Fitness of the US Workforce

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Abstract

Fitness matters for the prevention of premature death, chronic diseases, productivity loss, excess medical care costs, loss of income or family earnings, and other social and economic concerns. The workforce may be viewed as a corporate strategic asset, yet its fitness level appears to be relatively low and declining. Over the past half-century, obesity rates have doubled, physical activity levels are below par, and cardiorespiratory fitness often does not meet minimum acceptable job standards. During this time, daily occupational energy expenditure has decreased by more than 100 calories. Employers should consider best practices and design workplace wellness programs accordingly. Particular attention should be paid to human-centered cultures. Research should address ongoing surveillance needs regarding fitness of the US workforce and close gaps in the evidence base for fitness and business-relevant outcomes. Policy priorities should consider the impact of both state and federal regulations, adherence to current regulations that protect and promote worker health, and the introduction of incentives that allow employers to optimize the fitness of their workforce through supportive legislation and organizational policies.

INTRODUCTION

The prosperity of a society is closely intertwined with the health of its citizens. The positive correlation between health and per capita income appears to have a direction of causality that runs both ways (12). Healthy and safe communities are well positioned to attract new businesses and industries, create new jobs, build economic vitality, generate community prosperity, and support global competitiveness (115). A healthy, vibrant community may be described as a productive community with economic vitality (25), including an educated, well-prepared, and trained workforce that is strong and resilient to the ongoing challenges it faces. Such a workforce has previously been described as being healthy, productive, ready, and resilient (24, 131).

Obesity, habitual physical activity, and cardiorespiratory fitness represent important health and fitness factors that relate to performance at work and in life. Consider ancient Greece where community safety and prosperity complemented a strong and vital military workforce. Military training was inextricably linked to functioning in society, being a productive citizen, and valuing education (36). Military leaders have recently expressed concern that widespread obesity among young men and women in the United States has become the leading health reason for failure to qualify for military service, which reinforces the important relationship between workforce health and organizational performance and productivity. A population health factor has become a significant concern to national security, an observation connecting indicators of health to national safety, security, and prosperity (71) and providing a direct link between the health of the workforce and the health of the community.

A physically active lifestyle, a healthy weight, and a moderate-to-high degree of cardiorespiratory fitness are also important for general health and well-being. These fitness indicators have been associated with lower risk for chronic disease diagnoses (e.g., 31, 57), as well as with functional outcomes (e.g., 53) and preventable mortality (e.g., 11, 51, 56). Because the workplace is only one component of an employee's life, a broader perspective that extends beyond the workplace is warranted when considering the importance of workforce fitness. Other macrosocial determinants of health exert influence on the health and well-being of employees, and their cumulative effect carries over into the workplace.

These considerations provide context for contemplating fitness as an important strategic corporate asset. The purpose of this review is fourfold: (*a*) to discuss why workforce fitness matters, (*b*) to describe the fitness profile of the US workforce, (*c*) to discuss the changing nature of work, and (*d*) to consider evidence of effectiveness and implications for workplace wellness programs. The overarching goal of this review is to describe the importance of a fit workforce to achieving optimal organizational and societal performance.

FITNESS DEFINED

For the purpose of this review, the operational definition of "fitness" focuses on three components: (*a*) obesity, (*b*) physical activity and exercise, and (*c*) cardiorespiratory fitness. Other aspects of physical fitness include muscular strength, flexibility, balance, and coordination, among others. **Figure 1** presents an overview of these concepts and attributes and how they relate to each other and also highlights those that constitute the focus of this review.

Obesity

According to the *Evidence Report* of the National Heart, Lung, and Blood Institute, obesity is defined as a body mass index (BMI) of 30 kg/m^2 or greater (76). This definition is based only on a

