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SPECIAL REPORT

Cardiovascular Health Research in the Workplace: A Workshop Report

Chris Calitz, MPP; Charlotte Pratt, PhD, MS, RD; Nicolaas P. Pronk, PhD; Janet E. Fulton, PhD; Kimberly Jinnett, PhD, MSPH; Anne N. Thorndike, MD, MPH; Ebyan Addou, MPH; Ross Arena, PhD, PT; Alison G. M. Brown, PhD, MS; Chia-Chia Chang, MBA, MPH; Lisa Latts, MD, MSPH, MBA; Debra Lerner, PhD, MSc; Michiel Majors, BS; Michelle Mancuso, MPH, CHES; Drew Mills, MPH, CHES; Eduardo Sanchez, MD, MPH; David Goff, MD, PhD

ABSTRACT: Heart disease and stroke are the first and fifth leading causes of death in the United States, respectively. Employers have a unique opportunity to promote cardiovascular health, because >60% of US adults are employed, and most spend half of their waking hours at work. Despite the scope of the opportunity, <1 in 5 businesses implement evidence-based, comprehensive workplace health programs, policies, and practices. Integrated, systems-based workplace health approaches that harness data science and technology may have the potential to reach more employees and be cost-effective for employers. To evaluate the role of the workplace in promoting cardiovascular health across the lifespan, the National Heart, Lung, and Blood Institute, the National Institute for Occupational Safety and Health, and the American Heart Association convened a workshop on March 7, 2019, to share best practices, and to discuss current evidence and knowledge gaps, practical application, and dissemination of the evidence, and the need for innovation in workplace health research and practice. This report presents the broad themes discussed at the workshop and considerations for promoting worker cardiovascular health, including opportunities for future research.

Key Words: cardiovascular health ■ knowledge gap ■ research ■ Total Worker Health ■ workplace health

Heart disease and stroke are the first and fifth leading causes of death in the United States, respectively, accounting for roughly one third of all annual deaths.[1] Each year, these conditions cost the healthcare system an estimated $137 billion in direct costs, with an additional $127 billion in indirect costs through lost productivity.[1] In 2010, the American Heart Association (AHA) defined ideal, intermediate, and poor cardiovascular health (CVH), through 7 metrics known as Life's Simple 7 (ie, dietary patterns, physical activity patterns, smoking status, body weight, total cholesterol, blood pressure, and blood glucose).[2] Approximately 1% to 5% of US adults are in ideal CVH.[3–6] The workplace is an advantageous setting for improving Life's Simple 7 metrics because 157 million US adults were employed in February 2020 before the COVID-19 pandemic,[7] >60% of US adults, and spend most of their waking life at work. Workplaces can contribute to chronic conditions through harmful workplace practices, including hazardous work conditions, high job demands, and inflexible schedules.[8–10] Such organizational and psychosocial stressors have been linked to cardiovascular disease risks related to blood pressure, hypertension, obesity, diabetes mellitus and metabolic syndrome, and depression.[11] Effective science-based policies and programs exist that can help improve health and well-being,[12–14] and there is evidence that comprehensive strategies may be more effective than siloed programs.[15]

Every business impacts its workers' health and well-being. According to Quelch and colleagues,[16] the extent

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Correspondence to: Chris Calitz, MPP, Center for Workplace Health, American Heart Association, 7272 Greenville Ave, Dallas, TX 75206. E-mail: chris.calitz@heart.org

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Nonstandard Abbreviations and Acronyms

AHA	American Heart Association
CVH	cardiovascular health
ROI	return on investment
WPH	workplace health

to which companies promote health follows 4 dimensions: (1) employee; (2) environment; (3) consumer; and (4) community health and well-being. These 4 dimensions have been presented as context to building a corporate culture of health.[17] Each of these dimensions also influences CVH and, as a result, strategies for building a corporate culture of health align well with those that aim to improve CVH. Another conceptual model, based on a *Total Worker Health* approach, identifies integrated pathways that influence worker health, and address workplace policies, programs, and practices, as well as conditions of work to impact worker and business outcomes.[18] Furthermore, research supporting the role of each of these dimensions and pathways in improving CVH and well-being spans from individual factors to factors associated with the physical, psychosocial, and economic environment. Given that comprehensive workplace health (WPH) programs remain scarce,[14] additional research on comprehensive, integrated approaches will support development of effective interventions to promote CVH.

Accordingly, the National Heart, Lung, and Blood Institute, the National Institute for Occupational Safety and Health, and the AHA convened a 1-day workshop on March 7, 2019, that engaged a group of occupational health and CVH experts to advance the knowledge and implementation of effective strategies, including research and innovation to promote the CVH and well-being of US workers. The workshop was held in Houston, TX, at the AHA's annual EPI Lifestyle Scientific Sessions research conference. The speakers and panelists were selected by National Heart, Lung, and Blood Institute, National Institute for Occupational Safety and Health, and AHA to reflect a broad range of perspectives on CVH promotion in the workplace. Over 100 researchers, employer practitioners, and administrators attended the workshop.

The objective of this report is to describe the broad workshop themes that were developed by an AHA science steering group with input from National Institutes of Health and National Institute for Occupational Safety and Health before the workshop: (1) define and harmonize key terminology relevant to the field (Table 1)[19–25]; (2) review current research and evidence of effective WPH programs and policies; (3) identify important knowledge gaps to advance WPH science; and (4) highlight the need for future innovation in WPH research. This information can be used by employers, policy makers, and researchers to implement existing evidence-based WPH policies and programs in real-life settings and test new workplace strategies to promote CVH. This article is organized around the themes that emerged from the predetermined topics and discussions at the conference (Figure S1 provides conference agenda).

Table 1. Identifying and Defining Key Terminology

Concept	Definition
CVH	CVH is defined by the AHA as optimal levels of Life's Simple 7 metrics (smoking, diet, exercise, body mass index, blood pressure, blood glucose, and blood cholesterol).[2]
Comprehensive WPH programs	WPH programs refer to a coordinated and comprehensive set of strategies that include programs, policies, benefits, environmental supports, and links to the surrounding community designed to meet the health and safety needs of all employees.[19]
Culture of health	The creation of a working environment where worker health and safety are valued, supported, and promoted through WPH programs, policies, benefits, and environmental supports. Building a culture of health involves all levels of the organization and establishes the WPH program as a routine part of business operations aligned with overall business goals.[20]
Workplace	Any location where a worker conducts work for an employer. In this sense, "workplace" could be an office building, a construction site, a motor vehicle, a mine, or even the worker's home.[21]
Health and well-being	Health and well-being, considered within the Healthy People 2030 framework as a single term, can be defined as how people think, feel, and function, at both a personal and a social level, and how they evaluate their lives as a whole.[22]
Total Worker Health framework	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.[23]
Return on investment	Compares the investment costs with the magnitude and timing of expected gains. For WPH programs, this usually refers to the medical savings or productivity gains associated with the employer's investment in worker health programs.[24]
Value in investment	Measures how much total value is yielded by a given investment. While return on investment compares the hard-dollar "tangible benefits" against the investment needed to produce them, value in investment includes both tangible and intangible benefits that result from the same investment.[25]

AHA indicates American Heart Association; CVH, cardiovascular health; and WPH, workplace health.

