



Special Article

Occupation as Socioeconomic Status or Environmental Exposure? A Survey of Practice Among Population-based Cardiovascular Studies in the United States

Leslie A. MacDonald, Alex Cohen, Sherry Baron, and Cecil M. Burchfiel

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Decisions about how occupation is used in epidemiologic research can affect conclusions about the importance of socioeconomic and environmental factors in explaining disparities for outcomes such as cardiovascular disease. A review of practices in the collection and use of occupational data was conducted among population-based cardiovascular studies in the United States. Studies were identified for review from the National Heart, Lung, and Blood Institute website and the biomedical database, Computer Retrieval of Information on Scientific Projects, by use of selected criteria. Data collection instruments and study publications were retrieved and reviewed for 30 of 33 studies (91%). Most of the studies (83%) collected at least descriptive occupational data, and more than half (60%) collected data on workplace hazards. The reviewed studies produced 80 publications in which occupational data were used in analyses, most often as an indicator of socioeconomic status. Authors rarely acknowledged known conceptual and empirical links among socioeconomic status, employment stability, and working conditions. Underutilization of data on workplace conditions was found. Existing data could be used more effectively to examine the contribution of work-related social and environmental conditions to the development of modifiable cardiovascular disease through multiple pathways.

cardiovascular diseases; environment and public health; epidemiologic research design; occupations; social class

Abbreviations: CVD, cardiovascular disease; SES, socioeconomic status.

Editor's note: An invited commentary on this article appears on page 1422, and the authors' response is published on page 1426.

Occupation is a widely used explanatory variable in health research representing social status and class, as well as exposure to environmental hazards. Disparities in cardiovascular disease (CVD) vary according to socioeconomic status (SES), and it is widely recognized that prevention efforts will be enhanced by the discovery of underlying mechanisms (1). Correspondingly, conceptualization of occupation is critical for identifying pathways (social, behavioral, physiologic, environmental) linking observed associations with health. The conceptual model on work and health disparities by Lipscomb et al. (2) describes the broad interplay of factors governing the

conditions of work relevant to health. Work determines income and provisions for health benefits (in the United States), but it also conditions broad inequities in opportunities for advancement, employment security and stability, and patterns of exposure to physical (3, 4), psychosocial (5), and chemical (6–9) hazards. These inequities are further manifested by the social organization of work, influencing the distribution of workers exposed to “light” and “heavy” work by gender and race/ethnicity (4, 10–13). Additionally, some evidence indicates that workplace hazards such as job strain may pose greater risk in lower SES groups (14), perhaps because of a confluence of adverse exposures at work (8, 15) and in the community (16), combined with fewer health-enhancing resources (17).

The demographic and socioeconomic diversity within many large-scale, population-based, epidemiologic studies

Correspondence to Dr. Leslie MacDonald, Industrywide Studies Branch, Division of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Mailstop R-15, Cincinnati, OH 45226-1998 (e-mail: lmacdonald@cdc.gov).

Table 1. Study Selection Parameters

Study Selection Factors	Study Selection Criteria	Procedure for Identifying Studies That Meet Criteria	Procedure for Identifying False-Positive Studies
Funding dates	Ongoing or recently completed (since 2000)	CRISP end date between fiscal years 1999 and 2004	CRISP end date prior to fiscal year 1999
Study design	Prospective epidemiology study	CRISP keyword search (text strings = longitudinal, prospective, observational, "epidemiol," cohort, incidence)	CRISP keyword "flags" used to identify possible disqualifying study designs, including clinical trials, cross-sectional, and animal studies (text strings = trial, experimental design, experimental study, comparison, randomize, randomly assigned, control group, placebo, case control, case-control, cross-section, clinical outcome, treatment outcome, animal study)
Study sample	US adult population-based sample	NHLBI website review of study sample descriptions that included age and residential area CRISP keyword search (text strings = community, population-based)	Reviewed study sample descriptions listed on the NHLBI website that reported participant demographics, including age and residential area; CRISP keyword "flags" used to identify possible disqualifying study sample characteristics, including reference to animals or children
Health outcomes	Chronic cardiovascular disease	Records must include at least 1 keyword indicating a CVD health outcome (text strings = "cardi," cerebrovascular, cerebral ischemia, cerebral vascular, coronary, CHD, CVD, heart, "hypertensi," peripheral arterial, peripheral vascular, stroke)	CRISP keyword "flags" used to identify possible disqualifying health outcomes, including CVD outcomes unrelated to occupation (text strings = cardiomyopathy, "myocardi," congenital, vaccine, and reactivity)

