Workplace Programs, Policies, And Environmental Supports To Prevent Cardiovascular Disease

ABSTRACT Using a novel approach, we provide a preliminary “snapshot” of how the comprehensiveness of workplace cardiovascular health initiatives is related to measures of employees’ health risks, disease prevalence, and medical expenditures. We linked scores for the twenty large organizations that voluntarily completed the American Heart Association’s newly launched Worksite Health Achievement Index (WHAI) for 2015 to individual-level MarketScan® data for 373,478 of their workers with employer benefits that year. Higher aggregate WHAI scores were associated with lower values for four of seven modifiable indicators of cardiovascular risk and a higher value for one. Although also associated with lower prevalence of cardiovascular disease, higher aggregate scores were associated with higher spending on the condition. These and other findings provide useful benchmarks and norms for employer practices related to cardiovascular disease prevention. As employers continue to complete the annual WHAI, we expect to gain further insights into the policies, programs, and environmental supports employers can implement to positively influence cardiovascular health and related spending.

Heart disease is the leading cause of death in the United States, costing the country about $207 billion each year in medical expenditures and lost productivity. Ninety-nine percent of the adult US population has at least one of seven cardiovascular health risks: high blood pressure, high cholesterol, high blood glucose, unhealthy weight, tobacco use, physical inactivity, and poor diet. The combined contribution of these risk factors increases employer medical spending by 213.6 percent per person per year.

The workplace is an ideal setting for improving heart health because approximately 151 million US adults are in the civilian noninstitutionalized workforce, and the labor force participation rate exceeds 60 percent. In February 2016 the American Heart Association (AHA) launched the Worksite Health Achievement Index (WHAI), a scorecard that assesses the comprehensiveness of an organization’s heart health programs, policies, and environmental supports for promoting its employees’ cardiovascular health.

In this article we report the results of an exploratory analysis that linked employers’ WHAI scores to their employees’ health risk and medical claims data. Because the WHAI is new, and longitudinal WHAI scores are not yet available, this pilot study offers a “snapshot” view of the relationship between organizational and individual variables that are important for understanding heart disease prevalence, expenditures, and associated risk factors.

We took advantage of data from a convenience sample of twenty large organizations that Truven Health recruited to complete the WHAI. These organizations also contributed their workers’
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deidentified medical, drug, and health risk data to the MarketScan® multiemployer database. Thus, we were able to connect employer WHAI scores and employee data to assess the association between an organization’s score and measures of employees’ health risks, disease prevalence, and medical expenditures. Additional years of data will be needed to draw conclusions about how organizational programs, practices, and environmental supports influence key outcomes of interest.

The relevance of this line of research is threefold. First, employers seek benchmarks related to their health promotion initiatives to compare their practices with those of peers. Second, employers seek norms related to employees’ health risks and costs to assess whether their workforce is average or extraordinary. Finally, employers seek insights on which interventions yield the greatest benefit. This third aim, which we could only begin to address because of the study’s cross-sectional design, will be the focus of future research when longitudinal data become available.

Background
Since 2009 the AHA has published several statements on workplace wellness policies14–15 and use of incentives in wellness programs.12 The AHA Presidential Advisory on Workplace Wellness Recognition called for the development of a comprehensive tool to assess workplace health promotion programs, practices, and environmental supports for heart health.13 The resultant WHAI was based on the AHA’s existing Fit-Friendly Worksites recognition program14 and the Worksite Health ScoreCard of the Centers for Disease Control and Prevention (CDC).15 Established and widely used workplace health scorecards such as these have been shown to be valid, reliable, and closely aligned with evidence-based practices for workplace health promotion.16

Our study offers an early view of organizational practices related to heart disease prevention and aggregate data on health risks, disease prevalence, and expenditures for hundreds of thousands of employees in twenty large organizations. It also provides a preliminary look at the association between organizationwide scores on the WHAI and objective data about individual health risks and insurance claims.

Study Data And Methods

Recruitment
We identified fifty-seven large organizations as potential study participants, choosing them because Truven Health had complete data on their employees’ enrollment in insurance plans, medical claims, pharmacy claims, and health risk assessments in its MarketScan database. For data on health risk assessments, complete meant that at least 50 percent of the responses to questions about one or more of the seven risk factors for cardiovascular disease were available.

