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Assessment of American Heart Association's Ideal Cardiovascular Health Metrics Among Employees of Large Health Care Organization: the Baptist Health South Florida Employee Study

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Assessment of American Heart Association's Ideal Cardiovascular Health Metrics Among Employees of a Large Healthcare Organization: The Baptist Health South Florida Employee Study

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ABSTRACT

Background: Healthcare organizations and their employees are critical role models for healthy living in their communities. The American Heart Association (AHA) 2020 impact goal provides a national framework that can be used to track the success of employee wellness programs with a focus on improving cardiovascular (CV) health. This study aimed to assess the CV health of the employees of Baptist Health South Florida (BHSF), a large nonprofit healthcare organization.

Hypothesis: HRAs and wellness examinations can be used to measure the cardiovascular health status of an employee population.

Methods: The AHA's 7 CV health metrics (diet, physical activity, smoking, body mass index, blood pressure, total cholesterol, and blood glucose) categorized as ideal, intermediate, or poor were estimated among employees of BHSF participating voluntarily in an annual health risk assessment (HRA) and wellness fair. Age and gender differences were analyzed using χ^2 test.

Results: The sample consisted of 9364 employees who participated in the 2014 annual HRA and wellness fair (mean age [standard deviation], 43 [12] years, 74% women). Sixty (1%) individuals met the AHA's definition of ideal CV health. Women were more likely than men to meet the ideal criteria for more than 5 CV health metrics. The proportion of participants meeting the ideal criteria for more than 5 CV health metrics decreased with age.

Conclusions: A combination of HRAs and wellness examinations can provide useful insights into the cardiovascular health status of an employee population. Future tracking of the CV health metrics will provide critical feedback on the impact of system wide wellness efforts as well as identifying proactive programs to assist in making substantial progress toward the AHA 2020 Impact Goal.

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Introduction

Every year, cardiovascular disease (CVD) accounts for 17.3 million deaths globally and approximately 800 000 of these deaths occur in the United States.[1,2] The US government spends over $300 billion to manage CVD annually,[2] and most of this spending goes toward the treatment of diseases that are preventable.[3] Although CVD-related morbidity and mortality is on the decline in the United States, it is still the leading cause of death.[2] Thus, reducing CVD morbidity and mortality remains a top public health priority.[4] Much of the success in reducing CVD morbidity and mortality has been achieved through influencing its major risk factors (smoking, high blood pressure, high cholesterol, obesity, diabetes, and unhealthy diet).[5] Further reduction in these factors is needed to sustain the decline in CVD morbidity and mortality.

In 2010, the American Heart Association (AHA) set a goal to decrease deaths from CVD and stroke by 20% and improve the cardiovascular (CV) health of all people living in the United States by 20% by 2020. The AHA introduced 7 CV health metrics (diet, physical activity, smoking, body mass index [BMI], blood pressure, total cholesterol, and blood glucose), to measure CV health and monitor the progress made toward achieving the goal.[5]

Several community-based studies have assessed the distribution of the CV health metrics, and they report a low prevalence of the AHA's definition of ideal CV health.[6–11] However, reports on the prevalence of these metrics in the workplace are sparse. Currently, the US workforce makes up approximately 59% of the entire population. Over the last decade, there has been a significant change in the demographics of the US workforce toward an increasing proportion of older people. It is estimated that employees 55 years or older will comprise about 19% of the workforce by 2020, a 20% increase from 2000.[12,13] Based on these statistics, the workplace is becoming a prime setting for intervention to reduce CVD through the use of worksite wellness programs and other intervention strategies.[14,15]

The purpose of our study was to assess the CV health of the employees of Baptist Health South Florida (BHSF), a large nonprofit healthcare organization. We hope the findings of this study will inform the design of worksite wellness programs tailored to the needs of employees and also serve as a means to evaluate the effectiveness of these programs.

Methods

Design and Setting

This is a cross-sectional study conducted in 2014 among the employees of BHSF, a large nonprofit healthcare organization. A Health Risk Assessment (HRA) is administered annually to employees at BHSF. Employee participation is voluntary. The HRA is divided into 2 phases. In phase 1, employees complete an online health questionnaire tailored for the use of BHSF, utilizing the WebMD platform. Phase 2 is conducted during a health fair, where trained healthcare professionals take biometric measures from employees. Of the over 15 000 currently employed at BHSF, 9364 participated in the 2014 HRA and consented to the use of their health data for this study. The study was approved by BHSF Institutional Review Board.