CURRENT RESEARCH

In 2009, the AHA recommended comprehensive WPH programs to improve CVH among workers.[26]

In general, comprehensive programs consist of employee screening with adequate follow-up, health education, links to related employee services (such as Employee Assistance Programs), and a supportive physical and social environment that encourages adoption of healthy choices.[27,28] Although most US employers report providing WPH programs, a recent national survey by the Centers for Disease Control and Prevention indicates that <1 in 5 worksites implement comprehensive programs and policies.[14]

Research over the past few decades has explored the effectiveness of WPH interventions to promote health outcomes. A search of the literature found that these interventions fall into several broad categories. Table 2[29–39] presents a curated summary of WPH strategies organized by these various broad risk factor categories that address CVH.

Beyond immediate impacts on health behaviors and outcomes,[8] well-designed WPH programs and policies can have positive returns on investment (ROIs), including improved healthcare costs and productivity and reduced absenteeism. The ROI depends significantly on the quality and comprehensiveness of the programs and policies implemented. One meta-analysis found that for every $1.00 spent on WPH programs, the absenteeism costs decreased by $2.73 and the medical costs decreased by $3.27.[40] Economic returns may be larger for smoking interventions.[41] Comprehensive WPH programs can return a positive ROI within 3 years of implementation,[12] although recent studies have suggested that returns may be smaller when taking into consideration more rigorous study designs.[42] Furthermore, WPH programs and policies can also improve the health of employees' families and their communities.[8]

ROI was a topic of discussion in the workshop. Although current ROI data are encouraging, a promising area for research is on the value of investment in workplace well-being programs (eg, on job satisfaction and purpose, employee motivation, and perceived quality of life).[39,43] Although it was accepted that ROI from well-being programs may be important to employers, it may be unrealistic for employers to expect a financial ROI in the short-term (ie, 1–2 years). Current evidence on the ROI of WPH programs supports their utility to organizations[38]; however, there is limited rigorous, high-quality research, such as large randomized controlled trials, available, partially

Table 2. Evidence-Based WPH Strategies to Improve CVH

Risk Factor	Evidence-Based Strategies	National Implementation[14]
1. Food environment and healthy food promotion	Improve fruit and vegetable intake through financial incentives, labeling, choice architecture, point-of-purchase prompts, and menu modifications, and improve the availability of fruits and vegetables[29]	23.1% of worksites, ranging from 19.8% among small employers (10–24 employees) to 75.6% among large employers (≥500 employees)
2. Physical activity environment and promotion	Offer standing and treadmill desks and incentivizing programs, such as free pedometers and prizes to promote physical activity and improve fitness in the workplace[30]	28.5% of worksites, ranging from 24.7% of small employers to 75.8% of large employers
3. Weight management and diabetes mellitus prevention	On-site healthcare staff deliver diabetes mellitus and weight management programs; health coaches identify barriers and strategies to encourage weight loss.[31,32] Employer subsidies can also drive employee participation in weight management programs[33]	Diabetes mellitus management: 19.5%, ranging from 16.8% among small employers to 75.9% among large employers Obesity management: 18.6%, ranging from 16.0% of small employers to 74.4% of large employers
4. Smoking cessation support and clean indoor air	Workplace policies and programs can be critical to influencing tobacco use among workers[34,35] However, e-cigarettes are posing new challenges for employers and require an update to smoking and vaping policies in the workplace[36,37]	18.5%, ranging from 16.1% of smaller to 73.5% of large worksites
5. Health risk assessment, referral, and on-site care	An assessment of health risk with individual feedback is associated with improved health outcomes; the association is stronger if assessment of health risk with individual feedback is complemented with health education programming of at least 1 h or repeated multiple times over a year[38]	25.5%, ranging from 21.6% of smaller employers to 68.7% of large employers
6. Workplace health policies and environmental supports ("culture of health")	Cross-sectional studies demonstrate significant and salient correlations between psychosocial work factors, culture of health elements (eg, strong executive leadership support, resource allocation and commitment, and perceived organizational support) and the health and safety of employees. More research is needed to evaluate causality[39] and develop data on *Total Worker Health* interventions for CVH	

CVH indicates cardiovascular health; and WPH, workplace health.

because of the difficulty and expense of conducting such research in the workplace setting. Future studies can be designed to develop the evidence base on the ROI and value of investment of WPH programs.

During the workshop, a portfolio analysis of National Institutes of Health funding focused on WPH research was presented. From 2014 to 2018, 38 grant applications focused on worksite wellness-related interventions, of which about 24% were supported by the National Heart, Lung, and Blood Institute and 22% by the National Cancer Institute. During that same period, the total National Institutes of Health award dollars increased from about $8.2 to $11.7 million. Most (84%) of the funded studies were clinical trials. Given that National Institutes of Health grants are investigator initiated, potential applicants are encouraged to submit high-quality research focused on WPH. Researchers are encouraged to include rigorous assessment of cost-benefit and cost-effectiveness in their WPH research. Participants also discussed the importance of using case studies to complement findings from clinical trials. Case studies are routinely used in the business sector and can capture the nuance of organizational culture and context that either facilitates or hinders policy and program implementation. Data S1 contains case studies presented at the workshop. The benefits and characteristics of case studies, as well as other types of research methods and study designs related to worker health, have been considered and acknowledged in the literature.[44]

Participants also discussed the importance of developing tools and resources for smaller companies given that ≈47.5% of US adults work in small businesses (<500 employees).[45] Implementation of best practices lags in smaller businesses because of factors such as lower capacity, resources, and implementation readiness.[46] Although CVH appears to vary by occupation,[47] and socioeconomic status,[48,49] there is less consensus and research concerning the prevalence of comprehensive programs by industry sector,[50] organization size,[51] and/or wage level of workers.[46,52] Finally, participants briefly discussed the role of social determinants of health in the workplace. In general, social determinants of health, such as income, education, housing, and transportation, were discussed as employee social risks that may impact an employer's bottom line in terms of employee CVH health and productivity risks associated with poor worker CVH.[49] Consequently, employers have a vested interest in developing good organizational practices and *Total Worker Health* approaches[53] that address these social risks (eg, implementing a higher minimum wage or investing in affordable housing). Compared with other risk factors, these social risk factors are not well studied in the WPH literature. More research on these higher-level factors may contribute to the effectiveness of WPH programs. For example, without flexible policies and supportive management, workers may not have sufficient time to take a food break, engage in physical activity, or participate in health coaching programming.