Abbreviations: CHD, coronary heart disease; CRISP, Computer Retrieval of Information on Scientific Projects; CVD, cardiovascular disease; NHLBI, National Heart, Lung, and Blood Institute.

makes them well suited for examining the contribution of work-related social and environmental conditions to disparities in CVD. However, despite considerable evidence linking SES and working conditions (18, 19), acknowledgement of these relations rarely accompanies CVD epidemiology findings and corresponding public health recommendations (20, 21). Little is known about the type of occupational data collected in population-based studies, how extensively these data are used, and how they are treated in analyses. Such knowledge could identify opportunities to expand the capacity of health research to examine the relations linking SES, the social and environmental conditions of work, and health. In this review, we identified practices in the collection, use, and analytical treatment of occupational data among population-based CVD studies in the United States.

MATERIALS AND METHODS

Thirty-three studies were identified for review from the National Heart, Lung, and Blood Institute (NHLBI) website (22) and the Computer Retrieval of Information on Scientific Projects (CRISP) (23) biomedical database by use of the following criteria: funding dates (ongoing or expiring after 1999), study design (prospective epidemiology), study sample (US adults), and health outcomes (CVD) (Table 1). For studies with public-access websites referred to as "Web-based studies," occupational variables were extracted verbatim from data collection instruments or from data dictionaries. Publications from these studies were identified for

review by searching keywords (e.g., "work," "employment") in publication titles and/or abstracts posted online. Preliminary results for Web-based studies were verified by study principal investigators and revised as needed. Investigators for the remaining studies received a letter informing them about our review. During a follow-up telephone call, we obtained information about the type of occupational data collected and citations in which these data were used.

We identified the proportion of studies that collected occupational data, the type of data collected, and whether the studies published findings including those data. Occupational data were classified as either "descriptive data" (employment status, job title) or as "exposure data" (physical job demands, workplace psychosocial stressors, chemical hazards). We considered how occupational data were collected (questionnaire, other) and sought to identify common practices. In our review of published findings, we considered what occupational data were used in analyses, the data source (survey, imputed), and what conclusions were made.

RESULTS

Descriptive occupational data

Twenty-five studies (83%) collected information on employment status or other descriptive occupational data (Table 2). The descriptive data collected most often were current occupation (19 studies), employment status (18 studies), employment history (13 studies), work schedule

characteristics (12 studies), and industry (9 studies) (Table 3). These data were consistently obtained through participants' self-reports.

Open-ended questions ("What kind of work do you do?" and "What is your usual occupation or job?") were used frequently to capture current occupation. Current occupation was also collected as a categorical variable (managerial, technical, service), most commonly among the non-Web studies. Four studies used current occupation to impute workplace environmental data to examine the effects of exposure to physical job demands, workplace psychosocial stressors, and chemicals (24). The sources of exposure data used for imputation of physical and psychosocial job stressors included the *Dictionary of Occupational Titles for the 1980 U.S. Census* occupational categories and the US Department of Labor's 1969, 1972, and 1977 *Quality of Employment Surveys* (25). Semiquantitative estimates of organic solvent exposure were imputed from the job-exposure matrix developed by the National Cancer Institute (24, 26, 27). Two of the 4 publications using imputed workplace environmental data reported significant associations between occupational exposure (job strain and solvents) and health (24, 28).

