeVellis RF. *Scale development: theory and applications* (Vol. 26). Thousand Oaks, CA: Sage Publications; 2016.
- 61 Stanton JM, Sinar EF, Balzer WK, Smith PC. Issues and strategies for reducing the length of self-report scales. *Pers Psychol.* 200;55:167-194.
- 62 Muthén LK, Muthén BO. *Mplus user's guide*. Los Angeles, CA: Muthén & Muthén; 1998.
- 63 Cliff N. The eigenvalues-greater-than-one rule and the reliability of components. *Psychol Bull.* 1988;103:276-279.
- 64 Thurstone LL. *Multiple factor analysis*. Chicago: University of Chicago Press; 1947.
- 65 Steiger JH, Lind JC. Statistically based tests for the number of common factors. Iowa City, IA: Annual Meeting of the Psychometric Society; 1980.
- 66 Browne MW, Cudeck R. Alternative ways of assessing model fit. In: Bollen KA, Long JS, eds. *Testing structural equation models*. Newbury Park, CA: Sage; 1993:136-162.
- 67 Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Modeling.* 1999;6:1-55.

- 68 IRTPRO for Windows [computer software], Version 5, Vector Psychometric Group, 2020.
- 69 Fisher GG, Matthews RA, Gibbons AM. Developing and investigating the use of single-item measures in organizational research. *J Occup Health Psychol.* 2016;21:3-23.
- 70 U.S. Bureau of Labor Statistics (BLS), Household Data Annual Averages, 18. Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity, 2020 Current Population Survey, <https://www.bls.gov/cps/aa2020/cpsaat18.pdf>. Accessed December 20, 2021.
- 71 U.S. Bureau of Labor Statistics (BLS), Spotlight on Statistics, Profile of the labor force by educational attainment [BLS website], August 2017, Available at <https://www.bls.gov/spotlight/2017/educational-attainment-of-the-labor-force/home.htm>. Accessed January 6, 2022.
- 72 U.S. Bureau of Labor Statistics (BLS), Household Data Annual Averages, 23. Persons at work by occupation, sex, and usual full- or part-time status, 2019 Current Population Survey, Available at <https://www.bls.gov/cps/aa2019/cpsaat23.pdf>. Accessed December 20, 2021.
- 73 U.S. Bureau of Labor Statistics (BLS), Economic News Release, Contingent and alternative employment arrangements summary, June 7, 2018, Available at <https://www.bls.gov/news.release/conemp.nr0.htm>. Accessed January 6, 2022.
- 74 U.S. Bureau of Labor Statistics (BLS), News Release, Employee tenure in 2020, September 22, 2020, Available at <https://www.bls.gov/news.release/pdf/tenure.pdf>. Accessed January 6, 2022.
- 75 U.S. Bureau of Labor Statistics (BLS), Household Data Annual Averages, 11. Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, 2020 Current Population Survey, <https://www.bls.gov/cps/aa2020/cpsaat11.pdf>. Accessed December 20, 2021.

- 76 Hemphill JF. Interpreting the magnitude of correlation coefficients. *Am Psychol.* 2003;58:78-80.
- 77 Monroe S, Cai L. Evaluating structural equation models for categorical outcomes: a new test statistic and a practical challenge of interpretation. *Multivariate Behav Res.* 2015;50:569-583.
- 78 Sauter SL, Hurrell JJ Jr, Murphy LR, Levi L. Psychosocial and organizational factors. In: Stellman JM (Ed.). *ILO Encyclopaedia of occupational health and safety: Vol. 2 (4th ed).* Geneva: International Labour Office; 1998:34.1-34.31.
- 79 Quick JCE, Tetrick LE. *Handbook of occupational health psychology (2nd ed.).* Washington, D.C.: American Psychological Association; 2011.
- 80 Schonfeld IS, Chang CH. *Occupational health psychology.* Springer Publishing Company; 2017,
- 81 Niedhammer I, Bertrais S, Witt K. Psychosocial work exposures and health outcomes: a meta-review of 72 literature reviews with meta-analysis. *Scand J Work Environ Health.* 2021;47:489-508.
- 82 Lay AM, Saunders R, Lifshen M, et al. Individual, occupational, and workplace correlates of occupational health and safety vulnerability in a sample of Canadian workers. *Am J Ind Med.* 2016;59:119-128.
- 83 Hofmann DA, Burke MJ, Zohar D. 100 years of occupational safety research: from basic protections and work analysis to a multilevel view of workplace safety and risk. *J Appl Psychol.* 2017;102:375-388.
- 84 Forgeard MJC, Jayawickreme E, Kern M, Seligman MEP. Doing the right thing: measuring well-being for public policy. *Int J Wellbeing.* 2011;1:79-106.
- 85 Seligman M. *Authentic happiness. Using the new positive psychology to realize your potential for lasting fulfillment.* New York: Simon & Schuster; 2002.