Truven Health client directors recruited candidate organizations by meeting with key decision makers at these organizations to describe the study and answer any questions. As an incentive for participation, organizations were promised a report that would compare their data with those of all participating employers and provide early insights from the analysis. Twenty (35 percent) of the fifty-seven potential participants signed informed consent documents and completed the online WHAI on the basis of their organizational policies and practices in 2015 within the one-month recruitment period. Managers in charge of wellness programs, benefits, or medical services or other human resources personnel completed the WHAI.

After the surveys were completed, employee-level data were extracted from MarketScan and linked to WHAI aggregate and subcategory scores. The study included only active, full-time, nonpregnant employees ages 18–64 who were enrolled in a self-insured health plan for all of 2015. We excluded individuals with negative claim values. We included employees eligible for health benefits in the sample regardless of whether or not they incurred claims during the study year. For employees to be included in our analysis of employee health risk, they had to have completed a health risk assessment administered by their employer during the study year.

WHAI Score
The WHAI has three sections: organizational and workforce demographic characteristics, structure and process measures, and performance metrics. The WHAI score was derived from the structure and process measures section, which contains fifty-five questions that are collectively worth 151 points. These questions assess the comprehensiveness of an organization’s programs, policies, and environmental supports (culture of health) across seven domains: leadership commitment (six items, worth seventeen points), organizational policies and environment (twenty-two items, worth fifty-two points), strategic communications (six items, worth sixteen points), health-promoting programs (ten items, worth thirty-one points), employee engagement practices (six items, worth fifteen points), community partnerships (one item, worth five points), and measuring and reporting of outcomes (four items, worth fifteen points). We examined the total WHAI score in the aggregate and scores for each of...
Employers seek benchmarks related to their health promotion initiatives to compare their practices with those of peers.

the domains. Total scores and subscores were standardized on a scale of 0–100 points, where higher scores represent “better,” more comprehensive engagement practices.

EMPLOYEE CARDIOVASCULAR HEALTH We examined three sets of employee health measures: the prevalence of seven risk factors for cardiovascular disease, disease prevalence, and medical and drug expenditures (including employer and employee spending) on cardiovascular disease.

We standardized health risk definitions in accordance with AHA guidelines. High biometric risks for heart disease were high blood pressure, defined as ≥120 mm/Hg systolic and ≥80 mm/Hg diastolic values; high cholesterol, defined as total cholesterol ≥200 mg/dl; high blood glucose, defined as a fasting blood glucose of ≥100 mg/dl; and unhealthy weight, defined as body mass index outside the range of 18.5–24.9 kg/m². High behavioral risk for heart disease consisted of tobacco use, defined as smoking cigarettes or using any form of tobacco; physical inactivity, defined as participating in less than 150 minutes of moderate-intensity physical activity or less than 75 minutes of vigorous activity in a given week; and poor diet, defined as consuming fewer than five servings of fruit or vegetables per day.17

Across all risk categories, prevalence of health risk was calculated as the number of employees at high risk by category, divided by the number of valid nonmissing responses to the items about the risk factor derived from the health risk assessment database. Although health risk assessment data were based on self-reports, employees were prompted to report results from physician visits or wellness screenings on site.

We determined cardiovascular disease prevalence and spending by counting the number of employees whose claims were assigned to Major Diagnostic Category 5: diseases and disorders of the circulatory system. Using the medical claims database, we calculated disease prevalence as the number of individuals filing claims assigned to that category, divided by total eligible employees. We calculated medical and drug expenditures for heart disease as total allowed amounts assigned to the same category, divided by total eligible employees.

ANALYSIS We calculated descriptive statistics for the sample and provide norms related to the implementation of programs and policies, cardiovascular health, and expenditures. Next, we estimated person-level general linear mixed models to measure the relationship between WHAI scores (overall and by subcategory) and the seven cardiovascular health risks, cardiovascular disease prevalence, and medical spending. For each model, we included the following variables as covariates: sex, age range (18–34, 35–44, 45–54, or 55–64 years), geographic region (Northeast, North Central, South, or West), plan type (health maintenance organization, point-of-service plan, exclusive provider program, preferred provider organization, comprehensive plan, or consumer-driven or high-deductible plan), marital status (married, single, or divorced or other), union member or not, hourly or salaried employee, health plan generosity (average paid amounts divided by covered charges), industry sector (goods producing; trade, transportation, and utilities; information, professional, and finance; education and health services; or other), and employer size (number of employees). We used a random effects model to address the grouped nature of the data. For all models with dichotomous outcomes (health risk or presence of cardiovascular disease), we specified the binomial distribution. For the cardiovascular cost model, we specified a gamma log distribution, which offered the best fit.