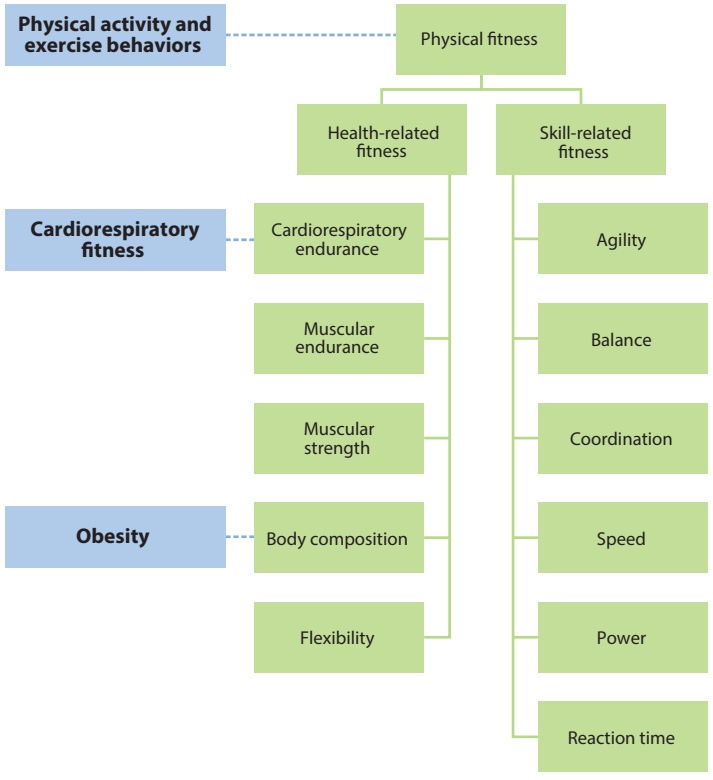

Figure 1

Various fitness components. The blue boxes indicate the focus of this review (adapted from Reference 19).

person's height and weight, does not take into consideration other indices of body composition, and is not specific to body fat. Body composition may be measured through various methods, including skinfold thickness, bioelectrical impedance analysis, computed tomography, and magnetic resonance imaging, among others. BMI remains a method of choice owing to its high correlation to body fat, relative ease of use, low cost, and measurement accuracy.

Physical Activity and Exercise

Classically defined, physical activity represents any bodily movement produced by skeletal muscles that expends energy (19). Thus, physical activity refers to an increased energy output that includes movements resulting from both leisure and nonleisure activities. Physical activity may be categorized into various domains, including occupational (i.e., work related), domestic (e.g., activities around the house, chores), transportation (e.g., walking or bicycling for the purpose of reaching a destination), rest (i.e., only the energy expended above basal metabolic rate), and leisure time (e.g., playing sports). The current physical activity guidelines for health call for at least 150 min of activity per week obtained through moderate or vigorous activity or a combination of the two (122).

Exercise is a subcategory of physical activity and may defined as planned, structured, and repetitive activity that has as a final or an intermediate objective the improvement or maintenance of physical fitness (19). Exercise situations include almost all sports activities because they tend to be related to an intentional focus on improvement or maintenance of fitness.

Cardiorespiratory Fitness

Physical fitness may be defined as a set of attributes that are related to either health or skill (see **Figure 1**) (19). Cardiorespiratory fitness is one of several attributes of health-related physical fitness. It relates specifically to the ability of the circulatory and respiratory systems to supply fuel during sustained physical activity and to eliminate fatigue products. A maximal oxygen uptake test performed on a treadmill or cycle ergometer allows for its measurement, which is expressed as the maximal volume of oxygen uptake in L/min or mL/kg of body weight/min (VO_{2max}) (8). Alternatively, it may be estimated using submaximal tests or field tests (e.g., the Rockport One-Mile Walking Test) or may be based on self-report using physical activity and demographic data (1, 8).

WHY DOES FITNESS MATTER?

The physical fitness levels of the workforce impact, directly or indirectly, employers, shareholders, employees, family members, the larger community, and society as a whole. Physical fitness, as defined in this article, has strong relationships with positive health outcomes, including reduced risk for preventable deaths (59, 70, 72) and chronic conditions such as cardiovascular disease, type 2 diabetes, certain cancers, back pain, and high cholesterol (18, 31, 57, 61, 92, 93, 95, 122, 130), as well as reduced health care spending (3, 4, 43, 45, 91, 97, 127), productivity loss (15, 18, 29, 45, 96), absenteeism (2, 10), short-term disability, and workdays lost (15) and enhanced mood and work performance (30, 93). Fitness is also associated with other non-health-related benefits, such as increased worker income and overall family earnings (27, 58), lower debt (74), lower long-term unemployment (30), low turnover rates, job satisfaction, and recruitment and retention of workers (9, 63, 90). Owing to its impact on specific occupational groups such as the military, firefighters, and law enforcement, fitness enhances local and national security and safety—an important societal benefit (23, 71, 115). Full-time employment may also increase the likelihood that workers are more active overall. Among men, full-time employment was positively associated with physical activity levels regardless of being in a sedentary type of occupation as compared with those who did not work (123). Among women, however, those in sedentary full-time jobs were significantly less active than their nonworking counterparts (123). Yet, women with active jobs were 30% more active during the week than were those with sedentary jobs; a similar observation was noted in 22% of men (123).

Companies benefit from a fit workforce in terms of both its corporate performance and the health of its people. This benefit leads to greater economic prosperity for an increasingly large group of people and contributes to the common resource pool, enabling communities to invest more in other macrosocial determinants of health such as education, culture, governance, migration, mass media, infrastructure, and others—many of which are critical to business success and all of which are critical to creation of health (40, 115). Such investments create good jobs, increase housing values, and support local, national, and global competitiveness (25, 115). Thus, workforce fitness matters to employees, their families, their companies, and the larger community and should therefore be considered a corporate asset to be simultaneously protected and promoted (54, 85, 86, 94, 110).