Current evidence suggests that WPH programs are effective for promoting CVH, yet the literature indicates that there is significant variation in the adoption of evidence-based programs according to company size (as indicated by Table 2). Comprehensive programs and policies that integrate the key components discussed in this report should be prioritized, including those that build a workplace culture of health. Investigators are encouraged to examine the sustainability of these programs and other aspects of their value and impact, such as work-family interrelationships, quality of life, and broader population health. In addition, research should leverage new technology, such as artificial intelligence (AI), and the workplace environment in innovative ways to increase the reach and effectiveness of WPH programs. Table 3 lists current knowledge gaps in WPH programs, serving as future research opportunities.

IMPLEMENTING EVIDENCE-BASED INTERVENTIONS: PHYSICAL ACTIVITY

Being physically active is an important action most people of all ages can take to improve their health. The workshop addressed the importance of physical activity as a risk factor attributable to the release of *The Physical Activity Guidelines for Americans*, 2nd edition.[54] The guidelines provide evidence for the substantial health benefits of physical activity to help people function and sleep better, improve mental health, and reduce the risk of many chronic diseases. The guidelines recommend that adults

Table 3. Current Knowledge Gaps and Research Opportunities in WPH

Different populations: Include diverse demographics, people with disabilities, small businesses, nonstandard work arrangements, social context, and social determinants of health indicators (eg, low socioeconomic status)
Culture of health: Conduct interventions that address leadership, the role of culture of health, and organizational systems in CVH outcomes
Health equity: Study how WPH programs influence health disparities
Well-being: Conduct more research that combines objective measures (eg, Life's Simple 7) with subjective measures of well-being and mental health; most research tends to be siloed and fails to apply integrated approaches, such as *Total Worker Health*. https://www.cdc.gov/niosh/twh/wellbq/default.html
Dissemination and implementation: Conduct research that adapts interventions and scales them up to reach large, diverse populations, including businesses of all sizes
Economic analysis: Include cost-effectiveness, cost-benefit analyses, ROI, and VOI in WPH research

CVH indicates cardiovascular health; ROI, return on investment; and VOI, value in investment; WPH, workplace health.

Table 4. Key Physical Activity Guidelines for Adults

Adults
- Adults should move more and sit less throughout the day. Some physical activity is better than none. Adults who sit less and do any amount of moderate-to-vigorous physical activity gain health benefits.
- For even greater health benefits, adults should strive to achieve 150 min (2 h 30 min) to 300 min (5 h) a week of moderate-intensity, or 75 min (1 h 15 min) to 150 min (2 h 30 min) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Preferably, aerobic activity should be spread throughout the week (ie, most if not all days of the week).
- Additional health benefits are gained by engaging in physical activity beyond the equivalent of 300 min (5 h) of moderate-intensity physical activity a week.
- Adults should also do muscle-strengthening activities of moderate or greater intensity involving all major muscle groups on ≥2 days a week, as these activities provide additional health benefits.

should, above all, move more and sit less (Table 4).[54] However, despite the known health benefits of physical activity, only 54% of US adults meet the aerobic component of the guidelines,[55] and <3% of US adults primarily walk or bicycle to work.[56] Workplaces can play an important role in promoting physical activity and reducing sedentary behavior (ie, moving more and sitting less). At the workplace, employers can provide supportive programs, environments, and policies for their workers. In the community, they can help workers access options to actively commute to the workplace and facilitate community resources for physical activity.

Organizational-Level Strategies That Promote Individual Physical Activity in the Workplace

By offering programs and environmental or policy supports, workplaces can help employees engage in physical activity at the workplace.[54] Approximately 2 of 5 workplaces in the United States offer a physical activity program.[57] Less frequently offered strategies include encouraging active transportation (10%), providing a personal device for tracking physical activity (9%), such as a step counter, or providing standing desks and other environmental supports (16%) for physical activity.[57] Environmental supports for physical activity, such as on-site facilities, showers, or bicycle racks, may require more initial planning and capital investment. However, once in place, they provide inexpensive, lower maintenance strategies for increasing employees' opportunities to engage in physical activity while at work.[57] It may be challenging for small businesses to justify the expense of implementing some of these strategies. In these cases, small businesses should assess their work force to determine what strategies would potentially have the most uptake and generate the most value for dollars spent.

There are several proven strategies to reduce sedentary behavior (eg, sitting less) in the workplace.[58] Physical changes to workstations to include sit-stand workstations, treadmill desks, and portable pedal machines have been shown to reduce sedentary behavior. These approaches are stronger when combined with educational (eg, e-newsletters), social (eg, work-group contests), or environmental (eg, managerial support and signage) support strategies.[59] In 2017, ≈14% of US workplaces offered active workstations for their employees.[57]

Informal and formal workplace policies can also help encourage physical activity.[60] Policies include having meetings with built-in, short activity breaks, allowing physical activity while on the clock, and employing a walking meetings or a walk over lunch policy. Policies can also be more formal, such as providing flexible work schedules, health insurance subsidies, and grants or subsidies for public transportation.[60] Other workplace policies and practices can also be designed to be supportive of health and physical activity. Attention to job design and work organization (schedules, level of control, and supervisory supports) is also paramount. For example, high job demand and low job control has been demonstrated to negatively impact leisure time physical activity.[61]

Community-Based Strategies: Getting to the Workplace Actively

Population-based approaches, which are often implemented at the community level, present a promising strategy by providing supportive policies and environments that can help people actively commute to the workplace where possible. Such approaches improve population health through small shifts (or "nudges") in the physical activity behavior of many people rather than from large shifts of fewer people.[62] The Guide to Community Preventive Services (*The Community Guide*) recently issued a recommendation built on environment approaches to increase physical activity.[63] Built environment approaches work to create or modify environmental characteristics in a community to make physical activity easier or more accessible. This recommendation is for strategies that combine ≥1 interventions to improve pedestrian, bicycle, or mass transit systems with ≥1 land use and environmental design interventions to increase physical activity. Practically, this recommendation provides evidence that connecting a *route* (eg, sidewalk, trail, or path) to a *destination* (eg, workplace) can increase physical activity. Resources, such as the Centers for Disease Control and Prevention's Connecting Routes to Destinations materials,[64] can help practitioners implement strategies aligned with this recommendation at the community level.

When communities provide supportive policies and environments, they can help improve active commuting to the workplace, leading to potential benefits in CVH.[65] In Salt Lake City, UT, provision of light rail service decreased body mass index levels and improved physical activity levels in new riders.[66] In Perth, Australia, when neighboring hospitals were compared, the hospital implementing an active transportation policy improved walking and bicycling to work from 4% in 2006 to 14% in 2012.[67] Policies at state and local levels, such as Complete Streets[68] policies, help make streets and communities safe for all pedestrians, regardless of age, ability, or mode of transport. When workplaces are connected to pedestrian and bicycle networks, they allow people of all ages and abilities living in proximity to reach their destinations safely and conveniently.[69] Businesses can also consider access to opportunities for active transportation and public transit when selecting new locations.