Data Collection

Data collected from the online health questionnaire included demographic characteristics (age, gender); lifestyle habits such as diet, smoking status, physical activity levels, sleep habits, alcohol intake; self-assessment of health status, perception of stress levels, and attitudes toward behavioral change. Biometric measures included: height, weight, BMI, waist circumference, blood pressure, blood glucose, and total cholesterol. Blood glucose, total cholesterol, and blood pressure were measured with electronic devices (Table 1). All data collected were stored securely in a Health Insurance Portability and Accountability Act Privacy Rule–compliant and secure database.

Definition of Cardiovascular Health Metrics

According to the AHA, ideal cardiovascular health is defined as the absence of cardiovascular disease and the presence of 7 CV health metrics characterized by the following: nonsmoking, BMI <25 kg/m^2, physical activity of vigorous intensity $\geq$75 min/wk or moderate intensity $\geq$150 min/wk, dietary pattern consistent with the Dietary Approaches to Stop Hypertension (DASH) diet, total cholesterol <200 mg/dL, blood pressure $<120/<80$ mm Hg; and blood glucose <100 mg/dL.[5] We used the data from our study participants to replicate these metrics as much as possible, and we modified metrics that could not be replicated (Table 1).

Statistical Analysis

The data were collated and analyzed using SAS 9.3 (SAS Institute, Cary, NC). Normally distributed continuous variables are described as mean $\pm$ standard deviation (SD). Categorical variables are described as frequencies (%). The prevalence of the cardiovascular health metrics was calculated for all participants and for men and women across 3 age categories, <40, 40–59, and $\geq$60 years. The χ^2 test was used for comparisons of age and gender differences. Statistical significance was considered at a P value <0.05. Summary categories for the prevalence of ideal CV health metrics were created by combining the number of ideal metrics met by study participants and classifying them into 3 groups (0–1, 2–5, and 6–7).

Results

The mean (SD) age of the 9364 study participants was 43 (12) years (Table 2), and 74% were women. Sixty-eight percent of participants were either overweight or obese. Approximately 1% of participants were smokers, and 18% were hypertensive. Mean (SD) healthy diet score was 6 (2) out of a maximum score of 10. Most study participants reached ideal health status for the following cardiovascular health metrics: physical activity, smoking, total cholesterol, and blood glucose (Figure 1). However, for diet, BMI, and blood pressure, most participants fell into the poor or intermediate category.

Comparison between age categories (Table 3) indicates as age increased, lower proportions of study participants met ideal status for physical activity, BMI, blood pressure, total

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Table 1. Definition of Cardiovascular Health Metrics

Metrics	Measurement for Current Study	Categories
Smoking	Study participants self-identified as current smokers, former smokers, or nonsmokers.	Ideal: Nonsmoker or quit >12months. Intermediate: Former smoker or quit <12 months. Poor: Current smoker.
Body mass index	Weight and height measured by trained healthcare professionals. Unit of measurement was in kg/m^2.	Ideal: <25 kg/m^2. Intermediate: 25–29 kg/m^2. Poor: ≥30 kg/m^2.
Physical activity	Study participants self-reported weekly levels of physical activity as either moderate or vigorous intensity and duration in minutes.	Ideal: ≥75 min/wk vig or 150 min/wk mod. Intermediate: 1–74 min/wk vig or 1-149 min/wk mod. Poor: None
Diet	Diet consisted of 5 items: fruits/vegetables, whole grains, protein, salt and sugary drinks. Study participants self-reported daily servings consumed of each item. A healthy diet score was calculated on a scale of 0 to 10 based on the daily servings reported.	Ideal: 10. Intermediate: 8–9. Poor: 0–7.
Total cholesterol[a]	Total cholesterol was measured with the CardioChek PA Analyzer using a random sample of venous blood.	Ideal: ≤200 mg/dL, without medication. Intermediate: 201–239 mg/dL, or treated to goal. Poor: ≥240 mg/dL.
Blood pressure	Blood pressure was measured after 5 minutes of rest in a seated position using the Welch Allyn Spot Vital Signs 4200B-E1.	Ideal: SBP <120, DBP <80 mm Hg, without medication. Intermediate: SBP 120–139, DBP 80–89 mm Hg, or treated to goal. Poor: SBP ≥140, DBP ≥90 mm Hg.
Blood glucose[a]	Blood glucose was measured with the CardioChek PA Analyzer using a random sample of venous blood.	Ideal: <126 mg/dL, without medication. Intermediate: 126–139 mg/dL, or treated to goal. Poor: ≥140 mg/dL.

