Cardiovascular Health Status by Occupational Group — 21 States, 2013

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Cardiovascular disease (CVD) accounts for one of every three deaths in the United States, making it the leading cause of mortality in the country (*1*). The American Heart Association established seven ideal cardiovascular health behaviors or modifiable factors to improve CVD outcomes in the United States. These cardiovascular health metrics (CHMs) are 1) not smoking, 2) being physically active, 3) having normal blood pressure, 4) having normal blood glucose, 5) being of normal weight, 6) having normal cholesterol levels, and 7) eating a healthy diet (*2*). Meeting six or all seven CHMs is associated with a lower risk for all-cause, CVD, and ischemic heart disease mortalities compared with the risk to persons who meet none or only one CHM (*3*). Fewer than 2% of U.S. adults meet all seven of the American Heart Association's CHMs (*4*). Cardiovascular morbidity and mortality account for an estimated annual $120 billion in lost productivity in the workplace; thus, workplaces are viable settings for effective health promotion programs (*5*). With over 130 million employed persons in the United States, accounting for about 55% of all U.S. adults, the working population is an important demographic group to evaluate with regard to cardiovascular health status. To determine if an association between occupation and CHM score exists, CDC analyzed data from the 2013 Behavioral Risk Factor Surveillance System (BRFSS) industry and occupation module, which was implemented in 21 states. Among all occupational groups, community and social services employees (14.6%), transportation and material moving employees (14.3%), and architecture and engineering employees (11.6%) had the highest adjusted prevalence of meeting two or fewer CHMs. Transportation and material moving employees also had the highest prevalence of "not ideal" ("0" [i.e., no CHMs met]) scores for three of the seven CHMs: physical activity (54.1%), blood pressure (31.9%), and weight (body mass index [BMI]; 75.5%). Disparities in cardiovascular health status exist among U.S. occupational groups, making occupation an important consideration in employer-sponsored health promotion activities and allocation of prevention resources.

BRFSS is a national, random-digit–dialed telephone survey conducted annually by U.S. states and territories to gather data on health-related risk behaviors, chronic illnesses and conditions, and use of health-related services among non-institutionalized, civilian residents aged ≥18 years.* BRFSS includes a standard set of core questions that are asked every year; however, states can chose from optional modules on specific subjects or include state-added questions. In 2013, 21 states† adopted the optional industry and occupation module or asked state-added questions regarding industry and occupation. Combined landline and cell phone response

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* http://www.cdc.gov/brfss/annual_data/2013/pdf/overview_2013.pdf.
† California, Florida, Illinois, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Oregon, Utah, Washington, Wisconsin, and Wyoming.

Continuing Education examination available at http://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

rates[§] in the 21 states ranged from 31.1% in Washington to 59.2% in North Dakota, with an overall median of 44.0%. The optional module contained two questions on industry and occupation. Participants who were employed for wages, self-employed, or out of work for <1 year were asked, "What kind of business or industry do you work in?" and "What kind of work do you do?" Participant responses were open-ended, and were later coded to one of the 574 Bureau of Census (2002) occupation numeric codes; these were grouped for analysis into 22 Standard Occupational Classification System major groups.[¶] Respondents were excluded if information about employment was missing, if they were on active military duty, or if they were unpaid or retired workers. Responses for each of the seven CHMs were scored as "0" for not ideal or "1" for meeting the ideal of that individual metric based on self-reported responses to questions about whether or not the respondent had ever been told by a health care provider that he or she had high blood pressure, high cholesterol, or diabetes. Other questions about smoking, exercise, and weight were calculated from BRFSS or derived from multiple BRFSS

[§] http://www.cdc.gov/brfss/annual_data/2013/pdf/2013_DQR.pdf.
[¶] http://www.bls.gov/soc/.

questions.[**] The seven CHMs were summed for a score, with a range of 0–7. For the purposes of this study, the CHM score was dichotomized into two groups: 0–2 and 3–7. CHM scores were analyzed by occupational group, adjusted for sociodemographic variables, including age, sex, race/ethnicity, and education level, using logistic regression models in SUDAAN.

