Cardiovascular Disease Risk Awareness and Its Association With Preventive Health Behaviors

Evidence From a Sample of Canadian Workplaces

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Objective: The aim of this study was to determine Canadian workers' level of awareness about their cardiovascular disease (CVD) risk factors and the association between CVD risk awareness and health behaviors. **Methods:** We used cross-sectional data to compare awareness of CVD risk factors with biometric measures from a workplace screening clinic ($n = 320$). We assessed the association between risk factor awareness and self-reported health behaviors using logistic regression analyses. **Results:** Overall, 39.5% of workers did not know at least one of their CVD risk factors. These individuals were less likely to meet recommended physical activity levels and to consume three daily servings of fruits and vegetables, and more likely to report weekly fast food consumption. **Conclusions:** This study highlights a lack of awareness about cholesterol levels and demonstrates a negative association between low CVD awareness and preventive health behaviors.

Cardiovascular diseases (CVDs) are a significant public health concern, representing 31% of all global deaths in 2012.[1] Despite being the leading cause of death globally, CVDs are highly preventable. Approximately 80% of CVD-related mortality and morbidity is preventable by engaging in exercise, maintaining healthy dietary habits and a healthy body weight, and not smoking.[2] Although a number of factors contribute to an individual's adoption of preventive health behaviors, one important precursor to adoption is awareness of one's risk for CVDs.[3]

There is limited evidence, however, exploring CVD risk factor awareness among Canadian workers and, to our knowledge, no evidence about how blood pressure and cholesterol awareness are related to workers' preventive health behaviors. This is a significant oversight considering the growing number of employers that have begun to offer biometric screening clinics to their employees.

Workplace biometric screening clinics may be especially beneficial in cases wherein workers are unaware of their underlying CVD risk levels,[4] and international evidence suggests a lack of awareness about personal CVD risk factors in various subpopulations. Misperceptions about obesity status and weight loss have been found among individuals in the United States,[5–7] the Netherlands,[8] the United Kingdom,[9] and Australia.[10] In Canada, the United States, and England, 17%, 19%, and 35% of individuals with hypertension in each respective country were not aware of their hypertensive status.[10,11] There have been similar findings with respect to cholesterol awareness. Among a group of American patients recently hospitalized with coronary artery disease, only 8% of patients could recall their low-density lipoprotein and high-density lipoprotein levels.[12]

Some researchers have linked risk-factor awareness to health behaviors. In the United States, Duncan et al[6] found that individuals who misperceived their weight were less likely than those with accurate weight perceptions to have reported trying to lose weight in the past year. We found no studies that directly assessed blood pressure and cholesterol misperceptions and their association with health behaviors, though some studies provide indirect evidence of this association. One Canadian study found that among individuals with hypertension, having a hypertension diagnosis was associated with greater levels of self-reported physical activity and dietary changes relative to those without a diagnosis.[13]

The existing literature has explored CVD risk awareness levels among high-risk subpopulations or in specific professions; however, less is known about how biometric screening clinics may contribute to overall CVD awareness in the broader working population. There is also limited evidence about the association between overall CVD awareness and healthy behaviors in a working population. Overall awareness is important considering that the effective management of weight, blood pressure, and cholesterol is recommended by most guidelines for preventing CVDs.[14] Finally, most of the literature exploring the link between CVD awareness and health behaviors comes from outside of Canada. The present study fills these gaps in the literature by drawing evidence from a sample of Canadians who participated in a workplace biometric screening clinic. The first objective was to determine the extent to which individuals who recently participated in a workplace screening clinic were aware of, and had correctly evaluated their risk of, being overweight, having high blood pressure, and having high cholesterol before participating in the clinic. The second objective was to determine the association between individuals' levels of awareness about these risk factors and their self-reported health behaviors (ie, physical activity levels, fruit and vegetable consumption, and fast food consumption).