Abbreviations: DBP, diastolic blood pressure; mod, moderate; SBP, systolic blood pressure; vig, vigorous.
Sources: Lloyd-Jones et al. 2010,[5] Kim et al. 2013.[6]
[a]Nonfasting samples were measured.

Table 2. Baseline Characteristics of 2014 Baptist Health South Florida Study Participants

Variable	Total Cohort, N = 9364	Female, n = 6918	Male, n = 2446
Characteristics, mean (SD)			
Age, y	43 (12)	43 (12)	42 (12)
Body mass index, kg/m^2	29 (6)	28 (6)	29 (5)
Healthy diet score	6 (2)	6 (2)	6 (2)
Total cholesterol, mg/dL	175 (38)	177 (38)	167 (38)
Systolic blood pressure, mm Hg	121 (13)	119 (13)	126 (11)
Diastolic blood pressure, mm Hg	76 (8)	76 (8)	78 (8)
Blood glucose, mg/dL	96 (24)	95 (23)	98 (26)
Characteristics, n (%)			
Current smokers	70 (1)	57 (1)	13 (1)
Hypertension	1695 (18)	1174 (17)	521 (21)

Abbreviations: SD, standard deviation.

cholesterol, and blood glucose. Inversely for diet, the proportion of participants meeting ideal status increased with age. Only a small proportion of study participants regardless of age category did not meet the ideal status for smoking.

We examined gender differences within age categories (Table 3). Men were less likely than women to meet the ideal for diet, although this finding was not statistically significant for the 40–59 years and >60 years age groups. The overall proportion of participants who met the ideal for diet was generally very low as well. Men were more likely to be physically active than women within all age categories. For smoking, no gender difference was observed across age categories. A higher proportion of women met ideal status for BMI and blood pressure in all age categories, but the gender gap decreased with increasing age. For total cholesterol, a similar proportion of women and men from the <40 years and 40 to 59 years age groups met the ideal status although there was no gender difference for participants <40 years old. In addition, men >60 years old were more likely to meet the ideal status for total cholesterol compared to women of

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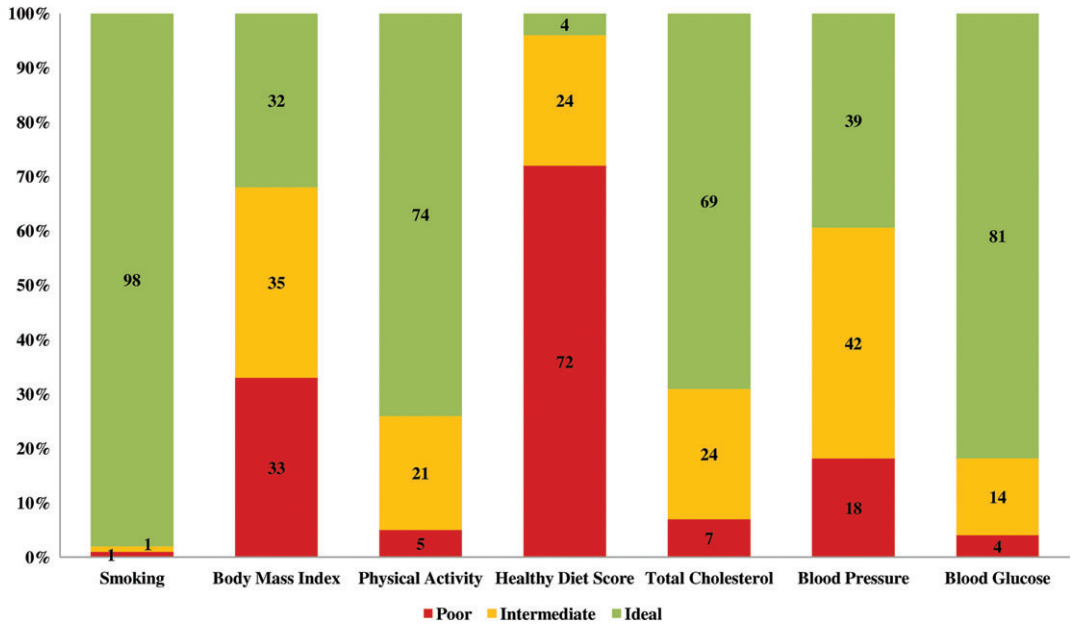