Public health surveillance can help track progress in workplace physical activity by monitoring the programs, environments, and policies occurring in the workplace and in the community. Several recommended actions for surveillance have been put forward to improve capacity to consistently monitor workplace programs, environments, and policies.[70,71]

During the workshop, the need to embed national health guidelines into employer-based settings was supported. Companies may have a greater incentive to adopt and promote national health guidelines if they are linked to organizational health goals. Alternatively, guidelines can be disseminated more widely to national, regional, and local chambers of commerce and other business groups on health to increase awareness of best practices. Promoting physical activity in the workplace and in the surrounding community are key aspects of a comprehensive strategy to increase physical activity in the United States.

RESEARCH OPPORTUNITIES IN THE WORKPLACE

The Role of Data Science

AI and machine learning innovations have been introduced as promising solutions for dealing with "big data" in the health and well-being field. Data science methods may circumvent specific challenges and barriers related to workplace-based research, such as statistical power and heterogeneity between populations.[72] *Data science* is a broad term that represents a multidisciplinary field involving scientific methods, processes, algorithms, and systems to generate information, knowledge, learnings, and insights based on structured and unstructured data. Examples of specific methods include agent-based modeling, social network analysis, system dynamics modeling, group model building, machine learning, natural language processing, AI, and deep learning. Data sources are equally varied, and depending on the intended purpose, may include medical claims data, survey and health risk assessment data, clinical and biometric data, wearable data, social media and search engine data, as well as qualitative focus group and interview data.

Although there is a wealth of information about the relationship between work and health,[73] there is less evidence available on practical strategies that connect employer efforts to improved worker health and work-related outcomes. Employers typically engage in 3 activities that are aimed at worker health: (1) promotion of health and well-being programs and policies, (2) harm prevention, and (3) safety strategies and disease management investments.[74] Employers must understand their workforce demographics, and often conduct a health risk assessment to identify prevalent chronic conditions and risk factors among their workers. This is followed by a review of available evidence, especially occupational safety and health, and comparison of this evidence to their company's plan offerings. Together, these 3 pieces, ***risk assessment, available evidence, and plan design***, form the basis of the programmatic solutions that employers develop (Figure).

AI, big data solutions, and other machine learning strategies can support policy and practice decision-making across many industries, but the adage "garbage in, garbage out" applies to these nonhuman forms of analysis just as it does to the human forms.[72,75–77] Much of the data currently used in predictive modeling or big data solutions rely on medical claims data available mostly in nonpublic data sets held by commercial companies.[78] These data sources include integrated, deidentified data that link across medical, pharmacy, workers' compensation, disability, and absenteeism and presenteeism to better capture consequential outcomes for a business or community beyond medical cost reduction.

Integrated databases are the exception, most often representing only a fraction of any given company's overall workforce and susceptible to variable quality standards around data capture and person-level linking across data sources.[79] If the same integrated data are fed into an AI solution, any analyses could be biased.[80] For example, the outcomes would not reflect part-time workers who are not enrolled in employer-based insurance programs. These employees typically do not have a chance to appear in the data. Another pitfall is treating eligible nonusers as those without a health need. When these groups are excluded, as they can be in use-based claims data, distorted results may

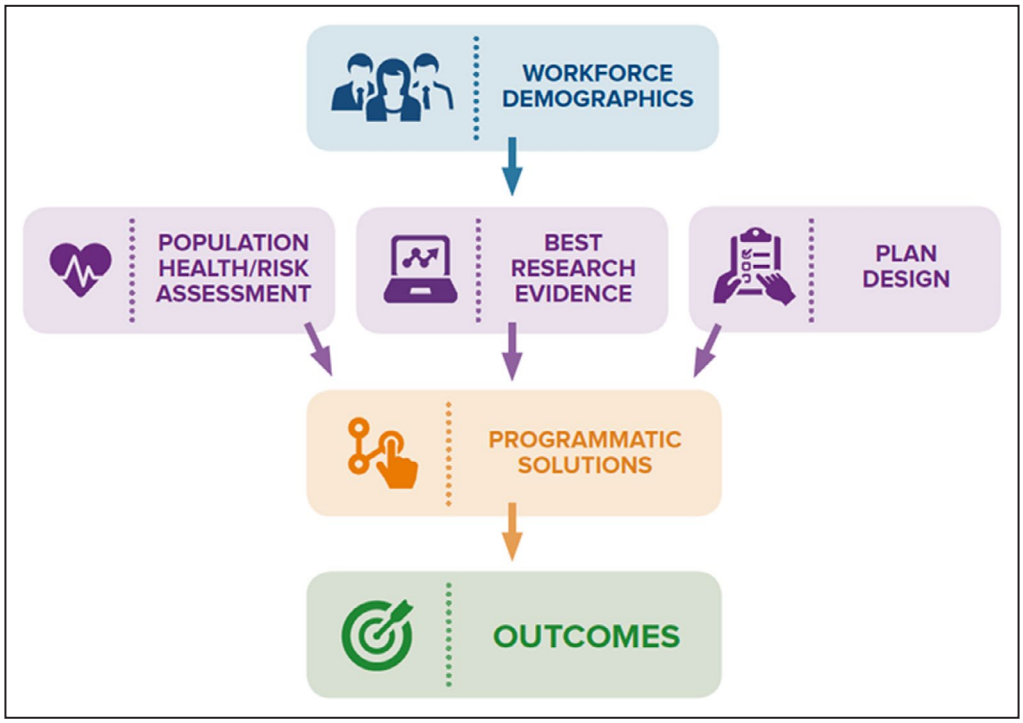

Figure. **Processes in workplace health improvement.**

be produced that represent current claims activity and costs for a nonrandom portion of the employee population. This significantly limits decision-making quality and the potential impact of any policy or practice aimed at worker health improvement, thus undermining efforts that are so critical to sustaining a healthy and high performing workforce.[81]

Apart from perceived lack of transparent data methods, another potential barrier to AI and data science is worker concerns about data privacy. The difficulty of managing information and data privacy in the digital environment has been highlighted by numerous high-profile data breaches, such as Experian and Facebook. In the arena of employee WPH programs, concerns exist about the transparency of privacy notices and the use of employee health data that are routinely collected as part of health risk assessments and/or biometric screenings. The National Institute for Occupational Safety and Health identifies ensuring confidentiality and worker privacy as an essential element of a *Total Worker Health* approach.[82] The AHA has previously recommended that privacy notices must be provided in all situations where personal health information is collected, and that these notices must make "a clear, consumer-friendly statement about how the data will be used, shared, sold, and/or protected."[83]

During the workshop discussion, the need for transparent data methods was underscored so that risk predictions and other health-related algorithms are not perceived as a "black box" by researchers or worker. Issues relating to data access for research were also highlighted, considering that many large employee health databases are proprietary and are difficult for researchers to access for free. Barriers to data science in WPH included the complexity of the data, data collection and access, and consumer concerns about data privacy. Potential solutions for accessing data included developing relationships with companies, partnering with Medicaid and Medicare, collaborating with large health cohort studies that collect information on work status and occupation, and making data available at the local level through partnerships with local public health agencies and business chambers. A proposal to create a national database or survey of employee well-being was put forth at the workshop. Completion of a worker well-being survey instrument will make worker well-being data collection possible.[84]

In summary, large data streams can be useful if it is understood what they represent and their true association with health and work-related interventions and associated outcomes. In an ideal world, marshalling the power of good data can create deeper insights about what health care and work comprises for healthier employees and longer, more fulfilling, working lives.[85]

ADDRESSING MENTAL HEALTH IN CVH

Depression and its co-occurrence with cardiovascular disease were topics of discussion. Depression is a common and frequently debilitating health condition. It affects ≈7% to 10% of US adults and costs $210.5 billion annually in direct and indirect costs.[86] Although it is more common in women than men,[87] depression affects all people regardless of sex, race, ethnicity, age, and geographic location. Of any health condition, depression can be one of the costliest to employers.[88] Depression is only one mental health outcome, but it was the primary focus of the session's discussion on mental health, because of the significant level of evidence supporting the association.