FITNESS PROFILE OF THE US WORKFORCE

Relevant studies were selected from the scientific literature in an attempt to characterize the fitness profile of the US workforce. Studies included reflect nationally representative samples (16, 17, 38, 39, 46, 53, 64, 123) as well as those that are specifically focused on firefighters (7, 33, 35, 60, 83, 106, 112), police (law enforcement) (101, 114), the military (49, 65, 107), or generally employed

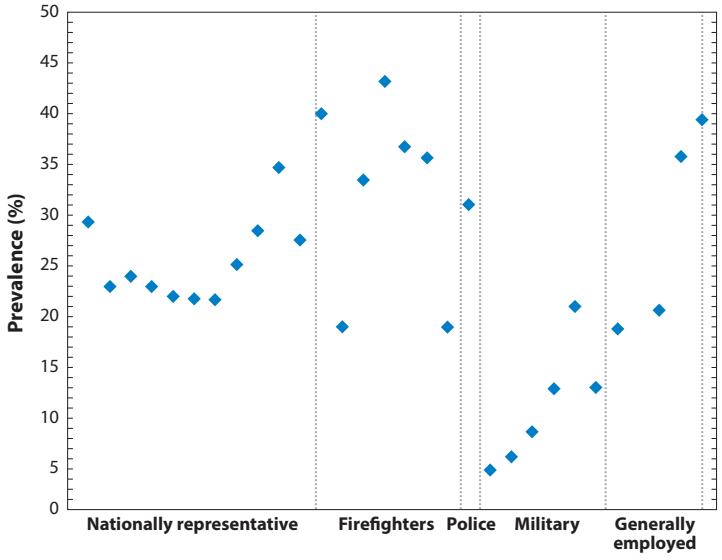

Figure 2

Obesity prevalence among various types of employee populations. The icons represent data points drawn from different studies and described in the text. Data points are organized according to the time frame during which they were collected.

populations (41, 43, 96, 97, 128). This review is not exhaustive; rather, it is intended to reflect a perspective of what has been reported across the three health factors and to identify potential gaps in the literature.

Obesity

Figure 2 presents an overview of obesity prevalence among various populations. Obesity prevalence across all studies averaged 24.9%; however, the data showed a range between 4.9% for active military personnel in 1995 (65) and 43.2% among volunteer firefighters in the Missouri Valley region in 2007 (83). The studies depicted in **Figure 2** represent data collected at various time points that need to be considered. Some of the variation in obesity prevalence is related to increases over time. To address this issue, **Figure 3** presents 19 obesity prevalence data points from 6 studies based on nationally representative data (16, 38, 39, 46, 53, 64) and shows that between 1986 and 2011 workforce obesity prevalence doubled from ~15% to ~30%.

Figure 2 shows a cluster of studies with above-average obesity prevalence data among firefighters (7, 35, 83, 112), although lower estimates were also reported (33, 60). A cluster of studies for the military showed below-average estimates (49, 65, 107). Firefighters and law-enforcement personnel have previously displayed higher levels of risk related to cardiovascular disease, including overweight and obesity (100). For example, 2008–2011 obesity prevalence based on National Health Interview Survey (NHIS) data was reportedly 36.5% and 40.5% among non-Hispanic white male firefighters and law-enforcement workers, respectively (46). Furthermore, they report 57.1% and 38.9% among black male firefighters and law-enforcement workers, respectively (46). Hence, the data reported here are supported by other primary studies on firefighters and police populations.

Studies reporting on the military include very low obesity rates such as 4.9% (65) and 8.7% (107) for the years 1995 and 2002, respectively. Others report higher prevalence such as 21% based on military records collected between 2001 and 2006 (49) or 21.2% among non-Hispanic

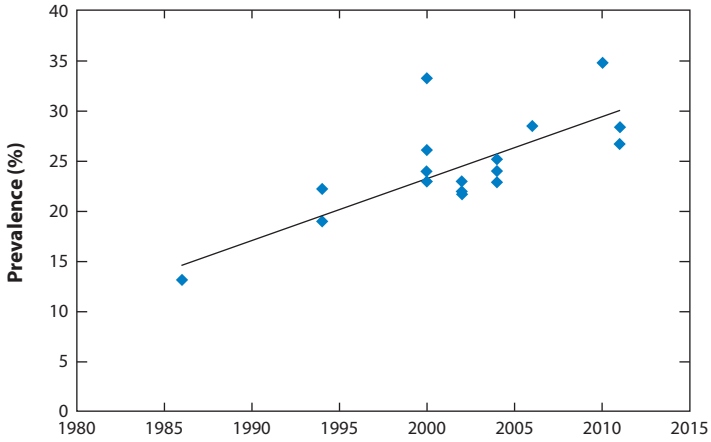

Figure 3

Employee obesity prevalence over time, based on nationally representative study populations.

white males reflecting 2008–2011 data (46). The National Research Council's report on fitness assessments for military enlistment (23) and other military leaders expresses concern (71) that obesity, as it reflects a negative health trend in the larger civilian population, may have a negative impact on the ability of the armed forces to recruit and retain high-quality and physically fit personnel. When comparing early studies in this military cluster with the more recently available data, a profound increase in obesity prevalence of close to 300% is noted.