Figure 1. Prevalence of cardiovascular health metrics among 2014 Baptist Health South Florida study participants.

the same age. For blood glucose, both genders in all the age categories had a high proportion who reached ideal status.

Table 4 indicates that 60 (1%) study participants met the ideal status for all 7 CV health metrics, and 6 study participants did not meet the ideal status for any of the CV health metrics. As age increased, the proportion of participants who met ideal status for more than 5 ideal CV health metrics decreased for both genders.

The summary categories (Table 4) show that women had a higher proportion than men who met the ideal status for 6–7 CV health metrics.

Discussion

In this cross-sectional study of employees of BHSF, we found that 60 (1%) study participants met the AHA's definition of ideal CV health (ideal status for all 7 metrics). However, the proportion of participants who met the ideal for most of the CV health metrics was higher than the reported average for US adults,[2] which could be attributed to the worksite wellness programs at BHSF. Our major concerns were the CV health metrics of diet, BMI, and blood pressure. Of the study participants, 4%, 32%, and 39% reached ideal status for diet, BMI, and blood pressure, respectively. The National Health and Nutrition Examination Survey (NHANES) reported that 0.5%, 31.3%, and 44.3% of US adults ages 20 years or over reached ideal status for diet, BMI, and blood pressure, respectively in 2009 to 2010.[2] The poor diet of the majority of study participants may explain the large proportion of those who were either overweight or obese and with a blood pressure over 120/80 mm Hg, although physical activity for 74% of study participants was ideal.

Studies have documented the relationship between poor dietary habit and high BMI.[16–18] Diets low in fruits, vegetables, and whole grains but high in fat, red or processed meat, and fast food have been associated with an increase in BMI. Furthermore, research has shown that the DASH diet is associated with lower blood pressure levels.[19–21] The dietary habits practiced by the participants of our study may have contributed to their high BMI and blood pressure, because most of them were on diets not consistent with our modification of the DASH diet.

Several community-based studies conducted in the United States have reported a very low prevalence of the AHA's ideal CV health.[6–11] In a study called The Heart of New Ulm Project, Kim and colleagues reported a 1% prevalence of ideal CV health in a rural community in Minnesota. This study also mentioned diet and BMI as the metrics where the majority of study participants fell into the poor category, which is similar to the finding of our study.[6] In the Heart Strategies Concentrating on Risk Evaluation (Heart SCORE) study conducted by Bambs and colleagues in Allegheny County in Pennsylvania, only 1 (0.1%) individual out of 1933 met ideal status for the 7 CV health metrics.[7] Yang and colleagues studied a nationally representative sample of over 40 000 US adults ages 20 years or over, using data from NHANES. Their results showed that few participants met the ideal status for all 7 CV health metrics, with a prevalence of 2%, 1.3%, and 1.2% for the study cohorts of 1988 to 1994, 1999 to 2004, and 2005 to 2010, respectively.[9] Furthermore, data from the 2009 to 2010 NHANES of US adults ages 20 years or over revealed that only 0.1% met the criteria for ideal CV health.[2]

We observed that women were more likely to achieve ideal status for more individual CV health metrics compared to men, and as age increased the proportion of participants who met ideal status for most of the CV health metrics decreased. The findings of Fang and colleagues are similar to ours.[10] They examined the AHA's 7 CV health metrics among adult Americans in the 50 states and the District of Columbia using 2009 data from the Behavioral Risk Factor