The high cost of depression is not primarily attributable to the use of depression treatment. Approximately 4 in 10 people with depression do not seek treatment because of stigma.[89] People who are depressed commonly consume healthcare resources for other health outcomes, and for comorbid chronic health conditions, such as diabetes mellitus, which are harder and more costly to treat when depression is present.[90] In fact, research has shown strong links between depression and cardiovascular disease,[91] diabetes mellitus,[92] obesity,[93] alcohol use,[94] and tobacco use.[89]

Depression is so costly to business because it is a leading cause of health-related productivity loss.[95] Depression is associated with high rates of work absence, difficulty performing work effectively and efficiently ("presenteeism"), job turnover, and work disability.[90] In team-based work, one employee's depression can affect overall productivity. Approximately 50% of the $210.5 billion total cost from depression is borne by employers in the form of losses because of absenteeism and presenteeism.[86] Employers and researchers could consider making a concerted effort to address mental health in the workplace by developing policies and programs designed to support employee mental health. *Total Worker Health* strategies include healthy job design and organization of work,[23] manager training, organizational support,[53] structuring benefits to ensure parity between mental and physical health, and leaders building a culture that supports a mental health-friendly workplace. Comprehensive telehealth interventions also show promise (see Be Well at Work program case study in the Data S1). These strategies are a part of the solution and could be incorporated into a written, organization-wide Mental Health Plan.[96] The Mental Health Plan describes an organization's strategy for supporting a mental health friendly workplace and lists the relevant stakeholders. Leadership can then support and implement the Mental Health Plan. There are many opportunities for designing healthy jobs and workplace interventions to promote workplace mental health.[97] For example, Canada and the United Kingdom have developed mental health standards in the workplace that are enforced just as other workplace regulations.[98,99]

The role of workplace culture in stress and mental health was discussed with particular emphasis on the negative effect that unsupportive policies, programs, and leadership in the workplace have on worker health outcomes. Although not considered a mental health disorder in its own right, chronic, unmanaged stress is a risk factor for the development of other diagnosable disorders, such as depression, anxiety, and cardiovascular disease.[100–102] For example, bullying and harassment has a negative impact on work productivity and worker health.[102] Further upstream, it was recommended that culture of health curricula could be embedded into business school programs, such as Harvard's Culture of Health: A Business Imperative programs.[16,103]

FUTURE DIRECTIONS AND INNOVATIONS

Future innovations will need to fill gaps in WPH research and adapt and scale evidence-based interventions to reach broader populations in novel ways. In addition, research will be needed to facilitate the development of innovative tools and new *Total Worker Health* strategies to aid in the promotion of CVH in the workplace.

In the field of WPH, many researchers and practitioners have focused more on individual-based methods for promoting health. The most common methods include physical activity or nutrition programs, tobacco cessation, or referral to employee assistance programs after problems arise.[14] Although these strategies are important parts of comprehensive programs, it is vital for researchers and employers to work to develop new ways to support health and well-being at a systems level to ensure a sustainable culture of health. Structural and population-based strategies, implemented at the organizational level, often impact a larger percentage of the workforce, are more enduring, and have greater health impacts. With a rapidly aging workforce,[104] a constantly evolving digital environment, and rising healthcare costs,[105] continuing with current standard methods alone may not be enough to close the observed gaps in health outcomes of populations.

WORKFORCE TRAINING

An important and necessary consideration is training the next generation of researchers interested in how to address issues that connect workplace concerns to improvements in the health and well-being of the

public. For such training to occur, support for effective training programs is needed. Furthermore, strong leadership and mentorship need to be established that foster interinstitutional collaborations and multisectoral partnerships, explicitly include the public health and business sectors, and successfully deploy federal and private funding sources. Business and public health leadership could consider building partnerships that are responsive to the direction in which the field of worker health and well-being is moving. In addition, these partnerships will need to generate social value to support public health goals while allowing business to gain long-term competitiveness.[106,107]

Over the past several decades, a need to develop training programs that are connected or embedded in the applied setting has emerged in occupational health psychology and worker safety, health, and well-being fields. As such, it stands to reason that research training programs fall in line with this direction. Research and training infrastructure already aligned with this development have been initiated and include areas of emphasis, such as dissemination, translation, and implementation sciences.[108–110]

For early career investigators, training support and successful establishment of early track records in sciences associated with WPH and well-being are paramount. Identifying federal and private funding opportunities is important to support quality research. Yet, it is also important for early career investigators to think in context of longer-term, research portfolio development instead of singular focus on siloed questions for which short-term funds may be accessible. For this reason, early career investigators' training needs should emphasize mentorships and a connection to business leaders to build a generative dialogue that connects practice and research for the long-term.[107]

Academic programs should become more explicit in partnering with applied programs that conduct investigations and science-based training linked to the workplace settings. Despite advances in dissemination and implementation research and progress in workplace-based evidence on the relationship between health and productivity,[110–112] variability in WPH program design still exists. This variability needs to be addressed to elucidate the critical elements of what generates successful interventions. Early efforts have identified such design elements,[13,113] but training programs should focus on such developments and generate evidence of effectiveness that covers workplaces of all sizes, across multiple sectors, and connects to public health needs.

SMALL COMPANIES

Future efforts may also focus on the special needs of smaller businesses and organizations. According to the 2017 Workplace Health in America Survey,[14] small worksites (<250 employees) were less likely to offer a comprehensive WPH program compared with larger worksites (>250 employees). With 59 million Americans working for small businesses (<500 employees),[45] this is a clear opportunity for researchers and practitioners to address new and innovative ideas.

Small businesses face many challenges to providing any WPH programs, let alone comprehensive programs.[114] Small businesses often lack a budget, dedicated personnel, and the necessary expertise, and often report a perceived lack of employee interest.[115] Although some research has indicated that there is an observed difference between small and large companies in implementing WPH programs,[116,117] results from the Workplace Health in America Survey[14] indicate that these differences become statistically insignificant when controlling for 3 important contextual factors: a person assigned who is responsible for implementing a WPH program, an annual budget, and a program that has been in existence for >5 years. Differences between industry sector also disappear when controlling for these factors. Nevertheless, it can be argued that small companies would struggle to easily meet these criteria because of staff and budget constraints relative to large companies.