Several studies report on employed populations from a wide variety of workplaces. These studies also reflect an increasing obesity trend. Pronk and colleagues (97) reported an overall obesity rate during 1995–1997 among 8,822 employees from 298 different companies in the Upper Midwest of 18.8% and, in 2002, a 26.5% obesity rate among employees from Colorado, Minnesota, Texas, and Washington (96). Goetzel and associates (44) pooled data collected between 2005 and 2007 from 4 research centers and reported a 39.4% obesity prevalence among more than 10,000 employees. Reporting on a random sample of employees from 8 companies in Kentucky in 2008, Gates and coworkers measured an obesity rate of 35.8% (41). Hence, these studies follow a similar trend of an approximate doubling in obesity rates over the past two decades. Finally, results from a study investigating the obesity prevalence among retired employees indicates a rate of 20.6% for data collected in 2001 and 2002 (128). This rate approximates the one estimated by the trend line observed in **Figure 3** for nationally representative studies.

Physical Activity

Caban-Martinez and associates (17) used NHIS data collected between 1997 and 2004 on 153,393 workers from 41 occupational groups to determine the proportion that met the *Healthy People 2010* guidelines for physical activity (121). Results indicated that 36% of men and 31% of women met the *Healthy People 2010* physical activity guidelines. Stratified analyses by age, race, and gender did not show any changes in prevalence rates in physical activity among employees between 1997 and 2004. However, male workers were consistently more active than female workers, and white workers had consistently higher activity levels compared with black or "other" race workers. Hispanic workers were much less likely to report meeting recommended levels of physical activity than were non-Hispanic workers. Across all occupations included in the report, substantial variability occurred. For example, the proportion of male police and firefighters or teachers, librarians, and

counselors that met the activity guideline was 55% and 52%, respectively. On the other hand, only 25% of farm operators, managers, and other agricultural workers reported meeting activity guidelines. Note, the NHIS data are collected via self-report, which provides different prevalence estimates as compared with those based on measurement by accelerometer (118).

Based on National Health and Nutrition Examination Survey (NHANES) 2003–2004 data, which included measured physical activity monitoring using accelerometers, Van Domelen (123) also reported that male full-time employees were consistently more active than were female full-time employees, although both groups were classified as "light activity" (100–759 counts/min) based on previously validated cut points for accelerometer counts (118). In a study by Lewis and colleagues (64) using the 1999–2004 NHANES data, daily levels of physical activity among 3,354 workers were classified into three levels and associated with 18% of workers mostly sitting, 49.7% standing/walking, and 32.4% using stairs/lifting light or heavy loads. Moreover, 29.7% was neither moderately, nor vigorously active at all.

Specific to occupational categories, Ramey and colleagues (101) noted that police officers were more active during off-duty days than on-duty days. This observation confirms the primarily sedentary nature of police work (111), despite the occasional burst of physical activity (100). Police officers from Austin, Texas, categorized as being sedentary in terms of their overall physical activity levels, were absent significantly more often than were their more active counterparts (114). Other reports confirm the relatively low levels of moderate-to-vigorous physical activity among firefighters (35), the military (65), or other occupations (96, 97, 128).

The low levels of physical activity among working populations may be the result of a significant decline in the proportion of occupations that are considered moderately active with a concomitant increase in light and sedentary occupations. Among data from the US Bureau of Labor Statistics between 1960 and 2010, trends in occupational physical activity indicate that the activity requirements of the job have declined by more than 100 calories per day (22). This reduction in daily occupation-related energy expenditure makes it more difficult for workers to meet the physical activity guidelines for health (122). Furthermore, this reduction accounts for a significant portion of the increase in average body weights for men and women in the United States (22).

Cardiorespiratory Fitness

Lewis and colleagues (64) report on a unique analysis of NHANES 1999–2004 data that provides insight into all three fitness indicators for the same population. This article's assessment of cardiorespiratory fitness across 40 occupations among a representative sample of US employees is rare. The researchers show that across all occupations studied, the average estimated VO_{2max} levels for the total sample, men, and women were 40.4 mL/kg/min, 43.8 mL/kg/min, and 35.9 mL/kg/min, respectively. The highest estimated VO_{2max} was found for male construction laborers (49.5 mL/kg/min), and the lowest was for female farm operators, managers, and supervisors (27.4 mL/kg/min).