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Table 3. Prevalence of Cardiovascular Health Metrics Among 2014 Baptist Health South Florida Study Participants by Age and Gender

		Age Categories				<40 Years			40–59 Years			≥60 Years		
Metrics		<40 Years, n = 4159, %	40–59 Years, n = 4271, %	≥60 Years, n = 934, %	*P* Value	Women, n = 3008, %	Men, n = 1151, %	*P* Value	Women, n = 3188, %	Men, n = 1083,%	*P* Value	Women, n = 722, %	Men, n = 212, %	*P* Value
Smoking	Poor	0.3	1	1	<0.0001	0.3	0.2	0.6835	1	1	0.0898	1	1	0.7995
	Intermediate	1	1	1		1	1		1	1		1	1	
	Ideal	99	98	98		99	99		97	99		98	97	
Body mass index	Poor	29	37	38	<0.0001	27	33	<0.0001	35	41	<0.0001	39	35	0.0243
	Intermediate	33	37	36		28	46		34	45		34	44	
	Ideal	38	27	26		44	21		31	14		27	21	
Physical activity	Poor	5	5	6	<0.0001	6	3	<0.0001	5	5	<0.0001	6	4	0.0068
	Intermediate	18	22	26		20	13		24	17		28	19	
	Ideal	77	72	68		74	84		70	79		65	77	
Diet	Poor	72	72	68	0.0017	73	69	0.0096	72	72	0.6618	67	70	0.1413
	Intermediate	25	23	27		24	28		23	24		27	27	
	Ideal	3	5	6		4	3		5	4		6	3	
Total cholesterol	Poor	4	8	14	<0.0001	4	4	0.3569	9	6	0.0026	17	5	<0.0001
	Intermediate	13	30	47		13	14		29	32		45	52	
	Ideal	83	62	39		83	82		62	62		38	42	
Blood pressure	Poor	5	24	50	<0.0001	4	8	<0.0001	22	29	<0.0001	48	55	0.0047
	Intermediate	41	45	38		33	62		41	54		38	40	
	Ideal	54	31	12		63	31		36	17		14	6	
Blood glucose	Poor	2	5	12	<0.0001	2	3	0.0095	5	6	0.0343	10	17	0.0094
	Intermediate	9	17	25		9	7		17	18		26	23	
	Ideal	89	78	63		89	91		78	76		64	59	

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Table 4. Number of Ideal Cardiovascular Health Metrics Among 2014 Baptist Health South Florida Study Participants

	All Ages				<40 Years			40–59 Years			≥60 Years		
	Total, N = 9364	Women, n = 6918	Men, n = 2446	*P* Value	Women, n = 3008	Men, n = 1151	*P* Value	Women, n = 3188	Men, n = 1083	*P* Value	Women, n = 722	Men, n = 212	*P* Value
No. of ideal metrics, n (%)													
0	6 (0.06)	5 (0.07)	1 (0.04)	<0.0001	1 (0.03)	0 (0)	<0.0001	3 (0.1)	0 (0)	<0.0001	1 (0.14)	1 (0.5)	0.4097
1	200 (2)	158 (2)	42 (2)		13 (0.4)	3 (0.3)		89 (3)	28 (3)		56 (8)	11 (5)	
2	907 (10)	641 (9)	266 (11)		83 (3)	55 (5)		388 (12)	154 (14)		170 (24)	57 (27)	
3	2122 (23)	1464 (21)	658 (27)		419 (14)	227 (20)		818 (26)	356 (33)		227 (31)	75 (35)	
4	2925 (31)	2015 (29)	910 (37)		874 (29)	492 (43)		962 (30)	374 (35)		179 (25)	44 (21)	
5	2124 (23)	1674 (24)	450 (18)		955 (32)	285 (25)		649 (20)	142 (13)		70 (10)	23 (11)	
6	1020 (11)	906 (13)	114 (5)		630 (21)	85 (7)		258 (8)	28 (3)		18 (2)	1 (0.5)	
7	60 (1)	55 (1)	5 (0.2)		33 (1)	4 (0.4)		21 (1)	1 (0.1)		1 (0.14)	0 (0)	
Summary categories of ideal metrics, n (%)													
0–1	206 (2)	163 (2)	43 (2)	<0.0001	14 (0.5)	3 (0.3)	<0.0001	92 (3)	28 (3)	<0.0001	57 (8)	12 (6)	0.0810
2–5	8078 (86)	5794 (84)	2284 (93)		2331 (77)	1059 (92)		2817 (88)	1026 (95)		646 (89)	199 (94)	
6–7	1080 (12)	961 (14)	119 (5)		663 (22)	89 (8)		279 (9)	29 (3)		19 (3)	1 (0.5)	