Current occupation was used as an indicator of SES in 8 studies (32 publications). Wide variation was seen in the selection of occupation-based SES indicators, but all were based on 3 general types of data: 1) US census classification of occupational groups, 2) occupational status or prestige ratings, and 3) employment status. Nineteen publications from 6 studies used a version of the US census classification of occupations in the development of their occupation-based SES index (29). This classification ranks 6 or fewer major occupational groups according to skill. Dichotomous classifications were sometimes used to distinguish the broad categories of manual versus nonmanual, blue-collar versus white-collar, and nonprofessional versus professional occupations. Sixty-eight percent of the publications using a census-based SES index showed significant associations with health. A mortality study (National Longitudinal Mortality Study (NLMS)) showed a consistent pattern of findings across multiple analyses (30–34), but the findings were inconsistent for 3 morbidity studies (35–38). Among the more recent publications were findings involving a composite area-level SES index representing neighborhood advantage, showing consistent significant associations with health in publications across 3 studies (35, 37, 39, 40).

Four studies (13 publications) used measures of occupational status or prestige, such as the Duncan Socioeconomic Index, to examine associations between SES and health (41). Findings from these studies showed a consistent pattern of association between occupational status and health for all (42–53) but 1 (54) publication. Employment status was used as an indicator of SES in 5 studies (15 publications). Employment status was dichotomized in 4 studies (10 publications), with significant results reported in half (55–64). One study (National Longitudinal Mortality Study) that distinguished types of unemployment showed significant associations between workforce participation and mortality in 3 of 5 publications (65–69).

Workplace environmental conditions

Eighteen studies (60%) collected data on study participants' workplace environmental exposures to physical, psychosocial, or chemical hazards (Table 3). With the exception of 1 study that measured mercury levels in toenail clippings (70), data on workplace environmental exposures were collected from participants' self-reports. Ten of the 18 studies (56%) with exposure data used those data in analyses (28 publications). Six studies collected data on both physical job demands and workplace psychosocial stressors; 4 additional studies collected data on physical job demands, and another 4 studies collected data on workplace psychosocial stressors. Three studies collected occupational chemical exposure data, in addition to physical and psychosocial job stressors. Three studies collected only chemical exposure data.

Data on physical job demands were used in analyses most often; however, a composite physical activity index was used to pool occupational and leisure physical activity data in more than half of the analyses (9 publications). The most commonly used composite physical activity measures were the Baecke Questionnaire, the Physical Activity Score, and the Physical Activity Index. Two studies (3 publications) investigating the association between composite physical activity and cerebrovascular disease all found a significant protective effect (71–73). Protective effects were also found in 2 studies reporting associations between composite physical activity and cardiovascular risk factors (74–79). Findings from 2 studies showed mixed results between physical activity and CVD, early atherosclerosis, and other outcomes (4, 80, 81).

Psychosocial job stressors were combined with nonoccupational stressors into a composite measure in 2 studies (82, 83). Most often, multiple dimensions of the psychosocial work environment (job demands, job control, social support) were included in analyses. The most common instruments used to collect data on workplace psychosocial stressors included the Caplan Inventory (job satisfaction, role ambiguity, supervisor support) (84) and the Job Content Questionnaire (job strain) (5, 85); 7 publications (64%) from 6 studies reported significant associations between such stressors and health (mostly CVD) (82, 83, 86–94).

Six studies (20%) collected data on workplace exposure to chemical agents (sewage, fertilizer, pesticides, hair dye, insecticides, workplace tobacco smoke, asbestos, lead, mercury, selenium, and cadmium). Occupational chemical exposure data were reported in 3 publications: The Honolulu Heart Program (HHP) reported a significant association between pesticide exposure and Parkinson disease (95); the Coronary Artery Risk Development in Young Adults (CARDIA) Study reported a decline in exposure to second-hand smoke in conjunction with smoke-free workplace policy implementation (96); the Dietary Etiologies of Health, Disease, and Cancer (DEHDC) reported no association between mercury exposure and coronary heart disease (70).