[**] Individual cardiovascular health metrics (BRFSS questions): *Blood pressure*: "Have you ever been told by a doctor, nurse or other health professional that you have high blood pressure?" Options: Met ideal (1) = No; Not ideal (0) = Yes; *Cholesterol*: "Have you ever been told by a doctor, nurse or other health professional that your blood cholesterol is high?" Options: Met ideal (1) = No; Not ideal (0) = Yes; *Glucose*: "Have you ever been told you have diabetes?" Met ideal (1) = No; Not ideal (0) = Yes; *Smoking status*: BRFSS calculated variable; Met ideal (1) = respondents who reported they had not smoked at least 100 cigarettes in their lifetime, those who reported having smoked 100 cigarettes in their lifetime but do not currently smoke; Not ideal (0) = respondents who reported having smoked at least 100 cigarettes in their lifetime and currently smoke; *Physical activity*: BRFSS calculated variable; Met ideal (1) = respondents who meet the recommendation of ≥150 minutes per week of moderate intensity activity, ≥75 minutes of vigorous-intensity activity, or an equivalent combination of aerobic physical activity; Not ideal (0) = respondents who did not meet the previously listed recommendation of physical activity; *Body mass index (BMI)*: BRFSS calculated variable; Met ideal (1) = respondents who have a BMI ≥18.5 kg/m2, also a BMI <25 kg/m2; Not ideal (0) = respondents who have a BMI ≥25 kg/m2; *Diet*: Derived from multiple BRFSS questions. Fruit and vegetable intake was reported via a six-item screener on consumption of 100% fruit juice, whole fruit, dried beans, dark green vegetables, and other vegetables during the previous month. Persons were classified as having an ideal diet if their consumption met or exceeded age- and sex-specific federal fruit and vegetable intake recommendations for persons with a sedentary lifestyle (http://aje.oxfordjournals.org/content/181/12/979.full.pdf+html).

Adjusted prevalence and prevalence ratios were obtained for CHM scores of 0–2, and for each of the seven individual metrics that contribute to the CHM score, an adjusted prevalence was calculated for not ideal scores. All analyses were weighted unless otherwise noted. Significance was determined by evaluating confidence intervals at $\alpha = 0.05$.

Overall, 102,258 BRFSS participants were currently employed and, therefore, considered for analyses. Among these, 20,771 were excluded because occupation information was missing (n = 16,412 [16%]) or they were on active military duty (n = 268 [0.3%]), unpaid or retired workers (n = 149 [0.1%]), or had a diagnosis of CVD (n = 3,942 [4%]). Among the remaining 81,487 participants, 14,878 were excluded because responses were missing for one or more of the 12 BRFSS questions used to calculate the CHM score. A total of 66,609 respondents (65.1% of the original sample of currently employed) were left for analysis. Adults aged 35–44, 45–54, and 55–64 years accounted for approximately 70% of the sample population; men accounted for approximately 53%, and non-Hispanic whites accounted for 66%. Approximately 39% of the sample population had graduated from college or technical school. The prevalence of meeting two or fewer CHMs was highest among persons aged ≥65 years (18.6%), men (11.1%), non-Hispanic blacks (12.2%), and persons with less than a high school education (17.7%) (Table 1).

Among all occupational groups combined, 3.5% of workers met all seven CHMs (score = 7). Transportation and material moving employees had the highest adjusted prevalence of not ideal (e.g., 0) scores for physical activity (54.1%), blood pressure (31.9%), and BMI (75.5%) (Table 2). Food preparation and serving employees had the highest adjusted prevalence of not ideal scores for smoking (22.8%), and computer and mathematical employees had the highest adjusted prevalence of not ideal scores for cholesterol (39.9%). In addition, personal care and service employees had the highest adjusted prevalence of not ideal scores for blood glucose (10.3%), and farming, fishing, and forestry employees had the highest prevalence of not ideal scores for diet (84.3%).