Figures caption/legend list

Figure 1. Worker well-being conceptual framework

ACCEPTED

Figure 1



Table 1. Sources used to develop the pilot NIOSH WellBQ

| Source | Reference |
|--|--|
| Quality of Worklife Questionnaire | Centers for Disease Control and Prevention ³³ |
| 1977 Quality of Employment Survey | Quinn and Staines ³⁴ |
| Job Demands and Worker Health questionnaire | Caplan et al. ³⁵ |
| Organization-Level Safety Climate scale | Zohar and Luria ³⁶ |
| Hahn & Murphy safety climate scale | Hahn and Murphy ³⁷ |
| Copenhagen Psychosocial Questionnaire – COPSOQ II | National Research Centre for the Working Environment ³¹ |
| Workplace Incivility Scale | Cortina et al. ³⁸ |
| Minnesota Satisfaction Questionnaire | Vocational Psychology Research, University of Minnesota ³⁹ |
| National Healthy Worksite Program Health and Safety Climate Survey | Centers for Disease Control and Prevention ⁴⁰ |
| Survey of Perceived Organizational Support | Eisenberger et al. ⁴¹ |
| Workplace/schedule flexibility measures | Shockley and Allen ⁴² |
| Effort-Reward Imbalance Questionnaire | Siegrist et al. ⁴³ |
| Leiden Quality of Work Questionnaire | van der Doef and Maes ⁴⁴ |
| Multi-faceted Organizational Health Climate Assessment scale | Zweber et al. ⁴⁵ |
| Generic Job Satisfaction Scale | Macdonald and MacIntyre ⁴⁶ |
| Health status measures | Health Enhancement Research Organization and Population Health Alliance ⁴⁷ |
| National Health and Nutrition Examination Survey | Centers for Disease Control and Prevention ⁴⁸ |
| Patient Health Questionnaire-4 (PHQ-4) | Kroenke et al. ⁴⁹ |
| Health and Work Performance Questionnaire | World Health Organization ⁵⁰ |
| Behavioral Risk Factor Surveillance System questionnaire | Centers for Disease Control and Prevention ⁵¹ |
| Job-Related Affective Well-being Scale | Van Katwyk et al. ⁵² |
| Job satisfaction questionnaire | Andrews and Withey ⁵³ |
| Job satisfaction survey | Spector ⁵⁴ |
| Work and Meaning Inventory | Steger et al. ⁵⁵ |
| Utrecht Work Engagement Scale | Schaufeli ⁵⁶ |
| National Health Interview Survey | Centers for Disease Control and Prevention ⁵⁷ |
| 6 th European Working Conditions Survey | European Foundation for the Improvement of Living and Working Conditions ³⁰ |

- 30 European Working Conditions Survey (EWCS), About Eurofound surveys [Eurofound website], 2020, Available at: <https://www.eurofound.europa.eu/surveys/about-eurofound-surveys/>. Accessed September 27, 2020.
- 31 Copenhagen Psychosocial Questionnaire (COPSOQ), COPSOQ – what is it? [COPSOQ international network website], 2020, Available at <https://www.copsoq-network.org/>. Accessed September 27, 2020.
- 33 National Institute for Occupational Safety and Health (NIOSH), Quality of Worklife Questionnaire [CDC NIOSH Workplace safety and health topics website], August 29, 2013, Available at <https://www.cdc.gov/niosh/topics/stress/qwlquest.html>. Accessed September 27, 2020.
- 34 Quinn RP, Staines GL. The 1977 quality of employment survey: descriptive statistics, with comparison data from the 1969-70 and the 1972-73 surveys. Ann Arbor, Michigan: Institute for Social Research; 1979.
- 35 Caplan RD, Cobb S, French Jr JRP, Harrison RV, Pinneau Jr SR. Job demands and worker health: main effects and occupational differences. Washington, DC: CDC NIOSH; 1975.
- 36 Zohar D, Luria G. A multilevel model of safety climate: cross-level relationships between organization and group-level climates. *J Appl Psychol*. 2005;90:616-628.
- 37 Hahn SE, Murphy LR. A short scale for measuring safety climate. *Saf Sci*. 2008;46:1047-1066.
- 38 Cortina LM, Magley VJ, Williams JH, Langhout RD. Incivility in the workplace: incidence and impact. *J Occup Health Psychol*. 2001;6:64-80.