Thirteen studies collected work schedule data, and 7 studies collected exposure data (physical, psychosocial, or chemical) that have not yet been reported in published analyses; 2 additional studies published results involving some but not all of the occupational exposure data collected.

Table 2. Occupational Measures Collected and Used by Study

Study Reviewed (Parent Study)	Primary Funding Source, Study Dates	Study Population	Descriptive Data		Physical Job Demands		Psychosocial Job Stressors		Chemical Agents	
			Occupational Data Collected	No. of Publications						
Atherosclerosis Risk in Communities Study ^a	NHLBI, 1987–2005	15,792 black and white men and women, aged 45–64 years from 4 communities	Yes	5 ^b	Yes	7	No		No	
Biobehavioral factors in atherosclerotic progression (Pittsburgh Healthy Heart)	NHLBI, 1998–2004	367 men and women, aged 50–70 years	Yes	0	No		Yes	1	No	
Bogalusa Heart Study ^a	NHLBI, 1972–2002	15,000 black and white youth from a semirural community followed into middle adulthood	Yes	0	Yes	0	No		No	
Brain attack surveillance in Corpus Christi	NINDS, 2000–2002	959 Hispanic and non-Hispanic men and women stroke cases, aged 45–75 years	Yes	1	No		No		No	
Cardiovascular Health Study ^a	NHLBI, 1988–2009	5,201 men and women aged ≥ 65 years; 687 additional participants (mostly African Americans) were subsequently recruited.	Yes	1	No		No		No	
Chronic dental disease and cardiovascular disease (Health Professionals Follow-up Study and the Nurses' Health Study)	NIDCR, 1986–2004	51,529 male health professionals (58% dentists) and 90,000 female nurses	Yes	0	No		No		No	
Coronary Artery Risk Development in Young Adults Study ^a	NHLBI, 1983–2003	5,115 black and white men and women, aged 18–30 years, with a range of educational attainment drawn from 4 cities	Yes	10	Yes	4	Yes	2	Yes	1
Dietary Etiologies of Health, Disease, and Cancer (Health Professionals Follow-up Study)	NHLBI, 1985–2008	51,529 male health professionals (3% non-Caucasian), aged 40–75 years	Yes	0	No		No		Yes	1
Family Blood Pressure Program	NHLBI, 1995–2008	Over 12,000-member multiracial cohort of hypertensive cases, with an average age of 54 years at entry	No		No		No		No	
Family Heart Study ^a	NHLBI, 1992–2005	2,530 surviving members (parents/children) of 588 families selected at random from other ongoing epidemiologic studies (e.g., Atherosclerosis Risk in Communities Study, Framingham Heart Study)	Yes	0	No		No		No	
Framingham Heart Study ^a	NHLBI, 1948–2008	5,209 Caucasian men and women, aged 30–62 years from Framingham, Massachusetts; in 1999, there were 993 survivors.	Yes	1 ^b	Yes	1	Yes	2	No	
Framingham Offspring Study ^a	NHLBI, 1971–2008	5,124 men and women, aged 5–70 years, consisting of offspring (and their spouses) of the original Framingham cohort	Yes	0	Yes	2	Yes	1	No	