The prevalence of meeting two or fewer CHMs among all 22 occupational groups was 9.6% (Table 3). Transportation and material moving employees (14.3%) and community and social services employees (14.6%) had the highest adjusted prevalence of meeting two or fewer CHM, and farming, forestry, and fishing employees (5.0%), production (7.7%) and arts, design, entertainment, sports, and media employees (5.9%) had the lowest adjusted prevalence of meeting two or fewer CHM compared with the other occupational groups. The adjusted prevalence ratios (aPRs) indicate community and social services employees (aPR = 1.56) and transportations and material moving employees (aPR = 1.55) are significantly more likely to meet two or fewer CHM compared with the other occupational groups.

Discussion

In 21 states, cardiovascular health indicators measured by CHM score differed among occupational groups, after

TABLE 1. Demographic characteristics and prevalence of meeting ≤2 cardiovascular health metric scores among currently employed adults — Behavioral Risk Factor Surveillance System, 21 states, 2013

Characteristic	Unweighted frequency	Weighted percentage of total sample population % (95% CI)	Prevalence of meeting ≤2 CHM % (95% CI)
Age group (yrs)			
18–24	1,841	5.8 (5.3–6.3)	1.7 (0.8–2.5)
25–34	7,494	17.8 (17.1–18.6)	3.8 (2.8–4.9)
35–44	12,635	22.9 (22.1–23.6)	6.2 (5.2–7.1)
45–54	18,957	28.3 (27.5–29.1)	11.8 (10.6–12.9)
55–64	18,911	19.7 (19.1–20.4)	15.4 (14.1–16.7)
≥65	6,771	5.5 (5.2–5.8)	18.6 (16.0–21.1)
Sex			
Male	30,604	52.8 (52.0–53.7)	11.1 (10.3–11.9)
Female	36,005	47.2 (46.3–48.0)	7.9 (7.2–8.5)
Race/Ethnicity			
White, non-Hispanic	54,390	66.0 (65.1–66.9)	9.2 (8.7–9.7)
Black, non-Hispanic	4,090	9.2 (8.7–9.7)	12.2 (10.2–14.3)
Hispanic	4,188	15.6 (14.8–16.4)	10.1 (8.2–11.9)
Other race or multiracial, non-Hispanic	3,190	9.2 (8.5–9.9)	8.7 (6.0–11.4)
Education			
Less than high school	2,022	8.0 (7.3–8.7)	17.7 (14.2–21.2)
Graduated high school	14,147	22.0 (21.2–22.7)	12.1 (11.0–13.2)
Attended college/technical school	18,564	31.2 (30.4–32.0)	10.4 (9.4–11.4)
Graduated college/technical school	31,876	38.8 (38.0–39.6)	5.8 (5.3–6.3)

Abbreviation: CHM = cardiovascular health metric; CI = confidence interval.

adjusting for age, sex, race/ethnicity, and education level. Persons working in community and social services and transportation and material moving had the highest prevalences of not ideal individual CHMs and were 56% and 55% more likely, respectively, than all other occupational groups to have met two or fewer CHMs. The findings for transportation and material moving occupations are consistent with a previous National Institute for Occupational Safety and Health study on the health of long-haul truck drivers. That study found that approximately 61% of truck drivers reported having two or more of the following health-related risk factors: high blood pressure, obesity, smoking, high cholesterol, no physical activity, or ≤6 hours of sleep within a 24-hour period (6).

The findings in this report are subject to at least five limitations. First, respondents who were excluded because of missing data for one or more of the CHM variables were found to be significantly different from respondents who were not missing these data, based on demographic variables, including occupation. This likely biases the results toward the null,

Summary

What is already known about this topic?

Work conditions and organization have a direct impact on health. Findings from studies indicate the existence of an association between cardiovascular disease and certain job factors and between specific cardiovascular disease health behaviors (e.g., smoking status, etc.) and occupational group.

What is added by this report?

Using population-based data, occupational group was found to be significantly associated with both the individual cardiovascular health metrics (CHMs) and the CHM summary score. In 2013, prevalence of meeting two or fewer CHMs ranged from 5.0% among farming, fishing, and forestry employees to 14.6% among community and social services employees.

What are the implications for public health practice?

With significant health disparities among different occupational groups, the results of this study can be used by state organizations and private companies to target cardiovascular disease prevention programs and improve workplace health promotion.