Among firefighters, cardiorespiratory fitness has been relatively well studied. In a review of the literature, Smith (106) reported a range of VO_{2max} values from 35.0 to 56.0 mL/kg/min. Studies on firefighters from the Midwest (7), Colorado (33), and the Missouri Valley (35) all conducted maximal exercise tolerance testing to measure VO_{2max} and recorded values of 42 mL/kg/min, 46.6 mL/kg/min, and 44.5 mL/kg/min, respectively. These values are all above the national average reported by Lewis and associates (64) but more importantly should be considered in the context of a minimum requirement for the job. Several investigators have suggested 12.0 metabolic equivalents (METs; 1 MET = 3.5 mL/kg/min) as a minimum threshold for firefighter fitness levels (33, 119). The oxygen demand of simulated firefighting tasks is reportedly between 23.0 and 42.5 mL/kg/min

(42, 113, 116). Hence, 42.0 mL/kg/min (equal to 12 METs) may be considered a reasonable minimum acceptable level of cardiorespiratory fitness needed to perform the job. This minimum acceptable level has been endorsed by the National Fire Protection Association (NFPA) as a standard for fire departments (75). However, enforcement of this level of cardiorespiratory fitness may be lacking (33); as many as 25% of firefighters tested failed to achieve this minimum standard. Furthermore, no lean firefighter recruits failed to achieve 12 METs, whereas 7% of overweight and 42% of obese recruits were not able to reach this threshold (119). Finally, Poston and associates (83) considered differences in obesity prevalence between career and volunteer firefighters. Obese as compared with nonobese firefighters had significantly lower VO_{2max} in both career (33.5 versus 41.4 mL/kg/min) and volunteer (30.8 versus 38.9 mL/kg/min) firefighters. In addition, among obese career firefighters, 90.4%, as compared with 43.9% of their nonobese counterparts, did not meet the NFPA-suggested minimum standards. Among volunteer firefighters these rates were 97.7% and 59.5%, respectively. In all, only 38.7% and 23.6% of career and volunteer firefighters, respectively, met or exceeded the minimum 12 METs criterion.

Active employees who completed a health and productivity questionnaire reported an estimated VO_{2max} of 33.4 mL/kg/min (96). Compared with the analyses conducted by Lewis and associates (64), these employees would qualify as being at low-to-moderate cardiorespiratory fitness levels. Wang and colleagues reported, on the basis of 1999–2004 NHANES estimates, that these employees would also qualify as being at mostly low cardiorespiratory fitness levels among the US population (126). The average estimated VO_{2max} levels for 40–49-year-old men and women were 42.2 mL/kg/min and 34.4 mL/kg/min, respectively (8).

Overall Characterization of the US Workforce Fitness Profile

To characterize the fitness profile of the US workforce, this author finds it reasonable to conclude that fitness levels are relatively low and appear to be declining. An approximate doubling of obesity rates over the past several decades has been noted. Since 1960, studies have reported a sustained reduction in overall occupational energy expenditure, and this reduction explains a major portion of the average increase in body weight over the same time period. The US workforce may be classified as being "fair" to "poor" in terms of cardiorespiratory fitness (8), leaving many workers in a fitness category that is below-average and, for some specific occupations, allowing fewer than 40% to meet minimum standards for job performance.

THE CHANGING NATURE OF WORK

The contemporary workplace is oriented more toward service than toward manufacturing or goods production. This shift has been noted in trend analyses of occupational physical activity using data from the US Bureau of Labor Statistics (22). Research conducted along a parallel path has identified sedentary behavior in general, and prolonged sitting time specifically, as an emerging public and population health threat (37, 47, 79) with specific relevance to the workplace (20, 21, 117).

The Changing Nature of the Energy Demand of Work

From 1960 to 2010, when comparing service occupations with goods-producing occupations and agricultural occupations, the prevalence of service occupations has steadily increased from ~50% to more than 80% (22). During this same time period, the latter two types of occupations have declined by as much as 50%. The energy expenditure associated with service-providing jobs is about half of that associated with farm and goods-producing jobs: The caloric expenditures of service jobs and agricultural and goods-producing jobs are estimated to be 1.5–2.0 METs and

3.0–4.0 METs, respectively. This decline has produced a fundamental shift in the energy expenditure associated with work over the past five decades. The impact is an estimated decrease of more than 100 calories in daily occupational energy expenditure, which, in turn, is purported to account for a large portion of the average increase in body weight among US men and women during this time period (22). Moreover, the health impact of meeting physical activity guidelines for health may be reduced or even negated when workers sit for too many hours during their day (80). This view is supported by the work of Mummery and colleagues (73), who show that Australian workers who sit more than 6 hours per day are twice as likely to be obese compared with those who sit less than 45 min per day. Thus, the change in energy demands of work tasks has resulted from increased sedentary behavior in the context of mostly service-oriented jobs. Clearly, this shift has implications for fitness and workplace wellness program design.