Healthy Women's Study (Epidemiology of Cardiovascular Risk Factors in Women)	NHLBI, 1983–2007	827 premenopausal women (41% non-Caucasian), aged ≥ 42 years	Yes	0	No	Yes	4	No		
Heritage Family Study	NHLBI, 1992–2005	742 black and white men and women recruited from 204 families	Yes	0	Yes	0	No	No		
Honolulu Heart Program ^a	NHLBI, 1965–2002	8,006 American men of Japanese ancestry born in 1900–1919, living on the island of Oahu in 1965, and aged 45–68 years	Yes ^b	5	Yes	0	Yes	0	Yes	1
Incidence of Diabetes and Cardiovascular Disease in Mexican Americans (San Antonio Heart Study)	NHLBI, 1987–2003	2,123 men and nonpregnant women (67% Mexican Americans), aged 24–64 years	Yes	9	No	No	No	No		
Longitudinal cardiac outcomes and body composition (Fels Longitudinal Study)	NHLBI, 2004–2007	685 Caucasian men and women aged 20–70 years	No		No	No	No	No		
Mayo Stroke Center	NINDS, 1976–2004	2,160 hospitalized incident myocardial infarction patients from 1979 to 1998 who were followed for a median of 5.6 years; subsequent stroke rates were compared with those of the general population of Rochester, Minnesota.	No		No	No	No	No		
Multiethnic Study of Atherosclerosis ^a	NHLBI, 2000–2009	6,000-member multiracial sample of men and women, aged 45–85 years, from 6 US communities	Yes	0	Yes	0	Yes	0	No	
National Longitudinal Mortality Study ^a	NHLBI, 1983–2009	637,162-member national sample of the US population, aged ≥ 25 years, drawn from the Current Population Survey for the years 1979–1989 who were linked with data from the National Death Index	Yes	12	No	No	No	No		
Pathways linking education/health in middle adulthood (National Collaborative Perinatal Project)	NIA, NIH, 1959–2007	720 offspring from 4,140 pregnancies in the Perinatal Study who were located in adulthood for follow-up	Yes	1	No	No	No	Yes	0	
Precursors of premature disease and death (Johns Hopkins Precursors Study)	NIA, 1947–2008	1,337 Johns Hopkins Medical School students from the classes of 1948–1964 who were followed from 22 years of age	Yes	0	No	Yes	1	No		
Prospective study of health in runners and walkers	NHLBI, 1998–2004	136,000 mostly Caucasian (81%) men and women walkers and runners	No		No	No	No	No		
Reasons for geographic and racial differences in stroke	NINDS, 2001–2007	30,000 black and white men and women aged ≥ 45 years drawn from 3 regions in the southeastern United States	Yes	0	No	No	No	No		
Sleep Heart Health Study ^a	NHLBI, 1994–2004	6,000 men and women aged ≥ 40 years who participated in NHLBI cardiovascular disease and respiratory studies between 1995 and 1998	Yes	0	No	No	No	No		

Table continues

Table 2. Continued

Study Reviewed (Parent Study)	Primary Funding Source, Study Dates	Study Population	Descriptive Data		Physical Job Demands		Psychosocial Job Stressors		Chemical Agents	
			Occupational Data Collected	No. of Publications						
Social and physical environments and health disparities	NIEHS, 2002–2008	1,000 adults from Detroit, Michigan, representing the city's racial, ethnic, and socioeconomic distribution	Yes	0	Yes	0	Yes	0	No	0
Strong Heart Study ^a	NHLBI, 1988–2005	4,549 American Indian men and women aged 35–74 years	Yes	0	Yes	0	No	No	No	0
Study of Women's Health Across the Nation ^a	NIA, 1994–2009	3,302 women from 5 racial/ethnic groups aged 42–52 years	Yes ^b	5	Yes	1	Yes	0	Yes	0
University of North Carolina Alumni Heart Study	NHLBI, 1996–2006	6,130 predominantly Caucasian men and women college alumni	No		No		Yes	0	No	
Women's Health Initiative ^a	NHLBI, 1991–2009	93,676 predominantly Caucasian postmenopausal women aged 50–79 years	Yes	1	No		No		Yes	0

Abbreviations: NHLBI, National Heart, Lung, and Blood Institute; NIA, National Institute on Aging; NIDCR, National Institute of Dental and Craniofacial Research; NIEHS, National Institute of Environmental Health Sciences; NIH, National Institutes of Health; NINDS, National Institute of Neurological Disorders and Stroke.

^a Study documentation obtained online (Web-based studies).