The challenge for researchers will be to navigate these barriers and develop interventions and programs that are still effective, both in terms of health impact and cost. One of the primary ideas put forth at the workshop was to work with small businesses to leverage community assets, including collaboration with large businesses, rather than relying on the small company to find ways to develop the infrastructure internally. This can remove some of the financial burden from the business, as well as provide a potentially wider range of services and facilities to employees. For example, a small employer could subsidize gym memberships rather than having an onsite fitness center. Another strategy could be to provide training to certain employees of small companies. Training could include focused education for decision makers on best practices in worker health and well-being, or broader awareness training for employees on the benefits of participating in WPH programs.

IMPLEMENTATION AND SCALE-UP

Throughout this article, the need for high-quality, comprehensive, and integrated programs, such as those described in the *Total Worker Health* approach, has been emphasized. These types of programs have been shown to be effective at improving both worker health outcomes and employer outcomes. But, as

mentioned previously, <1 in 5 companies offers comprehensive WPH programs.[14] Efforts from researchers and practitioners could focus on educating employers on the need for and benefit of implementing comprehensive, well-designed programs, rather than disjointed and less effective siloed programs. Comprehensive programs are typically more effective, reach more workers, and can lead to greater cost savings.[40]

Important challenges to scaling WPH programs are a lack of funding and lack of internal buy-in.[118] Garnering the support of key internal decision-makers can increase opportunities for funding and implementation of programs. Using evidence from research to support the implementation of a program can make the process less challenging. Linking program implementation to potential, positive business outcomes, such as reduced healthcare costs or improved employee productivity, can increase the support of internal stakeholders. After initial support or funding is granted, it is important to evaluate programs on a regular basis to demonstrate improvements in health and business outcomes and support the development of revenue streams.

CONCLUSIONS

Heart disease and stroke are leading causes of death and disability in the United States, and there is a low prevalence of ideal CVH in the US workforce.[5,6] Approximately 60% of adults work,[7] which makes the workplace an optimal physical and psychosocial environment for promoting CVH. Current research shows that science-based policies and programs exist that can be implemented by workplaces to improve nutrition and physical activity, and reduce tobacco use, obesity, and diabetes mellitus outcomes. Despite this opportunity, few US workplaces implement comprehensive science-based programs, policies, and practices. Smaller companies are less likely to implement proven strategies than larger companies, and greater consideration should be given to training and providing technical assistance to small companies to implement science guidelines. Physical activity can be addressed in the workplace through several organizational-level strategies to support and promote individual physical activity (eg, providing bicycle racks to encourage biking to work and using activity monitors to promote more steps) or community-based strategies (eg, connecting a walking/biking route to a workplace destination). AI and "big data" can potentially be harnessed to provide solutions and insights into WPH and productivity, but data collection and analysis methods will need to be transparent and account for missing data. Employer privacy concerns need to be addressed for AI's potential to be fully realized. Accessing large, proprietary databases can be difficult for researchers, so scientists can foster collaborations with businesses or Medicare and Medicaid to access health data. Other risk factors, like depression and workplace stress, need attention. Depression is common and costly to employers, and workplace stress could be an underlying cause. Many employees do not seek early treatment, and untreated depression may lead to low productivity and increased business cost. Future innovations in WPH research and practice include workforce training of the next generation of WPH researchers, developing tools and resources to assist smaller companies, and focusing on dissemination and implementation to adapt effective policies and programs to bring them to scale for population health improvement. Although the workshop took place before COVID-19, employers may face significant economic constraints as a result of the pandemic, which may make it harder for businesses to implement policies, programs, and environmental supports to improve CVH. Research will be needed to evaluate the impact of the pandemic on the workplace itself and WPH initiatives in both the short- and long-term. Finally, a shift from conventional to more comprehensive WPH programs that optimize job design, improve culture, and provide holistic supports and benefits can hasten improvements in population-level CVH.

ARTICLE INFORMATION

Affiliations

American Heart Association, Dallas, TX (C.C., D.M., E.S.); National Heart Lung and Blood Institute, Bethesda, MD (C.P., E.A., A.G.B., D.G.); HealthPartners Institute, Minneapolis, MN (N.P.P.); Centers for Disease Control and Prevention, Atlanta, GA (J.E.F.); University of California San Francisco and Genentech, San Francisco, CA (K.J.); Massachusetts General Hospital and Harvard Medical School, Harvard, MA (A.N.T.); University of Illinois at Chicago, IL (R.A.); Healthy Living for Pandemic Event Protection Network, Chicago, IL (R.A.); National Institute for Occupational Safety and Health/Centers for Disease Control and Prevention, Washington, DC (C.C.); Colorado Department of Health Care Policy and Financing, Denver, CO (L.L.); Tufts Medical Center, Boston, MA (D.L.); Salem Area Mass Transit District, Salem, OR (M.M.); and Kaiser Permanente, Oakland, CA (M.M.).

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Supplementary Material

Figure S1
Data S1
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SUPPLEMENTAL MATERIAL

Figure S1. Symposium Agenda.

Time	Agenda	Speakers(s)
7:30	Registration & breakfast	
	Session One: ***Research Opportunities in Workplace Health***	
8:00	Welcome & Opening Remarks **Eduardo Sanchez, MD, MS, MPH** *Chief Medical Officer for Prevention; Chief, Center for Health Metrics and Evaluation;* **American Heart Association** Program Planning Chair **Ross Arena, PhD, PT, FAHA** *Professor and Head, Dept. of Physical Therapy, College of Applied Health Sciences;* **UIC**	**Eduardo Sanchez, MD MPH** **Ross Arena, PhD PT** **FAHA**
08:15	**Morning Keynote** ***Promoting Cardiovascular Health in the Workplace***	**David Goff, MD, PhD** Director, Division of Cardiovascular Sciences, NHLBI **National Institute of Health**

09:00	***Funding My Workplace Research Career: Lessons from the Trenches*** **Early Career - Anne N. Thorndike, MD, MPH** **Senior Career – Nico Pronk, PhD**	**Anne N. Thorndike, MD, MPH** Assistant Professor of Medicine **Massachusetts General Hospital** **Nico Pronk, PhD** President, **HealthPartners Institute**
09:30	**Panel Discussion: What Workplace Research Do Employers Want?**	**Moderator: Ross Arena** **Panelists: David Goff, Nico Pronk, Kimberly Jinnett, Anne Thorndike**
10:15	**Break**	
	Session Two: ***The Role of Data Science in Workplace Health***	
10:30	**Session Keynote: Opportunities and Challenges in Workplace Data Science**	**Kimberly Jinnett MSPH, PhD** President **Center for Workforce Health and Performance**