IMPLICATIONS FOR WORKPLACE WELLNESS PROGRAMS

How should workplace wellness be designed to be effective at increasing fitness levels? A brief review of program effectiveness and considerations for program design follows.

Evidence of Effectiveness

This review is not intended to report on the broad scope of workplace wellness programs, as others have done (6, 45, 68, 78, 104); rather, it aims to provide insight into the evidence of effectiveness of workplace fitness programs. Because the definition of physical fitness in this article addresses obesity, physical activity, and cardiorespiratory fitness, evidence of effectiveness in these categories is highlighted.

A highly applicable and useful resource for finding evidence of effectiveness of worksite health programs, services, and policies is the Community Preventive Services Task Force (CPSTF) website (**http://www.thecommunityguide.org/worksite/index.html**). One often-cited CPSTF review of workplace wellness programs concluded that assessments of health risks with feedback plus health education when used with or without additional interventions generated evidence of effectiveness for tobacco use, alcohol use, seat belt use, dietary fat intake, blood pressure, cholesterol, summary health risk scores, absenteeism, and health care use, but not fruits and vegetables intake, body composition, and cardiorespiratory fitness (109). Another early review on this topic also concluded that typical workplace wellness programs could not report statistically significant increases in physical activity (32). A systematic review by Proper and associates (98), focused on the impact of physical activity and fitness programs on work-related outcomes, found eight studies with weak methodologies, and they noted limited effect on absenteeism; inconclusive evidence on job stress, job satisfaction, and turnover; and no effect on productivity. A recent systematic review on physical activity programs at the workplace by Malik and coworkers (67) identified 58 studies, of which 32 showed a statistically significant improvement over a control group, and concluded that programs can be efficacious; however, the overall review remained inconclusive. On the other hand, Conn and coworkers (28) reported results of a meta-analysis of workplace physical activity interventions and found positive effects for physical activity, fitness, lipids, work attendance, and job stress. Another Task Force review found that worksite nutrition and physical activity programs were effective at generating modest weight loss of 2.8 pounds (5). Additionally, CPSTF reviews on point-of-decision prompts to increase use of stairs (108) and the combined use of informational outreach and enhanced access to places for physical activity resulted in enhanced levels of physical activity (55). This result was corroborated by meta-analytic findings from Verweij et al. (125) who reported evidence of physical activity and dietary behavior programs to reduce body weight. Other

systematic reviews on the impact of physical fitness programs reported significant financial savings in terms of reduced absenteeism, medical costs, or both, among nonrandomized trials (124). Limited evidence of a relationship between physical activity and presenteeism was reported by Brown and colleagues (14). A recent review of integrated health protection (safety) and worksite health promotion programs on health and economic outcomes concluded that existing evidence supports an integrated approach because health outcomes showed sufficient evidence of effectiveness (86). However, productivity-related outcomes were considered promising but inconclusive, and little support was found for an impact on health care expenditures. Finally, in a review of reviews, Pronk (85) concluded that comprehensive, multicomponent worksite programs that include physical activity programming can generate improvements in health, can reduce absenteeism and sick leave use, and can generate a positive financial return. However, it appears that much of the potential for worksite programs to deliver on their promises may depend on how well they follow best practices. Successful workplace wellness programs generate value that reaches far beyond the workplace and is not limited to financial results alone (90).

Program Design Characteristics

Well-designed workplace wellness programs recognize the importance of addressing multiple levels of the organization, a multicomponent set of programmatic solutions, and a comprehensive approach to implementation (45, 88–90, 129). Unfortunately, as noted in the 2004 National Worksite Health Promotion Survey (NWHPS), only 6.9% of all worksites offer a comprehensive program (66). Compared with larger workplaces, smaller workplaces are less likely to offer comprehensive programs or wellness plans of any kind (48, 54, 66). Moreover, because the 2004 NWHPS did not include worksites smaller than 50 employees, it likely overstates the prevalence of comprehensive programs (48, 120). It is of interest to consider how workplace wellness programs may organize around best practice principles of design in order to optimize the likelihood for success.