^b Job title information used to link with occupational exposure data for 1 publication.

DISCUSSION

Our findings showed that a majority of studies (83%) collected descriptive occupational measures and that more than half (60%) collected data on workplace environmental conditions. However, less than half of these studies used the occupational data in published analyses. Our review of the 80 publications including occupational data showed that the data were used to represent either SES (51 papers) or workplace-based environmental exposures (28 papers). Authors rarely acknowledged the likely interdependence and interaction of SES and workplace conditions, despite considerable theoretical and empirical evidence linking the 2 (5, 18, 97–106).

Although surveys of research practice customarily review published articles, we instead reviewed research studies to assess data collection practices and data utilization. We chose population-based studies whose participant enrollment and follow-up were not governed by employment longevity or stability (a limitation of most occupational health studies). Although these studies generally include measures on a broad set of risk factors (behavioral, physiologic, and genetic factors), permitting examination of likely interdependencies and interactions between socioeconomic and environmental factors, we found no evidence that such analyses were performed among the studies reviewed. All studies reviewed met the high standards required for federal funding; however, there was limited uniformity in the collection and use of occupational data. Adoption of a minimum core set of occupational data across health studies could improve our ability to assess the consistency and strength of evidence linking SES, work-related social and environmental conditions, and health.

Methodological recommendations for using occupation as an explanatory variable in CVD epidemiology will vary according to the occupational profile of the cohort, but we believe minimum data for a general population cohort should include consideration of the following:

1. employment status
2. industry (including employer name and address), occupation, and job tenure
3. job strain and/or effort-reward imbalance (5, 107–110)
4. work schedule demands (shift, work hours, work-life conflict) (111–115)
5. second-hand tobacco smoke (116, 117)

Standardized narrative questions permit assignment of standardized numeric codes for industry and occupation (118, 119). Such coding permits researchers to examine health patterns by industry and occupation, to compare cohort characteristics with public data sources (e.g., Current Population Survey), and to link to external sources of workplace exposure data (26, 120, 121). Mannelte and Kromhout (122) provide an overview of standardized classification schemes used in epidemiologic research internationally. Automated systems under development at the National Institute for Occupational Safety and Health and elsewhere may soon expedite code assignment (123).

If all or much of a cohort is employed in a particular industry sector, investigators can focus additional occupational measures toward sector-specific cardiotoxic chemical

Table 3. Frequency With Which Occupational Data Were Collected and Reported in Published Findings Among the Studies Reviewed

Occupational Data	Studies Collecting Occupational Data (N = 30) ^a		Articles Reporting Use of Occupational Data in Analyses (N = 80) ^b	
	No.	%	No.	%
Descriptive data				
Current occupation/job title ^c	19	63	36	46
Employment status	18	60	15	19
Employment history ^d	13	43	0	0
Work schedule	13	43	0	0
Industry	9	30	0	0
Ability to work	7	23	0	0
Job loss/layoff	6	20	0	0
Employer name/address	5	17	0	0
Second job	4	13	0	0
Work effort and ability	3	10	0	0
Self-employment	3	10	0	0
Unpaid work	3	10	0	0
Years at present or usual job	2	7	0	0
Job search	2	7	0	0
Sum of studies that collected descriptive data	25	83		
Exposure data				
Physical job demands	11	37	15	19
Psychosocial job stressors	11	37	11	14
Chemical agents	6	20	3	4
Sum of studies that collected exposure data	18	60		

^a The data reported in this column are not mutually exclusive. Twenty-five studies (83%) collected occupational data. Seventeen of 25 studies collecting descriptive data also collected exposure data, and 1 study collected only exposure data.

^b The data reported in this column are mutually exclusive; that is, each publication reporting use of occupational data was assigned only 1 data type. One publication was found to use 2 types of descriptive occupational data but was counted once for ease of presentation (refer to footnote d below).

^c Current occupation or job title included open-ended text fields, standard occupational codes, and occupational categories (2 or more levels).