We intentionally did not apply a correction for multiple comparisons in reporting our regression results because our purpose was hypothesis generation.18 However, for interested readers, we provide those results using the false discovery rate approach to identify significant findings when multiple comparisons are made19 (see the online Appendix).20

LIMITATIONS The study had several limitations. This preliminary study provided a cross-sectional view of the association between organization-wide policies and practices as the independent variable and employee cardiovascular health risks, disease prevalence, and expenditures as dependent variables. Because it was a pilot study that presented a “snapshot” view, we could not infer causality between independent and dependent variables. In addition, the employers in our sample may be at varying stages of implementation of health promotion programs, and results may differ for early versus mature programs.
Finally, we had limited demographic information about employees, which restricted our ability to control for those potential confounders.

Study Results

**Descriptive Analysis** The study sample consisted of twenty organizations that collectively employed 675,550 workers who were eligible for benefits. We analyzed health risk assessment data for 373,478 (55 percent) of the employees. Employers were from a variety of industry sectors: 35 percent were goods-producing industries; 20 percent were in trade, transportation, and utilities; another 20 percent were in education and health services; 15 percent were in information, professional, and finance industries; and the remaining 10 percent were in other industries.

The twenty organizations had an average of 33,775 employees (Exhibit 1). Approximately 30 percent of employees were ages 45–54 (the largest category), and 43.8 percent were female. Only 12.3 percent of employees were union members, and 58.0 percent were salaried. Employees' average annual payment for medical and pharmacy claims were $4,851. Of that amount, on average, $329 was spent on cardiovascular disease. In terms of disease prevalence, 21.1 percent of employees had cardiovascular disease, based on their medical claims.

Exhibit 2 shows the percentages of employees with a condition or other risk factor for heart disease: high blood pressure (66.3 percent), high cholesterol (28.3 percent), unhealthy weight (71.9 percent), physical inactivity (47.2 percent), poor diet (70.6 percent), high blood glucose (25.1 percent), and tobacco use (5.5 percent).

Before standardization to 100 points, the maximum total WHAI score was 151. On average, organizations scored 106.2 points, which translated to a standardized score of 70.3 (Exhibit 3). The correlation among the seven WHAI subcategories was moderate (with Pearson rho values under 0.70; data not shown). The modest correlation showed that the WHAI measured different aspects of workplace health promotion structure and process variables and that employers did not always implement programs in the same way.

**Regression Analysis** In our exploratory analysis, we measured the association between standardized WHAI score, WHAI subcategory scores, and three sets of outcomes: risk prevalence for...
each of seven risk factors, cardiovascular disease prevalence, and per capita expenditures for heart disease. A higher aggregate WHAI score was associated with reductions in four risk factors (high blood pressure, high cholesterol, tobacco use, and physical inactivity) and with lower prevalence of cardiovascular disease (Exhibit 4). In contrast, and against expectations, a higher score was associated with poor diet and higher cardiovascular disease expenditures. For full model results, see the Appendix.20

No clear patterns emerged in terms of which WHAI subcategory predicted higher or lower health risks. We found a relationship between higher WHAI subcategory scores and lower risk prevalence in about two thirds (65.1 percent) of the significant associations that we examined. In addition to finding an association between overall WHAI score and disease prevalence, we found a significant association between a higher score...
in the WHAI leadership subcategory and lower disease prevalence (Exhibit 4). Although the aggregate WHAI score was associated with higher expenditures, higher scores were associated with lower cardiovascular disease expenditures in five of seven subcategories.

Interpretation of these results is limited because of the “snapshot” view that compared organizational variables and employees’ heart health and expenditures. Thus, the potential for reverse causation exists—that is, poor employee cardiovascular health might cause employers to adopt health-promoting programs.