The *Healthy People 2010* initiative defines comprehensive workplace wellness programs as those that include health education, supportive physical and social environments, integration of the worksite program into the organization's structure, linkage to related programs, and worksite screening programs (66, 121). To expand this definition and address a broader context, several best practices and benchmark studies as well as observations from subject matter experts, industry reports, and consensus statements were consolidated into a set of 44 best practice elements (88, 90). These elements were subsequently categorized into the following best practice design dimensions: (*a*) leadership, including elements that reflect program vision, organizational policy, resources, and implementation support; (*b*) relevance, including elements that address factors critical to program participation and that connect to the intrinsic motivations of workers; (*c*) partnership, including elements that relate to integration efforts with other groups or entities such as unions, other internal departments, external vendors, and community organizations, among others; (*d*) comprehensiveness, including the five components as defined by *Healthy People 2010* described above; (*e*) implementation, including elements that ensure a planned, coordinated, and fully executed work plan and process tracking system; (*f*) engagement, including elements that promote ongoing connections between employees and the program through activities and behaviors that build trust, respect, and an overall culture of health and well-being; (*g*) communications, including elements that reflect a strategic communications plan that maintains high program visibility and recognition; (*h*) a data-driven perspective, including elements that ensure program measurement, reporting, evaluation, and continuous improvement; and (*i*) compliance, including elements that ensure the program meets regulatory requirements and protects employees' and participants' personal information.

These best practice dimensions may be highly useful when considering how best to address workforce fitness issues. For example, owing to the nature of job tasks and work flows, it may be more productive to ensure that a group of administrative workers in a call center avoid prolonged sitting during the work day instead of promoting achievement of physical activity guidelines (50, 93). Such an approach is also sensitive to the roles and responsibilities of managers and supervisors who are charged to deliver product, take care of their staff, and represent an important group of leaders within the company. Alternatively, among a group of firefighters or police, it may be much more productive to bring fitness training equipment onsite. Their workdays are characterized by long periods of highly sedentary job tasks interspersed with occasional periods of intense physical exertion (101, 106). In this scenario, achievement of and adherence to high physical fitness standards, including cardiovascular fitness, strength, muscular endurance, flexibility, and other health- and skill-related fitness components, should be encouraged, brought as close to the workflow as possible, and perhaps even be an integral part of the job itself.

Fitness is also associated with worker injury rates, an integrated worker health protection and promotion issue that carries both social and economic costs (54, 86, 110). In an elegantly designed workplace wellness program developed on the basis of sports science principles, Roberts (102) implemented a preseason work-task-specific fitness program among tree planters. The program successfully increased VO_{2max} and other fitness parameters during pilot testing and demonstrated higher daily tree planting production as compared with productivity in the untrained group (2,088 versus 1,867 trees per day, respectively). Implementation of the program over 5 years among all Weyerhaeuser Company silviculture contractors reduced injury rates from 22% to 5% per year. As described, this program follows the nine best practice dimensions of program design.

CONTEXT AND PRACTICAL CONSIDERATIONS

The very best workplace health promotion programs can engage the vast majority of employees; show long-term impact on health and cost outcomes; minimize absenteeism and voluntary turnover; optimize attraction and retention of high-quality employees; integrate successfully with safety, human resources, and operations; and generate a significant return to the bottom line (9, 34, 52, 63, 86, 89, 90). These programs operate in an environment that embodies best practice design dimensions and places significant onus on respecting people.

Ethics, Trust, Respect, and Human-Centered Cultures

When programs are situated in an environment of trust, respect, and human-centeredness, employer interests related to fitness or other health-related outcomes may be met more efficiently and effectively and generate engagement and positive experiences among employees (77). To that end, employers should seek buy-in and commitment to the program from all stakeholders and leaders at every level in the organization through transparent, inclusive, and participatory processes. Participatory practices are designed to involve employees actively and are effective in gaining employee engagement, participation, and positive outcomes (69). For example, participatory practices have been associated with significant reductions in office worker sedentary time (81). According to Puhl & Peterson (99), weight stigmatization and discrimination are particularly pronounced in the workplace setting. Their conclusions are supported by evidence that shows how obese individuals face stigma and prejudice at many stages of the employment process, including hiring, wage determination, and job promotions (74, 103, 105). Intentional efforts to focus on respect may address stigma and reflect a reasonable approach to appreciate human-centered cultures. For example, the intentional use of language may be used to address bias and discrimination against people with

obesity. A "people-first" language will respectfully address those with chronic disease rather than labeling them by their illness, i.e., referring to "people with obesity" instead of "obese people" (62).

Policy Considerations

Certain regulatory statutes and policies place responsibility on employers to protect the health of their workforce, provide a safe and healthful workplace, and provide guidance for programs to promote worker health and well-being (18; **https://www.osha.gov/law-regs.html**). These regulations include state and federal laws, including the Occupational Safety and Health Act (OSHA) of 1970, the Americans with Disabilities Act (ADA) of 1970, the Health Insurance Portability and Accountability Act (HIPAA) of 1996, and the Genetic Information Nondiscrimination Act (GINA) of 2008, among others (18). First and foremost, employers should adhere to all regulations that protect worker health and safety. Additionally, such regulations may be leveraged to also promote working conditions, resources, and normative cultures that are optimal to fitness, health, and well-being by integrating worker health protection and promotion (54, 86, 110, 129). However, it may be particularly relevant to consider how to optimize such conditions through regulatory and tax advantages for employers. How can policy and regulatory provisions be leveraged to generate optimal working conditions for worker fitness? Simple examples that can have significant impact on employee fitness levels include financial incentives for employers that provide bicycle commuting reimbursements as part of the qualified transportation fringe benefits covered in section 132(f) of the Internal Revenue Service code. Employers may cover reimbursement for reasonable expenses incurred by employees related to their commuting to work (up to $20 per month) (89). Additional options should be made available to employers.