TABLE 2. Adjusted prevalence of individual cardiovascular health metric (CHM) scores of "not ideal" (0) among currently employed adults, by occupational group and CHM — Behavioral Risk Factor Surveillance System, 21 states, 2013

Occupational Group (SOC group)	Adjusted* prevalence of CHM scores % (95% CI)						
	Smoking status	Physical activity	Blood pressure	Cholesterol	Blood glucose	Weight (BMI)	Diet
Management (11)	12.2 (10.6–14.0)	44.0 (41.3–46.7)	26.9 (24.7–29.2)	30.3 (28.1–32.6)	6.7 (5.4–8.4)	69.4 (67.0–71.7)	80.4 (78.1–82.5)
Business and Financial Operations (13)	13.4 (10.9–16.4)	45.1 (40.9–49.3)	25.7 (22.4–29.2)	32.3 (28.6–36.3)	7.0 (5.4–9.0)	66.8 (63.5–70.0)	80.3 (76.8–83.4)
Computer and Mathematical (15)	12.4 (9.2–16.4)	45.9 (41.1–50.8)	27.0 (23.2–31.2)	39.9 (35.5–44.5)	7.3 (5.1–10.3)	66.5 (62.0–70.8)	78.7 (73.9–82.8)
Architecture and Engineering (17)	10.1 (7.0–14.5)	46.8 (41.3–52.4)	26.9 (22.5–31.7)	32.6 (28.1–37.4)	7.5 (4.4–12.4)	65.3 (60.5–69.8)	77.7 (72.8–82.0)
Life, Physical, and Social Sciences (19)	10.1 (6.6–15.2)	39.1 (33.3–45.2)	19.4 (15.6–23.9)	29.7 (24.9–35.0)	6.2 (3.5–10.7)	61.4 (55.5–67.0)	79.8 (74.7–84.0)
Community and Social Services (21)	18.1 (12.7–25.2)	48.8 (42.6–55.1)	28.0 (22.6–34.0)	32.9 (27.4–38.9)	9.6 (5.7–15.8)	73.5 (68.3–78.2)	82.5 (78.3–86.1)
Legal (23)	9.9 (6.2–15.5)	43.5 (37.4–49.9)	21.7 (17.3–26.8)	32.0 (26.9–37.6)	8.4 (5.1–13.5)	63.0 (57.1–68.6)	78.3 (72.8–82.9)
Education, Training, and Library (25)	8.5 (6.6–10.9)	42.6 (39.2–46.1)	27.2 (23.9–30.8)	30.9 (27.5–34.4)	7.5 (5.6–9.9)	70.3 (67.6–72.9)	78.1 (75.4–80.7)
Arts, Design, Entertainment, Sports and Media (27)	11.3 (8.1–15.7)	39.1 (33.2–45.2)	22.2 (18.1–26.9)	31.9 (27.4–36.8)	5.3 (3.7–7.6)	57.6 (51.9–63.1)	70.8 (63.9–76.9)
Healthcare Practitioners and Technical (29)	10.9 (9.2–13.0)	46.6 (43.5–49.7)	25.1 (22.5–27.9)	32.3 (29.4–35.4)	6.6 (5.0–8.6)	64.8 (62.1–67.4)	77.0 (74.3–79.4)