METHODS

Data

Data from the Sun Life - Ivey Workplace Wellness Return on Investment Study, a quasi-experimental study including 820 individuals from six companies across Canada, were used. The companies were a sample of clients of Sun Life Financial, a Canadian-based financial services and insurance company, which provides health benefits coverage to approximately three million Canadian workers.[15] Each company had multiple sites ($n = 28$ total sites) across five provinces (Ontario, Quebec, Saskatchewan, Alberta, and British Columbia). The companies represented four sectors of the North American Industry Classification System (construction, information and cultural industries, transportation and warehousing, and public administration).[16] The present study used the baseline

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data from this trial. With a 68% response rate at baseline, survey response data regarding health behaviors and self-assessed risk for various health conditions were available for 564 individuals between January 2013 and March 2013. A subgroup of study participants ($n = 320$) was randomly selected to have their baseline biometric data collected by registered nurses at private screening clinics held at their workplaces within 2 months following the survey. The present study focused on this subgroup of individuals for whom both survey and biometric data were collected.

Measures

Self-Reported Health Behaviors

The outcome variables in this analysis were three self-reported health behaviors: physical activity levels, daily fruit and vegetable consumption, and weekly fast food consumption. The respondents were given five options for each question. In our final analyses, we did not keep the outcome variables in categorical form due to the limited number of observations in some categories. Instead, we combined several categories into dichotomous outcomes to capture whether the respondent met published health guidelines for each outcome. Participants were asked, ''How often do you engage in moderate to vigorous aerobic activity (eg, running, biking, walking quickly)?'' Respondents were classified as meeting physical activity guidelines if they reported spending at least 150 minutes per week engaged in moderate-to-vigorous physical activity (MVPA).[17] For fruit and vegetable consumption, participants were asked, ''How many servings of vegetables or fruits do you typically eat per day? (Note: one serving is about half a cup).'' Respondents were categorized according to whether they reported consuming at least seven servings daily (ie, the recommended intake of fruits and vegetables for adults according to Health Canada Guidelines)[18]. Respondents were also categorized according to whether they consumed at least three servings of fruits or vegetables daily, as this was the next lowest category available on the survey, and few respondents ($n = 19$) met the recommended guidelines of seven servings per day. Finally, participants were asked, ''In a typical week, how many days do you eat fast food (ie, pizza, hamburgers, French fries, etc.)?'' Respondents were categorized as frequent consumers of fast food if they indicated that they consumed fast food at least once a week. This threshold was selected because previous research has found that the strongest association between fast food consumption and obesity occurs when one or more fast food meals are consumed per week.[19]

Personal Risk Awareness for Weight, Blood Pressure, and Cholesterol

The explanatory variables of interest related to participants' personal risk awareness for weight, blood pressure, and cholesterol. With regard to weight assessments, individuals were asked which phrase most accurately described their opinion regarding their weight: being overweight, being at a healthy weight, or not knowing whether they were at a healthy weight. Biometric weight status was then assessed using body mass index (BMI) calculations from weight and height measurements taken by registered nurses during workplace screening clinics. Those with a BMI of 25.0 kg/m^2 or over were considered overweight.[20] In an alternate analysis, percentage body fat as measured by a bioelectrical impedance scale was used as an additional measure of weight status. Males having a body fat percentage of 21 or greater and women of 31 or greater being considered overweight.[11] Study participants were also asked about whether they had certain medical conditions, including high blood pressure/hypertension and high cholesterol. Response options for these questions were: ''I am unsure if I have this condition''; ''I don't have this condition''; ''I have this condition, but am not currently receiving professional treatment for it''; or ''I have this condition and am currently receiving professional treatment for it.'' During the postsurvey screening clinics, registered nurses took participants' blood pressure (systolic and diastolic) readings using an electronic sphygmomanometer. Individuals with systolic blood pressure readings at or above 140 mm Hg or diastolic blood pressure readings at or above 90 mm Hg were classified as having high blood pressure.[21,22] Total cholesterol levels were measured using the Accutrend Plus system (Roche Diagnostics, Basel, Switzerland), which determines lipid biomarkers by capillary sampling. If an individual's total cholesterol level was at or above 6.2 mmol/L, she/he was considered to have high cholesterol.[23]