Discussion

In this study of a convenience sample of twenty large employers that voluntarily completed the WHAI for 2015, we found that one-fifth of employees at these organizations had cardiovascular disease based on medical claims data. It was common for employees to have the condition or other risk factors for heart disease, with the percentages of employees ranging from a low of 5.5 percent for tobacco use (which was much lower than the US adult population prevalence of 16.8 percent) to a high of 71.9 percent for unhealthy weight (the same as national estimates reported by the CDO).

Employers reported having several programs, policies, and environmental supports for addressing cardiovascular disease and its risk factors. As a group, they had reasonably high overall WHAI scores, with an average standardized score of 70.3 out of 100.0; the lowest scores were in the subcategories of leadership and engagement, where they scored 62.4 and 52.7, respectively.

In addition to providing descriptive data, we sought to understand the relationships between organizational practices and employees’ health risks, disease prevalence, and expenditures. Our early attempt to uncover these relationships was limited by the lack of longitudinal data that would allow for tracking changes in WHAI scores alongside changes in the outcomes of interest.
A higher WHAI score was associated with lower levels of heart disease but higher per capita spending for the condition.

We note that organizational factors change slowly, and responses to the WHAI reflect practices that likely evolved over several years. Because the WHAI initiative is new, longitudinal WHAI scores are not yet available. As employers continue to complete the WHAI annually, in three to five years we expect to have data that provide greater insights into how changes in WHAI scores influence changes in employees’ health risks, disease prevalence, and expenditures. This, in turn, would make it possible to investigate the cause-effect relationship between employer policies and health and spending outcomes.

Despite these limitations, our exploratory analysis uncovered some intriguing results. We found that a higher total WHAI score was associated with lower prevalence of four modifiable health risk factors (high blood pressure, high cholesterol, tobacco use, and physical inactivity) but not with lower prevalence of poor diet. Two other risk factors were not significantly related to the aggregate WHAI score (high blood glucose and unhealthy weight). Our counterintuitive finding that poor diet was associated with higher WHAI scores is similar to results from the HERO II study, in which poor eating habits among employees were associated with lower medical spending.21 We hypothesize that our results and those of the HERO II study reflect how dietary habits are reported by health risk assessment respondents in contrast to their actual behavior. Furthermore, health risk assessment instruments that measure diet vary greatly, and our dichotomized indicators for high risk for poor diet may obscure important nuances associated with food choices.

In terms of heart disease prevalence, we found that a higher WHAI score was associated with lower levels of heart disease but higher per capita spending for the condition. This may be because heart patients have many comorbid conditions that explain a large portion of their medical spending, above and beyond spending for heart disease alone.

Our examination of WHAI subcategories and the nine outcomes of interest found results that were at times aligned with and at times at odds with the overall WHAI score. Some subcategories appeared to be stronger predictors of positive outcomes compared to others, but the results were mixed at best. Thus, no clear conclusions can be drawn so far as to which category of employer intervention produces the greatest impact.

Conclusion
This study represents the start of a major effort to address the types of organizational interventions that employers can introduce to improve heart health and financial outcomes that benefit both workers and businesses. Future analyses of WHAI scores and associated MarketScan worker-level data may lead to greater insights regarding what specific policies, programs, and environmental supports employers can implement to positively influence population health and concomitantly reduce medical spending for cardiovascular disease in a working population.
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7 American Heart Association. What is the Workplace Health Achievement Index? [Internet]. Dallas (TX): AHA; [cited 2016 Dec 12]. Available from: http://www.heart.org/HEARTORG/HealthyLiving/WorkplaceHealth/WhatIs-the-Workplace-Health-Achievement-Index_UCM_481057_Article.jsp#WcTlPbFKAY


14 American Heart Association. Fit-friendly worksites recognition [Internet]. Dallas (TX): AHA; [updated 2016 Feb 8; cited 2016 Dec 12]. Available from: https://www.heart.org/HEARTORG/HealthyLiving/WorkplaceHealth/Fit-FriendlyWorksites-Recognition_UCM_460612_Article.jsp#WCjZSk2qzIU


17 The MarketScan Health Risk Assessment database did not define physical inactivity in precisely the same terms that the AHA used.


20 To access the Appendix, click on the Appendix link in the box to the right of the article online.