Healthcare Support (31)	12.6 (9.7–16.3)	47.2 (41.3–53.1)	26.0 (21.7–30.9)	34.2 (28.9–39.9)	6.1 (4.2–8.7)	74.7 (69.8–79.0)	79.4 (74.4–83.6)
Protective Service (33)	11.9 (8.9–15.8)	38.3 (32.8–44.1)	25.6 (21.2–30.7)	30.0 (24.8–35.8)	5.9 (3.6–9.5)	73.2 (67.0–78.7)	81.0 (75.1–85.8)
Food Preparation and Serving (35)	22.8 (18.5–27.8)	47.0 (40.9–53.2)	22.9 (18.5–28.1)	32.0 (26.3–38.3)	7.8 (5.3–11.2)	63.6 (58.1–68.8)	70.6 (63.6–76.7)
Building and Grounds Cleaning and Maintenance (37)	17.8 (14.6–21.4)	48.7 (43.1–54.4)	30.2 (25.8–35.0)	35.2 (30.4–40.3)	8.6 (6.2–11.7)	67.7 (62.3–72.6)	80.9 (75.5–85.3)
Personal Care and Service (39)	15.3 (12.4–18.7)	40.8 (35.9–45.9)	29.9 (25.3–35.0)	34.0 (29.4–39.0)	10.3 (7.6–13.8)	72.6 (68.1–76.7)	76.8 (72.3–80.8)
Sales and Related (41)	14.5 (12.6–16.7)	45.1 (42.0–48.2)	25.2 (22.8–27.9)	30.8 (28.1–33.6)	6.5 (5.2–8.3)	64.9 (62.1–67.6)	78.9 (75.8–81.7)
Office and Administrative Support (43)	13.3 (11.6–15.2)	47.9 (45.1–50.8)	28.3 (26.0–30.7)	31.5 (29.2–33.8)	8.3 (7.0–9.8)	70.9 (68.5–73.2)	81.3 (78.9–83.4)
Farming, Fishing, and Forestry (45)	8.0 (3.7–16.7)	47.1 (34.2–60.3)	21.7 (13.3–33.3)	27.1 (17.4–39.7)	4.2 (1.9–9.0)	68.7 (55.1–79.6)	84.3 (73.6–91.2)
Construction and Extraction (47)	20.7 (17.5–24.3)	51.1 (46.4–55.8)	26.7 (22.8–31.1)	24.9 (21.5–28.8)	4.0 (2.9–5.7)	67.4 (62.6–71.8)	81.2 (76.2–85.3)
Installation, Maintenance, and Repair (49)	17.4 (13.9–21.5)	50.7 (44.8–56.6)	28.9 (24.2–34.2)	28.3 (23.6–33.6)	3.8 (2.4–6.1)	67.0 (61.5–72.1)	79.0 (73.2–83.9)
Production (51)	14.2 (12.0–16.7)	50.1 (45.7–54.5)	26.5 (22.9–30.4)	28.3 (24.8–32.0)	5.2 (4.0–6.9)	67.6 (62.8–72.1)	79.0 (74.1–83.1)
Transportation and Material Moving (53)	19.7 (16.5–23.4)	54.1 (49.4–58.6)	31.9 (28.0–36.1)	30.0 (26.1–34.3)	7.8 (5.8–10.5)	75.5 (71.4–79.2)	83.4 (79.1–86.9)
All occupational groups	**14.4 (13.8–15.0)†**	**46.3 (45.4–47.2)†**	**26.4 (25.6–27.2)†**	**30.8 (30.0–31.6)†**	**6.9 (6.4–7.3)†**	**67.9 (67.0–68.7)†**	**79.5 (78.8–80.3)†**