Surveillance System (BRFSS). The BRFSS is a state-based telephone survey. Overall, 3.3% of the population examined was in ideal CV health, and it ranged from 1.2% for the state of Oklahoma to 6.9% for the District of Columbia. Of the 9835 participants from the state of Florida, 3.5% met ideal status in all 7 CV health metrics. A lesser proportion of participants 65 years or older met the criteria for ideal CV health. Also, women had a greater proportion in ideal CV health compared to men (4.6% vs 1.9%). Our results are also consistent with a study conducted by the Centers for Disease Control and Prevention looking at racial differences in ideal CV health among adults in Mississippi. In this study, Short and colleagues reported that black and white females had a higher proportion of their population meeting ideal status for the CV health metrics. However, a higher proportion of men were found to be more physically active than women, a finding that we also observed.[22]

In addition, the low prevalence of ideal CV health metrics has been associated with increased risk of morbidity or mortality from not only CVD but also noncardiovascular diseases such as cancer, depression, and cognitive impairment.[8,9,23–29] Employees with any of these chronic diseases are not productive when they are absent from work (absenteeism) and when present, are not as productive as they should be (presenteeism).[14,30] Health-related productivity losses cost US employers over $225 billion every year or $1685 per employee per year, and 71% of this comes from reduced performance at work.[31] In 2004, only 6.9% of US employers provided comprehensive worksite wellness programs to their employees according to the National Worksite Health Promotion Survey, a far cry from the 75% goal the AHA set for 2010.[32] Studies have proven the effectiveness of these wellness programs.[33–35] Expenditure made by employers toward CVD prevention is money well spent, as some worksite wellness programs have reported between $3 to $15 return on investment for every dollar invested.[14,36] In view of these statistics and the findings of this study, we recommend the introduction of comprehensive worksite wellness programs as a means of improving CV health and reducing the risk and burden of CVD among employees. According to the AHA, worksite wellness programs should be designed to be of benefit to all employees and increase the participation of employees who have a higher risk of CVD such as men and people over age 60 years.

In this study, we have a few limitations to acknowledge. Self-reporting bias is a potential limitation, because study participants were required to fill out an online health questionnaire, and some may have responded to questions such as dietary habit, physical activity levels, and smoking status in the way they perceived as socially acceptable. The low prevalence of smoking reported in this study (1%) compared to the national prevalence of 18% among US adults[37] may be due to the fact that our HRA is incentive driven, and some smokers may have self-reported as nonsmokers so they can qualify for benefits. Additionally, because approximately one-third of employees did not participate in the HRA, the prevalences of individual CV health metrics and ideal CV health may have been overestimated.

Furthermore, the AHA's metric for measuring healthy diet may be conservative. Many studies, including ours, have reported extremely low prevalence of ideal for diet,[8,11,38] which results in an underestimation of the prevalence of ideal CV health when the individual CV health metrics are summed up. In a report on the quality of Americans' diets, the US Department of Agriculture, using the healthy eating index, estimated that 10% of the US population eats a good diet,[39,40] which is much higher than the 0.5% reported by Go and colleagues[2] and the 4% reported in our study, using the AHA's dietary metric. However, the AHA acknowledges the complexity of measuring diet and chose the current metric because the components presented the strongest evidence of causality for cardiovascular diseases, in addition to being simple and reproducible.[5] The strengths of this study include the large sample size and the use of standardized methods for data collection.

Conclusion

Our study demonstrated the feasibility of using the AHA's cardiovascular health metrics to assess cardiovascular health in the workplace and the need to intensify efforts to increase the prevalence of ideal cardiovascular health among employees. The findings of this study can act as a point of reference to evaluate the effectiveness of future wellness programs within our organization, and can be extended as a framework for use by other large employee organizations.

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