- 39 Vocational Psychology Research, Minnesota Satisfaction Questionnaire (MSQ) [MSQ questionnaire website], 2020, Available at <http://vpr.psych.umn.edu/instruments/msq-minnesota-satisfaction-questionnaire>. Accessed September 27, 2020.
- 40 U.S. Centers for Disease Control and Prevention (CDC), Workplace health promotion [CDC assessment tools website], January 22, 2020, Available at <https://www.cdc.gov/workplacehealthpromotion/tools-resources/workplace-health/assessment-tools.html>. Accessed September 27, 2020.
- 41 Eisenberger R, Huntington R, Hutchinson S, Sowa D. Perceived organizational support. *J Appl Psychol.* 1986;71:500-507.
- 42 Shockley KM, Allen TD. When flexibility helps: another look at the availability of flexible work arrangements and work-family conflict. *J Vocat Behav.* 2007;71:479-493.
- 43 Siegrist J, Li J, Montano D. Psychometric properties of the effort-reward imbalance questionnaire. Germany: Duesseldorf University; 2014.
- 44 Van der Doef M, Maes S. The Leiden quality of work questionnaire: its construction, factor structure, and psychometric qualities. *Psychol Rep.* 1999;85:954-962.
- 45 Zweber ZM, Henning RA, Magley VJ. A practical scale for multi-faceted organizational health climate assessment. *J Occup Health Psychol.* 2016;21:250-259.
- 46 Macdonald S, MacIntyre P. The generic job satisfaction scale: scale development and its correlates. *Employee Assistance Quarterly.* 1997;13:1-16.
- 47 Health Enhancement Research Organization (HERO) and Population Health Alliance, HERO scorecard [HERO scorecard website], 2020, Available at <https://hero-health.org/hero-scorecard/>. Accessed September 27, 2020.

- 48 U.S. Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS), National Health and Nutrition Health Examination Survey (NHANES) [NCHS NHANES website], September 17, 2020, Available at <https://www.cdc.gov/nchs/nhanes/index.htm>. Accessed September 27, 2020.
- 49 Kroenke K, Spitzer RL, Williams JBW, Lowe B. An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics*. 2009;50:613-621.
- 50 Kessler RC, Barber C, Beck AL, et al. The World Health Organization health and work performance questionnaire (HPQ). *J Occup Environ Med*. 2003;45:156-174.
- 51 U.S. Centers for Disease Control and Prevention (CDC), Behavioral Risk Factor Surveillance System (BRFSS) [CDC BRFSS website], August 31, 2020, Available at <https://www.cdc.gov/brfss/index.html>. Accessed September 27, 2020.
- 52 Van Katwyk PT, Fox S, Spector PE, Kelloway EK. Using the job-related affective well-being scale (JAWS) to investigate affective responses to work stressors. *J Occup Health Psychol*. 2000;5:219-230.
- 53 Andrews FM, Withey SB. Social indicators of well-being: Americans' perceptions of life quality. New York: Plenum Press; 1976.
- 54 Spector PE. Measurement of human service staff satisfaction: development of the job satisfaction survey. *Am J Community Psychol*. 1985;13:693-713.
- 55 Steger MF, Dik BL, Duffy RD. Measuring meaningful work: the work and meaning inventory (WAMI). *J Career Assess*. 2012;20:322-337.
- 56 Schaufeli WB, Bakker AB, Salanova M. The measurement of work engagement with a short questionnaire: a cross-national study. *Educ Psychol Meas*. 2006;66:702-716.