Abbreviations: BMI = body mass index; CI = confidence interval; SOC = Standard Occupational Classification.
* Adjusted for age, sex, race/ethnicity, education.
† Unadjusted.

because respondents who did not have missing data were more likely to be white, female, have a higher education level, and to hold a white-collar job. Had the overall sample with all respondents included been used, the significance of results presented would likely have been greater. Second, because BRFSS data are cross-sectional, it is not possible to make causal inferences. Third, BRFSS data are self-reported and therefore, rely on the accuracy of a participant's memory and willingness to be truthful and are subject to recall and social desirability bias. Fourth, the data used in this study were from an optional industry and occupation module administered by 21 states, so findings might not be nationally representative. Finally, the CHM score equally weights all seven metrics, which might not accurately reflect the individual impact of each metric on a person's cardiovascular health.

Although the CHMs are considered to be modifiable at the individual level, it is important to consider the impact that occupational factors might have on the metrics, including such factors as exposure to chemical and physical agents; workplace stress and adverse work organization related to workload and total hours; shift rotation; job assignment and design; and organizational culture (7,8). Additional research is needed to elucidate the relationship between work factors and cardiovascular health. The CDC Worksite Health ScoreCard was created to help employers evaluate their occupational safety and health and health promotion programs for prevention of heart disease, stroke, and other cardiovascular-related health effects. The scorecard, which was validated in a study of 93 employers in more than 32 states, includes 125 questions that solicit information on a various topics, such as occupational health and safety, physical activity, stress management, diabetes prevention, and organization support (9). The American Heart Association projects that by 2030, 43.9% of the U.S. population will have some type of CVD, and indirect costs attributed to lost productivity will increase by 58% to $290 billion (1). A growing body of scientific literature indicates that employment status and occupational group are important factors to consider in cardiovascular health research. The workplace is a viable and necessary site for carrying out cardiovascular health interventions, and attention to work conditions as a risk factor for CVD warrants further consideration (7,10).

TABLE 3. Adjusted prevalence and adjusted prevalence ratio of meeting two or fewer cardiovascular health metrics among currently employed adults, by occupational group — Behavioral Risk Factor Surveillance System, 21 states, 2013

Occupational group (SOC group)	Adults meeting ≤2 CHMs		
	Unweighted frequency	Adjusted* prevalence % (95% CI)	aPR* (95% CI)[†]
Management (11)	7,404	9.7 (8.3–11.3)	1.02 (0.87–1.19)
Business and Financial Operations (13)	2,991	8.8 (7.1–10.8)	0.92 (0.74–1.14)
Computer and Mathematical (15)	1,879	9.4 (7.3–12.2)	0.99 (0.76–1.29)
Architecture and Engineering (17)	1,781	11.6 (7.6–17.3)	1.23 (0.82–1.84)
Life, Physical, and Social Science (19)	1,225	7.6 (4.7–12.0)	0.80 (0.50–1.28)
Community and Social Services (21)	1,494	14.6 (9.8–21.2)	1.56 (1.07–2.29)[§]
Legal (23)	936	7.1 (4.3–11.5)	0.75 (0.46–1.23)
Education, Training, and Library (25)	5,480	9.3 (6.6–13.1)	1.00 (0.71–1.39)
Arts, Design, Entertainment, Sports and Media (27)	1,423	5.9 (4.3–8.1)	0.62 (0.45–0.84)[§]
Healthcare Practitioners and Technical (29)	5,783	8.3 (6.7–10.1)	0.86 (0.70–1.06)
Healthcare Support (31)	1,389	8.6 (6.2–11.8)	0.89 (0.64–1.23)
Protective Service (33)	1,257	8.0 (6.0–10.5)	0.82 (0.61–1.09)
Food Preparation and Serving Related (35)	1,432	8.0 (5.7–11.1)	0.81 (0.57–1.15)
Building and Grounds Cleaning and Maintenance (37)	1,820	11.5 (8.8–14.7)	1.18 (0.91–1.54)
Personal Care and Service (39)	1,823	10.8 (8.1–14.3)	1.13 (0.85–1.51)
Sales and Related (41)	5,323	9.1 (7.6–10.8)	0.95 (0.79–1.13)
Office and Administrative Support (43)	7,417	9.9 (8.6–11.3)	1.04 (0.90–1.21)
Farming, Fishing, and Forestry (45)	387	5.0 (2.5–9.9)	0.50 (0.25–1.00)
Construction and Extraction (47)	2,596	9.4 (7.3–11.9)	0.95 (0.74–1.22)
Installation, Maintenance, and Repair (49)	1,649	9.2 (6.8–12.5)	0.94 (0.69–1.28)
Production (51)	2,365	7.7 (6.2–9.7)	0.78 (0.61–0.98)[§]
Transportation and Material Moving (53)	2,421	14.3 (11.6–17.6)	1.55 (1.25–1.92)[§]
All occupational groups	**60,275**	**9.6 (9.0–10.1)**	**—[¶]**

Abbreviations: aPR = adjusted prevalence ratio; CHM = cardiovascular health metric; CI = confidence interval; SOC = Standard Occupational Classification.
* Adjusted for age, sex, race/ethnicity, and education.
[†] For calculation of aPR, each occupational group was compared with all other occupational groups.
[§] Results are statistically significant.
[¶] Unadjusted.

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