The respondents' self-assessments of these health conditions were then compared with the objectively measured biometric measures to construct risk awareness indicators. If an individual indicated that he or she had a given health condition or did not have a given health condition and this was reflected in the biometric measures, the individual was considered to have been correct in his/her self-assessments (reference group). If an individual indicated that he or she had a given health condition but the biometric indicators did not indicate this, the individual was considered to have overestimated his or her risk. If the individual indicated that he or she did not have a health condition but the biometric indicators revealed the presence of a risk factor, the individual was considered to have underestimated his or her risk. Finally, individuals who indicated that they did not know their health risk were coded as not knowing. Two proxy measures were used to assess overall CVD risk factor awareness. The first indicated whether the individual did not know his or her risk level for at least one of the factors and the second indicated whether the individual was correct about all three CVD risk factors.

Statistical Analysis

Univariate analyses were conducted to provide an overview of the sample and to determine the proportions of individuals who were correct about, overestimated, underestimated, or who did not know whether they were overweight, had high blood pressure, or had high cholesterol. Chi-square tests were also conducted comparing characteristics of individuals who did not know at least one of their CVD risk factors with those who were aware of their CVD risk factors.

Multivariable logistic regressions were used to determine how individuals' level of awareness of health risks was associated with self-reported health behaviors. The outcome variables were the dichotomized self-reported health behaviors (ie, physical activity levels, daily consumption of fruits and vegetables, and weekly fast food consumption). The explanatory variables of interest indicated whether individuals did not know, overestimated, or underestimated their risk of being overweight, having high blood pressure, or having high cholesterol relative to those who were correct about their risk level.

The regressions also included controls for a number of socio-demographic factors at the individual level, which previous research has found to be associated with preventive health behaviors. All of these factors were included in the model regardless of significance in order to control for confounding. We indicate significance at a P value of 0.05 or less. Controls included gender and age, as previous research has found that women and those over the age of 50 are more likely to engage in preventive health behaviors.[24] Categorical variables were included to indicate whether the individual was 20 to 29, 30 to 39, 40 to 49, or 50 years or older. Marital status was controlled for because of evidence indicating that married individuals are more like to make efforts to control health.[25] A dummy variable was included taking the value one for individuals who were married or in common law relationships and zero otherwise. Previous literature has also found a relationship between

TABLE 1. Descriptive Overview of Baseline Characteristics of Individuals who Received Biometric Information

	All (n = 276) n (%)	Do Not Know at Least One Risk Factor = 1 (n = 109) n (%)	Do Not Know at Least One Risk Factor = 0 (n = 167) n (%)	P
Activity level recommended	41 (14.9)	7 (6.4)	34 (20.4)	0.001
Fruits and veg: 3 or more	177 (64.6)	54 (49.5)	123 (74.5)	< 0.001
Fruits and veg: 7 or more	19 (6.9)	4 (3.7)	15 (9.1)	0.084
Fast food consumption	134 (48.7)	71 (65.7)	63 (37.7)	< 0.001
Male	138 (50.0)	56 (51.4)	82 (49.1)	0.712
Married	214 (77.5)	84 (77.1)	130 (77.8)	0.879
Management or executive	70 (25.4)	27 (24.8)	43 (25.7)	0.855
Age				
20–29	15 (5.4)	7 (6.4)	8 (4.8)	0.559
30–39	74 (26.8)	35 (32.1)	39 (23.3)	0.108
40–49	107 (38.8)	36 (33.0)	71 (42.5)	0.114
More than 50	80 (28.9)	31 (28.4)	49 (29.3)	0.872
Company				
One	57 (20.7)	18 (16.5)	39 (23.4)	0.170
Two	40 (14.5)	15 (13.8)	25 (15.0)	0.780
Three	51 (18.5)	21 (19.3)	30 (18.0)	0.785
Four	66 (23.9)	28 (25.7)	38 (22.8)	0.576
Five	22 (7.97)	12 (11.0)	10 (5.9)	0.132
Six	40 (14.5)	15 (13.8)	25 (15.0)	0.780

education and socioeconomic status and health behaviors.[26] Because information on income or educational attainment was not available, socioeconomic status was captured by a proxy dummy variable for category of work (ie, whether or not the individual was in a management/supervisor or executive role). All regressions also included controls for company-level factors to capture systematic differences across companies.