In addition, from a policy perspective, the Patient Protection and Affordable Care Act provides important considerations for employers as well as for program design. For example, under this bill, employers may increase incentive rewards from 20% to 30% of the cost of coverage in 2014 or even up to 50% if such an increase is deemed appropriate (82, 87). In addition, the Prevention and Public Health Fund provides opportunities for workplace wellness programs to become a major avenue for implementation of prevention initiatives. This fund authorizes $200 million in grants to help small employers (fewer than 100 employees) implement wellness programs. It also creates support for communities to improve health by increasing access to physical activity resources. Such strategies are supported by evidence of effectiveness and include recommendations for enhanced school-based physical education (26), which may increase physical activity and fitness levels of children and adolescents and which could track into adulthood. In this case, policy recommendations would support a long-term view that considers fitness levels of the future workforce.

In 2009, the National Physical Activity Plan Alliance introduced the National Physical Activity Plan. The plan is organized across eight sectors, and it includes a specific set of strategies and tactics for the business and industry sector (**http://www.physicalactivityplan.org/business.php**). The goals, strategies, and tactics were informed by available evidence (85) and are slated to be updated in 2015. A policy recommendation in the current plan includes the development of legislation and policy agendas that promote employer-sponsored physical activity programs while protecting the rights of individual employees and dependents. A comparison of national physical activity plans across multiple countries and which are specific to business and industry recommendations shows that policy recommendations for physical activity should be considered an integral part of workplace health, environmental, safety, and cultural contexts (13). In addition, strong support promotes simultaneous consideration of physical activity policies across multiple sectors so that workplace efforts are supported in the broader community and vice versa. Such complementary efforts that reach beyond the workplace are more likely to achieve successful outcomes.

Summary

In summary, workforce fitness is an important consideration for employers because employee fitness levels are directly related to their functional status and work performance, productivity outcomes, health status, health care costs, turnover, and overall job fit. Furthermore, fitness is important to the employee because it affects employment potential, income, family earnings, job retention, health status, and other important quality-of-life indicators and functional status. Unfortunately, the fitness level of the US workforce is relatively low and has declined over the past 50 years. Employers should promote fitness at the workplace, and supportive policy and regulations at both the state and federal levels should be leveraged to make this happen. Such policy should not be limited to the workplace, but also reach into the community and consider not only current workers but also youths because they represent the future workforce. These considerations make it even more important to focus on properly designed, evidence-informed, ethically responsible, and human-centered programs that incorporate fitness and present a path toward high-value outcomes.

SUMMARY POINTS

1. The overall physical fitness level of the US workforce, defined by obesity, physical activity and exercise, and cardiorespiratory fitness, appears to be low.
2. In some occupations where minimum fitness standards are directly related to a worker's ability to perform a job adequately, a more direct need exists to address low levels of physical fitness.
3. Over the past five decades, the workplace environment has become increasingly sedentary, and effective programs are needed to counteract the adverse health impacts of prolonged sitting time and sedentary behavior.
4. The evidence base for a relationship between physical fitness and health and economic outcomes appears to be strong; however, the evidence for increasing levels of physical fitness using workplace wellness programs is less clear, and the impact of such programs on health and economic outcomes needs to be strengthened.
5. Employers should consider using best practice principles when designing workplace wellness programs to address workforce fitness levels.

FUTURE ISSUES

1. Research priorities for workforce fitness include (*a*) surveillance of physical fitness along with other health-related indicators of the US workforce, which may inform health objectives for the nation and research priorities of funding agencies; (*b*) consideration of the use of fitness summary or optimal fitness scores composed of at least obesity, physical activity, and cardiorespiratory fitness in descriptive and interventional investigations of relevant outcomes, especially among special populations such as firefighters, police, and the military; and (*c*) enhancement of the evidence base regarding the relation of physical fitness to health, financial, and productivity-related outcomes.

2. The most effective programs should be studied to design fitness-enhancing interventions and translate the results to employer groups of all sizes and industries.
3. Continued focus on the impact of current legislation (e.g., OSHA, HIPAA, GINA, ADA) and the Patient Protection and Affordable Care Act and its potential to affect the health and fitness of Americans through the workplace is warranted.
4. A clear and compelling business case should be created for the engagement of employers and company leaders to participate intentionally in the health of their communities.

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