11:00	**The Use of Data Science in Employee Population Health Management: Employer Perspective**	**Lisa Latts MD, MSPH, MBA** Chief Medical Officer for Payers **IBM Watson Health**
11:15	**The Use of Data Science in Employee Population Health Management: Researcher Perspective**	**Nico Pronk PhD** President, **HealthPartners Institute** Chief Science Officer, **HealthPartners**
11:30	**Panel Discussion:** Data Science in Workplace Health: Hype or Health Impact?	**Moderator: Charlotte Pratt, PhD, FAHA** **Panelists: Kimberly Jinnett, Lisa Latts, Nico Pronk**
12:00	**Lunch**	
	Session Three: ***Implementing Physical Activity Guidelines in the Workplace***	
1:30	**Session Keynote: Janet Fulton, CDC**	**Janet Fulton PhD** Chief, Physical Activity and Health Branch, Division of

		Nutrition, Physical Activity, and Obesity (DNPAO) **Centers for Disease Control and Prevention (CDC)**
2:00	**Adoption of Physical Activity Best Practices in the Workplace: Results from the AHA's Workplace Health Achievement Index**	**Eduardo Sanchez, MD, MS, MPH** Chief Medical Officer for Prevention; Chief, Center for Health Metrics and Evaluation **American Heart Association**
2:15	**Larger Employer Case Study** Kaiser Permanente (Oakland, CA)	**Michelle Mancuso, BS, MPH** Manager, Workforce Wellness **Kaiser Permanente**
2:30	**Smaller Employer Case Study** Cherriots (Salem, OR)	**Michiel RG Majors, BA** Safety & Loss Control Specialist **Cherriots**

2:45	**Panel Discussion:** Barriers & Facilitators to Implementing Scientific Guidelines in Real Life Settings	**Moderator: Janet Fulton** **Panelists: Chris Calitz, Michelle Mancuso, Michiel Majors, Ron Goetzel**
3:15	**Refreshment Break**	
	Session Four: ***Improving Heart Health and Mental Health in the Workplace***	
3:30	**Keynote:** Creating Positive Mental Health in the Workplace	**Debra Lerner, MSc, PhD** Director, Program on Health, Work and Productivity Professor of Medicine & Psychiatry **Tufts Medical Center**
4:00	**Actionable Strategies for Employers: Recommendations from the AHA Mental Health in the Workplace Expert Panel**	**Chris Calitz, MPP** Director, Center for Workplace Health **American Heart Association**

4:25	Panel Discussion: Strategies for Creating a Positive Organizational Climate to Support Mental Health	Moderator: Chia-Chia Chang, NIOSH Panelists: Debra Lerner, Lisa Latts, Ron Goetzel, Paul Terry
4:55	Closing Remarks	Ross Arena PhD, PT, FAHA *Program Planning Chair*
5:00	Program Ends	

Data S1.

Case Studies

Data Science Case Study: HealthPartners

HealthPartners, the largest consumer-governed, non-profit health care organization in the nation, has developed summary measures of health and wellbeing to measure the organization's progress towards mission achievement, i.e., "*to improve health and wellbeing, in partnership with our patients, members, and community*." The organization developed two top-line measures of health and one of wellbeing, namely, current health, sustainability of health, and life satisfaction.

Current health is measured by creating a crosswalk between the weights for the 220 years lived with disability (YLD) conditions defined by the Global Burden of Disease project and the Johns Hopkins Adjusted Clinical Groups (ACG) system[119] across 27 Major Expanded Diagnostic Clusters. The HealthPartners framework calculates a "burden" score for each health plan member using a 100% sample of claims data.[120]

Sustainability of health comprises member report of six behaviors associated with health plus a clinical preventive services index based on the preventive services delivery rate of the clinic to which the patient is attributed. The six behaviors—tobacco use, diet, physical activity, alcohol use, sleep adequacy, and healthy thinking (i.e., expression of gratitude)—were selected because they have a powerful influence on sustainability of health.[120]

Subjective wellbeing was measured across seven domains: emotional, physical, career, financial, social/interpersonal, community, and meaning and purpose. Due to significant correlations between these domains and the single measures of life satisfaction, life satisfaction was chosen as the summary measure of subjective wellbeing[120,121]

This application of data science to the health and wellbeing of populations has now been shown to be a valid method[122] and implemented to characterize the health and wellbeing of the HealthPartners population[123] Results show that current health is 69% of what it could be, sustainability of health is 63% of what it could be, and wellbeing is 80% of what it could be. We also note that commercial populations (i.e., defined as those health plan members who are affiliated with an employer-based account for health care coverage), enjoy a significantly higher level of wellbeing than members who are covered under Medicaid[123]

Physical Activity, Small Business Case Study: Salem Area Mass Transit District, Salem, OR

Salem Area Mass Transit District (**Cherriots**) is a public transportation agency serving Salem, Oregon and the surrounding area, employs approximately 200 people with most staff working as Transit Operators and additional staff consisting of administrative personnel, management and maintenance staff. The nature of the work can vary widely by department; however, it is typically physically sedentary and yet mentally demanding. The majority of positions require sitting for most of the workday with many having varying and/or split schedules with limited time for breaks. The overall work environment is in compliance with local and federal safety regulations, however the rates of personal injury were higher than expected with extended periods of missed work after an injury.

Cherriots chose to address these concerns by creating an **incentivized activity-based WPH program** to counter many of the health and safety concerns affecting its employees. This program was developed by an internal, cross-divisional "Cherriots Wellness Committee". The activity-based program was developed internally and funded through a dividend reimbursement provided to Cherriots by its workers compensation insurance carrier. The program was initiated through a kickoff wellness fair in June of 2016. At the event, staff could receive a free wearable activity tracker, meet health benefit providers, and be introduced to the concept of activity challenges. Then the program created monthly

activity challenges which encourage walking and general activity to overcome sedentary work schedules. The monthly challenges typically require participants to average between 7,500 to 10,000 steps a day to be entered a random drawing for a prize.

The success of the program was almost immediate, reaching many of the short-term goals in the first day and surpassing the long-term goals within the first year. The program currently has a 70% participation rate with 87% of surveyed participants stating they have lost weight, with 36% losing over 10 pounds, and 15% stating they have lost over 20 pounds. There was also a positive cultural change within the organization that broke down many of the divisional silos and created common ground for conversations and collaboration between all levels of staff. This cultural shift, along with the increased amounts of visible activity, encouraged others to participate and resulted in fast-paced growth of the program. The success has also resulted in Cherriots being named one of the healthiest employers in Oregon, two years in a row.

This program's success has resulted in a considerable amount of cost savings through the control of health insurance premiums and a reduction in workplace injuries. Workplace injuries associated with ergonomics have been drastically reduced and the long-term effects of other injuries may be reduced through an increase in overall employee resiliency. This reduction in the number and severity of claims resulted in a considerable amount of financial savings, consistently reducing insurance cost through control of the experience rating.

Overall, the program has been an overwhelming success for Salem Area Mass Transit District. The program generated a considerable amount of cost savings, but also improved the workplace culture; reduced injuries and medical insurance claims; and most importantly improved the lives of the employees and the city they serve.