Each risk factor was run in separate regressions; however, these results are not presented given the small size of some of the subgroups. For instance, only seven individuals underestimated their risk of high blood pressure. Instead, we report the results for models that capture individuals' overall level of awareness about CVD risk factors. In these models, the exposure variables of interest captured whether the respondents did not know their risk level for at least one of the factors (Models 1a, 2a, and 3a), or were correct about all three CVD risk factors (Models 1b, 2b, and 3b). Our base case analyses included only individuals for whom we had complete information in all the regressions ($n = 276$). Alternate analyses in which the number of observations varied in each regression were not significantly different. The regression results are presented as odds ratios (ORs), and Stata 13SE was used for all statistical analyses.

Ethics approval for this study was obtained through the University of Western Ontario Research Ethics Board for Health Sciences Research Involving Human Subjects. Written informed consent was obtained from all study participants included in this study.

RESULTS

Characteristics of the Population

An overview of the sample characteristics is presented in Table 1. Half (50.0%) of the sample was female and most (77.5%) were married or in a common law relationship. Overall, 25.4% of individuals were management/supervisors or were executives in their companies, and the majority (67.7%) were 40 years or older. In comparison to the nationally representative Labour Force Survey (LFS) and National Household Survey (NHS) in Canada,[27] the participants in the current study are similar with respect to gender and occupational status. However, differences with respect to age and marital status were noted. The sample in this study was older than estimates from the LFS (67.7% vs 57.0% were aged 40 years and over) and also had a larger proportion of married individuals than the LFS (77.5% vs 67.1%).[28]

Overall, 14.9% of the respondents indicated that they engaged in least 150 minutes of MVPA per week. As noted earlier, only 6.9% of respondents met Health Canada guidelines for fruit and vegetable consumption (ie, seven daily servings per day)[18]; however, 64.6% consumed at least three daily fruit and vegetable servings. Almost half (48.7%) of respondents indicated that they typically consumed fast food at least once a week.

Bivariate analyses indicated that those who did not know at least one of their CVD risk factors were significantly less likely to meet recommended physical activity levels ($P < 0.001$) and consume at least three servings of fruit and vegetables per day ($P < 0.0001$), and more likely to consume fast food weekly or more frequently ($P < 0.001$). There were no significant differences between the two groups with respect to sex, marital status, age, or the likelihood of being a manager/executive.

Awareness of Risk Factors

As outlined in Table 2, 39.5% of individuals indicated that they did not know at least one of their cardiovascular risk factors, while 31.5% of individuals were correct in all of their self-assessments (ie, weight, blood pressure, and high cholesterol statuses). Among the specific risk factors, participants were most certain about their weight status. Approximately 74.3% of individuals were correct in their assessment that they were overweight, and only 5.1% indicated that they did not know. Similar proportions (10.5% and 10.1%) overestimated and underestimated whether they were overweight.

Most respondents (72.5%) were also accurate in their assessments of whether they had high blood pressure, and 16.8% indicated that they did not know if they had high blood pressure. Very few individuals (2.6%) underestimated whether they had high blood pressure. In contrast, participants were most uncertain about whether they had high cholesterol. Just over half (52.0%) of

TABLE 2. Overview of Cardiovascular Disease Awareness

Awareness Indicator	Whole Sample, n = 276, n (%)
Do not know at least one risk factor	109 (39.5)
Correct overall	87 (31.5)
Overweight assessment	
Correct	205 (74.3)
Do not know	14 (5.1)
Overestimate risk	29 (10.5)
Underestimate risk	28 (10.1)
Blood pressure assessment	
Correct	198 (72.5)
Do not know	46 (16.8)
Overestimate risk	22 (8.1)
Underestimate risk	7 (2.6)
Cholesterol assessment	
Correct	142 (52.0)
Do not know	84 (30.8)
Overestimate risk	28 (10.3)
Underestimate risk	19 (7.0)

individuals were correct about whether they had high cholesterol, and 30.8% of individuals indicated that they did not know. A similar proportion overestimated and underestimated whether they had high cholesterol (10.3% and 7.0%, respectively).