57 U.S. Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS), National health interview survey [CDC NCHS website], September 23, 2020, Available at <https://www.cdc.gov/nchs/nhis/index.htm>. Accessed September 28, 2020.

ACCEPTED

Table 2. Domain, subdomain, and subdomain constructs covered by the pilot questionnaire

| Domain | Subdomain | Subdomain Constructs (Number of items in parentheses)* |
|---|--|---|
| Work evaluation & 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) |
| | Job engagement | Job engagement [Absorption (1); vigor (2); dedication (3)] |
| Workplace policies & culture | 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) |
| | Benefits | Availability of job benefits (14); satisfaction with types of job benefits (14) |
| | Organization of work and life | Work to non-work conflict (2); workplace/schedule flexibility (2); management effectiveness (2) |
| Workplace physical environment & 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) |
| | Functioning | Cognitive functioning limitations (1); general limitations (1); work limitations (1); productivity (4) |
| | Injury | Work-related injury (1); injury consequence (1) |
| Home, community, and society | 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

Table 3. Survey sample demographics*

| Characteristic | Demographic category | N | % |
|-------------------|-----------------------------|-----|------|
| Age | 18-29 years | 163 | 16.7 |
| | 30-44 years | 273 | 28.0 |
| | 45-59 years | 345 | 35.4 |
| | 60+ years | 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 | Less than \$25,000 | 76 | 7.8 |
| | \$25,000 to \$74,999 | 340 | 34.8 |
| | \$75,000 to \$149,999 | 353 | 36.2 |
| | \$150,000 and over | 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 | Less than one year | 191 | 19.6 |
| | 1-10 years | 448 | 45.9 |
| | 11-20 years | 217 | 22.3 |
| | 20+ years | 119 | 12.2 |

*Demographic 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^1 | Root Mean Square Error of Approximation (RMSEA) | Comparative Fit Index (CFI) | Tucker-Lewis Index (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 ² | |
| 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 |
| | Management trust | Single item | | | | |
| Health culture at work | Health culture at work | 2-item scale | 0.78 | | | |
| | Availability of health programs at work | 7-item index | NA ³ | | | |
| Benefits | Availability of job benefits | 14-item index | NA ³ | | | |
| Organization of work and life | Work to non-work conflict | Single item | | | | |
| | Non-work to work conflict | Single item | | | | |
| | Workplace/schedule flexibility | 2-item scale | 0.71 | | | |
| Domain 3: Workplace physical environment and safety climate | | | | | | |
| | Overall workplace safety | Single item | | | | |

| | | | | | | |
|---|---|--------------|-----------------|-----------------|------|------|
| Safety climate | 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 ² | | |
| | 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 ³ | | | |
| | 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 ³ | | | |
| | Alcohol consumption | Single item | | | | |
| | Risky drinking | Single item | | | | |
| | Healthy diet | Single item | | | | |
| | Sleep hours | Single item | | | | |
| | Sleepy at work | Single item | | | | |
| | | | | | | |
| Functioning | Cognitive functioning limitations | Single item | | | | |
| | Work limitations | Single item | | | | |
| | Productivity | 4-item scale | 0.87 | 0.23 | 0.98 | 0.95 |
| 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 ³ |

¹Alpha calculated for scales with 2 or more items.

²Model fit could not be calculated as model is saturated.

³Alpha and model fit not available as 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* | (Low) Productivity |
|--|-------------------|--------------------|------------------------------|------------------------------|-------------------------|----------------|--------------------|-----------------------------|-------------------------------|-----------------|---------------------------|--------------------|
| 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 non-work 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 |
| Non-work 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 | 0.35 | -0.37 | -0.12 | 0.48 |
| Poor mental health | -0.26 | -0.42 | -0.28 | 0.49 | 0.43 | 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 |
| 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 | 0.32 | -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 |

* Correlations between variables with asterisks are polychoric correlations; all others are Pearson Product-Moment correlations.

Cell n exceeds 950 in the vast majority of cases and does not fall below 775.

Statistically significant coefficients (i.e., $p < .05$) are denoted by bold font. These coefficients are highly significant ($p < .001$) in the vast majority of cases.