Physical Activity, Large Business Case Study: Kaiser Permanente, Oakland, CA

Kaiser Permanente (KP) is a national health care provider with more than 12.4 million members in eight states and the District of Columbia. The organization currently has more than 217,000 employees, across a wide range of settings, with the majority employed in health care delivery at the medical facilities, but also including administrative, clerical and technical functions.

In 2010, Kaiser Permanente launched the Healthy Workforce program as an extension of the comprehensive health care services provided to Kaiser Permanente employees and their families. The program aims to foster a culture of workplace wellbeing, give all employees the tools and resources they need to live healthier lives, and reinforce what we call "total health" – a state of complete physical, mental, and social wellbeing. KP's wellbeing model includes six key areas: Physical Health and Safety; Mental Health and Wellness; Healthy Relationships; Community Involvement; Career Wellness; and Financial Wellness.

Launched in 2018, Kaiser Permanente's Healthy Workplace Activities Policy reinforces and supports the healthy workplace environment. The policy encourages opportunities to incorporate healthy activities during the workday. It ensures all employees are supported to participate in activities that are reasonable, appropriate, and do not disrupt or compromise staff, members, patients, visitors, or the quality of patient care. Examples of activities include Thrive breaks (standard work breaks that incorporate a healthy activity), walking meetings, departmental gratitude trees, and short bursts of exercises or meditation.

Kaiser Permanente developed a "Healthy Workplace Activity Policy Support Guide" to help managers, supervisors, and team leads understand the policy's provisions to support compliance and implementation. The Guide also includes links to healthy activity resources for employees; talking points for managers, supervisors, and team leads; and an employee Q&A for managers to share with their employees. There is also a website with national and regional healthy activity resources accessible to all Kaiser Permanente employees.

Kaiser Permanente also offers a variety of physical activity programs, tools, online information, and pamphlets that support the policy and motivate employees to be active. Examples include: Go KP, which is an easy-to-use online total health program that includes a yearly physical activity team; Instant Recess® and Stretch Breaks, which employees can incorporate into the workday to reduce sitting. Instant Recess consists of short bouts of activity, usually set to music, which can be done in any attire, anywhere, by everyone — regardless of fitness level. In addition, physical activity spaces that support and encourage movement throughout the workday are built into the work environment, such as outdoor spaces for walking, exercise, and bicycling; and staff gardens and labyrinths.

Depression Case Study: Be Well at Work

Be Well at Work is a telehealth intervention for employees with depression, which is provided over the telephone. It uses a multi-pronged approach to care emphasizing:

- ongoing assessment using state-of-the-art tools to track each participant's progress, and provide guided feedback to the participant and his or her primary care team
- tailored strategies to help the participant reduce patterns of thinking, feeling, and behaving that interfere with working
- guidance on modifying work routines to eliminate barriers to working effectively and efficiently, and
- skills and knowledge building to enable the participant to self-manage his or her own illness and future performance problems

Be Well at Work is evidence-based and was developed with funding from the National Institutes of Health, the Centers for Disease Control and Prevention, and the Veterans Health Administration.[124-126] After testing in four clinical trials involving more than 20 US companies, and the Veterans Health

Administration, Be Well at Work is now being transitioned to real-world settings and it is undergoing workplace and healthcare system implementation pilots.[127]

In workplace clinical trials, Be Well at Work outperformed usual care in restoring work performance and productivity, including a 50% reduction in absences, a 50% reduction in at-work productivity loss (presenteeism), improvements in time management of 40% versus 6.2% usual care,[125] improvements in ability to perform mental tasks and interpersonal tasks of 46% versus 18% in usual care.[125] Furthermore, the program produces an estimated savings of $3,100 per year per participant in reduced absences (and $5,100 per year per participant in reduced presenteeism (based on an annual median salary of $33,800).[125]

Be Well at Work also outperformed usual depression care in achieving clinical outcomes, including a 50% reduction in depressive symptom severity, and mental health improvements to levels obtained with antidepressants.[125]

Be Well at Work is an evidence-based, short-term program that focuses on functional improvement techniques[128] It is easily integrated into a system of care to work alongside existing medical care, behavioral healthcare, and Employee Assistance Programs.

Career Development Case Study: Perspective from Anne Thorndike

The workplace is an ideal setting for implementing and testing population-based strategies to promote healthy lifestyle. Although some employers provide funding for WPH program evaluations, few employers fund full-scale, high quality research projects that can guide the development of effective WPH programs and policies to improve health. At the workshop, Dr Thorndike discussed the learned six main lessons she had learned from her research in workplace health promotion that helped her develop and obtain funding for research:

- **Lesson 1**: Following one's interests by focusing on an aspect of health or health policy in the workplace that is consistent with one's overall career goals. For example, Dr Thorndike's interests in obesity prevention led her to conducting research on an employer-sponsored exercise and nutrition program, followed by a series of interventions in the workplace cafeterias and food environment.[129-133]
- **Lesson 2:** Apply for small grants (e.g., foundation grants, institutional funding) because they are critical for getting larger grants (e.g., NIH career development awards, R01-level awards). In most workplaces (and NIH study sections), it is difficult to convince the employer (or grant reviewer) that a large randomized trial is necessary or feasible without conducting smaller pilot trials. In her career, Dr Thorndike had at least one or two small foundation or institutional grants to collect pilot data needed for each NIH grant that she received.
- **Lesson 3:** Work with a multi-disciplinary team to develop novel research projects that will lead to important results that can change practice. As a physician, one of Dr Thorndike's most important early collaborations was with a business school marketing professor who introduced her to behavioral economics, and that led to the development of several different research projects in the workplace.[131-133]
- **Lesson 4:** Understand the importance of engaging the employees who are not researchers but are needed to help implement workplace research projects. In Dr Thorndike's workplace research, the cafeteria cashiers were responsible for collecting study data every time they entered customers' purchases in the cash register. Early on in this work, the research team met with the cashiers to explain about the research, ask for feedback, and let them know about "secret shoppers" that would be checking on

their accuracy. This process created transparency and trust between the cafeteria staff and the research team and helped improve the accuracy of data collection.

- **Lesson 5**: Pay attention to the results of a project, especially negative or marginal effects. Research in the workplace setting requires investment of time, energy, and resources by the employer, employees, and researchers. Everyone is interested in seeing positive results to support a new program or policy, but the ability to redirect efforts based on unexpected findings is important for success in obtaining future research funding. In one study, the evaluation of a workplace team-based exercise and nutrition program showed small but significant weight loss at one year,[129] whereas other interventions in the cafeteria setting showed significant changes in employees' food choices over two years.[132] To build on the success of the cafeteria program, an R01 project used the cafeteria setting to deliver a weight gain prevention program to employees.[134]
- **Lesson 6:** Think "outside the box." Much workplace research has tested the same types of WPH programs over the past 20-30 years. New breakthroughs are needed to explore ways to promote and sustain behavior change at work. For example, Dr Thorndike's team is using employees' food purchasing data to explore the role of workplace social networks in healthy food choices[135] and will be evaluating the role of genetics and psychological traits, such as impulsiveness, on healthy food choices at work.