Multivariable Analyses

Tables 3 to 5 report a summary of results for the logistic regression analyses exploring whether individuals' levels of awareness were associated with self-reported physical activity levels, fruit and vegetable consumption, and fast food consumption, respectively.

Model 1a in Table 3 shows that after adjusting for other individual and company-level factors, individuals who did not know at least one of their CVD risk factors were significantly less likely to report achieving 150 minutes of MVPA per week (OR = 0.26, 95% confidence interval: 0.11 to 0.62, $P < 0.01$). Model 1b shows that those who were correct in all of their risk-level assessments were significantly more likely to report achieving recommended physical activity levels (OR = 2.23, 95% confidence interval: 1.08 to 4.61, $P < 0.05$). None of the other individual-level factors were significantly associated with self-reported physical activity levels.

Similar findings were observed for self-reported fruit and vegetable consumption (Table 4). Individuals who did not know at least one risk factor (Model 2a) were significantly less likely to consume at least three servings of fruits and vegetables per day (OR = 0.31, 95% confidence interval: 0.18 to 0.54, $P < 0.001$), while those who were correct in all of their assessments (Model 2b) were significantly more likely to consume at least three servings a day (OR = 4.66, 95% confidence interval 2.36 to 9.18, $P < 0.001$). The only significant demographic predictor of self-reported fruit and vegetable consumption at the P value less than 0.05 level was sex; men were significantly less likely to report consuming at least three servings per day than women (OR = 0.54, 95% confidence interval: 0.30 to 0.96, $P < 0.05$).

As presented in Table 5, individuals who did not know at least one of their CVD risk measures (Model 3a) were significantly more likely to consume fast food at least once weekly (OR = 3.72, 95% confidence interval: 2.13 to 6.52, $P < 0.001$). Similarly, individuals who were correct in all of their assessments were significantly less likely to consume fast food on a weekly basis (OR = 0.52, 95% confidence interval: 0.29 to 0.92, $P < 0.05$) (Model 3b). A number of individual level factors were associated with fast food consumption, however. Married individuals and older respondents were significantly less likely to consume fast food on a weekly basis ($P < 0.001$), whereas individuals in management or executive positions were significantly more likely to do so ($P < 0.01$).

DISCUSSION

In the current study, the extent to which a group of working Canadian adults were aware of their personal risk levels for three CVD risk factors was explored. Study participants were generally aware of their weight status and, in line with nationally representative studies,[10,11] had relatively high levels of awareness of their blood pressure

TABLE 3. Odds Ratios of the Association Between Physical Activity Level and Knowledge of Personal Cardiovascular Risk Factors

	Model 1a (n = 276)		Model 1b (n = 276)	
Covariates	Odds Ratio (95% CI)	P	Odds Ratio (95% CI)	P
Cardiovascular risk knowledge				
Do not know ≥1 risk factor	0.26 (0.11–0.62)	0.003		
Correct for all risk factors			2.23 (1.08–4.61)	0.030
Male	1.51 (0.70–3.27)	0.292	1.56 (0.72–3.35)	0.259
Married	0.57 (0.25–1.34)	0.199	0.57 (0.25–1.32)	0.193
Management or executive	1.37 (0.62–3.02)	0.429	1.30 (0.60–2.83)	0.508
Age				
20–29 (Ref)				
30–39	0.78 (0.13–4.68)	0.789	0.66 (0.12–3.79)	0.642
40–49	0.93 (0.15–5.58)	0.935	0.83 (0.14–4.76)	0.831
50–59	1.79 (0.30–10.73)	0.523	1.74 (0.31–9.80)	0.530
Company				
One (ref)				
Two	0.89 (0.27–2.78)	0.812	0.86 (0.27–2.71)	0.797
Three	1.14 (0.38–3.41)	0.814	0.92 (0.31–2.73)	0.883
Four	0.73 (0.25–2.09)	0.556	0.67 (0.24–1.87)	0.439
Five	0.62 (0.11–3.59)	0.598	0.49 (0.09–2.74)	0.419
Six	1.34 (0.42–4.33)	0.620	1.12 (0.35–3.54)	0.847
Constant	0.27 (0.04, 1.81)	0.178	0.17 (0.03–1.06)	0.058

CI, confidence interval.

TABLE 4. Odds Ratios of the Association Between Fruit and Vegetable Consumption and Knowledge of Personal Cardiovascular Risk Factors

	Model 2a (n = 274)		Model 2b (n = 274)	
Covariates	**Odds Ratio (95% CI)**	P	**Odds Ratio (95% CI)**	P
Cardiovascular risk knowledge				
Do not know ≥1 risk factor	0.31 (0.18–0.54)	< 0.001		
Correct for all risk factors			4.66 (2.36–9.18)	< 0.001
Male	0.54 (0.30–0.96)	0.039	0.57 (0.31–1.02)	0.057
Married	1.81 (0.94–3.47)	0.075	1.74 (0.90–3.36)	0.102
Management or Executive	1.04 (0.56–1.96)	0.892	0.95 (0.50–1.80)	0.876
Age				
20–29 (Ref)				
30–39	0.84 (0.24–2.91)	0.786	0.71 (0.21–2.42)	0.587
40–49	1.18 (0.33–4.18)	0.798	1.00 (0.29–3.46)	0.996
50–59	1.58 (0.43–5.76)	0.490	1.72 (0.48–6.14)	0.405
Company				
One (ref)				
Two	1.99 (0.79–5.04)	0.145	2.06 (0.82–5.21)	0.125
Three	1.20 (0.50–2.86)	0.682	1.00 (0.42–2.37)	0.998
Four	1.73 (0.78–3.83)	0.176	1.69 (0.76–3.76)	0.200
Five	2.15 (0.69–6.71)	0.190	1.74 (0.56–5.42)	0.339
Six	2.29 (0.86–6.11)	0.098	1.92 (0.72–5.15)	0.195
Constant	1.45 (0.86–6.11)	0.592	0.72 (0.19–2.76)	0.631

CI, confidence interval.

risk. However, 48% of the respondents were not aware of whether they had high cholesterol. Results from the multivariable analysis highlighted that this lack of awareness of CVD risk factors was significantly and negatively associated with engagement in self-reported preventive health behaviors. Specifically, individuals who did not know at least one of their CVD risk factors were less likely to achieve 150 minutes of MVPA per week, less likely to consume at least three servings of fruits and vegetables daily, and more likely to consume fast food meals at least once weekly. Conversely, individuals who were correct with regard to all three of their CVD risk assessments were more likely to meet recommended physical activity guidelines, to consume at least three servings of fruits and vegetables daily, and less likely to consume fast food on a weekly basis.

Findings from this study are consistent with studies that have examined the association between self-reported weight loss behaviors and weight misperceptions among adults.[6] There is less evidence with respect to blood pressure and cholesterol awareness, though the present findings are consistent with studies that have demonstrated an association having a hypertension diagnosis and preventive health behaviors, such as increased physical activity

TABLE 5. Odds Ratios of the Association Between Fast Food Consumption and Knowledge of Personal Cardiovascular Risk Factors

	Model 3a (n = 275)		Model 3b (n = 275)	
Covariates	**Odds Ratio (95% CI)**	P	**Odds Ratio (95% CI)**	P
Cardiovascular risk knowledge				
Do not know ≥1 risk factor	3.72 (2.13–6.52)	< 0.001		
Correct for all risk factors			0.52 (0.29–0.92)	0.024
Male	1.54 (0.87–2.74)	0.138	1.50 (0.85–2.62)	0.159
Married	0.27 (0.13–0.55)	< 0.001	0.30 (0.15–0.59)	0.001
Management or executive	2.53 (1.34–4.77)	0.004	2.45 (1.33–4.53)	0.004
Age				
20–29 (Ref)				
30–39	0.49 (0.13–1.88)	0.299	0.57 (0.15–2.07)	0.388
40–49	0.42 (0.11–1.64)	0.212	0.44 (0.12–1.64)	0.219
50–59	0.28 (0.07–1.15)	0.077	0.28 (0.07–1.09)	0.065
Company				
One (ref)				
Two	0.50 (0.19–1.27)	0.142	0.53 (0.22–1.32)	0.174
Three	0.77 (0.32–1.85)	0.558	0.92 (0.40–2.12)	0.845
Four	1.66 (0.75–3.65)	0.210	1.78 (0.83–3.81)	0.141
Five	0.25 (0.08–0.84)	0.025	0.34 (0.11–1.07)	0.065
Six	0.80 (0.31–2.04)	0.644	0.93 (0.37–2.32)	0.878
Constant	2.87 (0.66–12.39)	0.159	4.75 (1.16–19.47)	0.031

CI, confidence interval.

levels and dietary changes.[10] The present study, however, highlights the importance of overall knowledge of three specific risk factors in relation to engagement in preventive health behaviors. Interestingly, analyses looking at each individual CVD risk factor separately did not indicate that any one of these factors was responsible for the significant association between overall awareness and health behaviors.

These findings are in line with the Health Belief Model,[29] which suggests that perceived susceptibility to a health condition is an important precursor to the adoption of preventive health behaviors. Within this framework, individuals who are aware that they are at a heightened risk for CVDs would be more likely to engage in preventive health behaviors than those who are unaware of their risk levels. Although perceived susceptibility alone is unlikely to lead to the adoption of preventive health behaviors, it is an important precursor to the adoption of these behaviors.[3] Findings from this study support the idea that informing individuals of specific personal CVD risk factors may facilitate the adoption of preventive health behaviors. Indeed, in an exit survey delivered after the biometric screening clinics in the present study, 82% of the respondents indicated that they intended to change their lifestyle in response to the receipt of cardiovascular health information (ie, weight, blood pressure, and cholesterol levels).

There are some important limitations to consider when interpreting these results. First, this analysis was cross-sectional in nature, implying that causal conclusions about the effects of personal CVD risk information on individuals' health behaviors cannot be made. The significant associations observed could have been due to other unobservable factors, including personality-driven differences that led to both greater health awareness and a higher likelihood of adopting preventive health behaviors. Second, this study relied on self-reported outcome measures, which could have led to biased results if individuals did not accurately respond to these questions. Third, biometric measures were obtained up to 2 months after the individuals' self-reported health risk assessments were collected. Thus, it is possible that any differences between subjective and objective CVD risk levels were due to this time lag and potential health changes that occurred during this timeframe. Fourth, it is also possible that the instruments to collect biometric data were responsible for differences. For instance, although previous research has found that the Accutrend Plus system has high day-to-day reproducibility for total cholesterol levels, it was found to slightly underestimate total cholesterol concentrations relative to measurements from venous blood samples.[30] If this is the case, cholesterol level estimates for individuals who overestimated their high cholesterol risk could be inflated. With respect to the measures used, BMI is known to be an imperfect measure of overweight status, and the association between CVD risk and BMI has been found to vary by race/ethnicity.[31] However, analyses using alternate measures of overweight and obesity (ie, percent body fat) had similar results to the base case analysis that used BMI. Finally, we note that data on race/ethnicity were not available in this dataset. The omission of controls for race/ethnicity could have biased our results if race/ethnicity is associated with CVD awareness and outcomes. If these differences were due to differential socioeconomic outcomes, then controls for socioeconomic status could minimize the bias due to this omission; however, differences due to genetic factors would not be captured in our model.[32]

CONCLUSIONS

Our findings clearly highlight that there was a general lack of awareness for some CVD risk factors, particularly cholesterol levels. Given that overall CVD risk awareness was associated with self-reported engagement in healthy behaviors, this is an indication that keeping people better informed about their weight status, blood pressure, and cholesterol levels could help to encourage preventive health behaviors. Workplace interventions such as the screening clinics offered in this study are one possible mechanism by which employers can contribute to better CVD risk awareness and the potential adoption of preventive health behaviors among workers.

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