^d One article by Petrovitch et al. (95) from the Honolulu Heart Program reported use of a variable representing duration of employment as a plantation worker, which was created from data in 2 categories (current occupation and employment history). This article was included in the count for current occupation.

agents, additional psychosocial working conditions (job insecurity), and physical demands (sedentary work, heavy exertion). We recommend 3 comprehensive reviews for further guidance on additional workplace exposures to consider for CVD studies (20, 124, 125). Other occupational exposure

data sources can be found on the website of the National Institute for Occupational Safety and Health (126). Focused exposure measurement efforts were evident among the studies in our review, such as the Honolulu Heart Program (chemical exposures relevant to agricultural work) and the Dietary Etiologies of Health, Disease, and Cancer (mercury exposure among dentists).

Two of the reviewed studies (Coronary Artery Risk Development in Young Adults Study, Study of Women's Health Across the Nation (SWAN)) collected all of the minimum recommended occupational data. Six additional studies collected information on all but exposure to second-hand tobacco smoke (Framingham Heart Study (FHS), Framingham Offspring Study (FOS), Multiethnic Study of Atherosclerosis (MESA), Honolulu Heart Program, Healthy Women's Study (HWS)) or all but work schedule demands (Women's Health Initiative (WHI)). However, job stress measures in three studies (Study of Women's Health Across the Nation, Honolulu Heart Program, and Healthy Women's Study) did not include the recommended domains.

Three studies (Coronary Artery Risk Development in Young Adults Study, Study of Women's Health Across the Nation, Women's Health Initiative) collected data on workplace exposure to tobacco smoke prior to the adoption of workplace tobacco control policies. Corresponding results (96) evaluating the impact of workplace policies on reduced exposure to second-hand smoke are important for sustaining policy efforts. Furthermore, because these policies were not uniformly adopted, these studies can contribute important empirical data on likely disparities in CVD among workers not afforded smoke-free policy protections (127).

None of the 13 studies with data on work schedule characteristics have used those data in published analyses. Two studies (Framingham Heart Study, Framingham Offspring Study) collected data on overtime and night work, both topics of increasing interest as a result of accumulating evidence linking these work schedule factors to chronic diseases, including CVD (114, 128). These data could advance research on the mechanisms underlying associations between work schedules and CVD (111, 128, 129). Because our assessment of data utilization was restricted to published manuscripts, the amount of data underutilization may be overstated.

Most of the studies in our review (84%) received funding renewals to continue research that originated years earlier—more than half prior to 1990. In light of increased emphasis in the literature over the past decade about the value of examining broad social and environmental determinants of health and the increased empirical evidence linking work and CVD, it seemed paradoxical that studies originating after 1990 were somewhat less likely to collect occupational data. These findings indicate that recent attention to social determinants of health has not influenced research practice in cardiovascular epidemiology toward greater inclusion of occupational data.

In conclusion, decisions regarding the conceptualization and treatment of occupation in epidemiologic investigations can yield vastly different opinions about where and how to direct prevention efforts. Our findings show that more thoughtful and exhaustive use of occupational data is

warranted to advance our understanding of the contribution of work-related social and environmental conditions to CVD and health disparities. Since completing our review, 2 study groups initiated discussion with the National Institute for Occupational Safety and Health about the development of an ancillary study to support in-depth analysis of their occupational data (Multiethnic Study of Atherosclerosis) and to support development of a supplemental survey to gather occupational data (Reasons for Geographic and Racial Differences in Stroke (REGARDS)). Such collaborative efforts between occupational and non-occupational researchers have the potential to generate constructive solutions for the conceptual, methodological, and analytical challenges inherent in the study of the social determinants of health. Meanwhile, current practice in the analysis and interpretation of occupational data within population-based epidemiology studies would be improved by the acknowledgement and examination of the relation between SES and working conditions and between working conditions and health through multiple pathways (social, behavioral, physiologic, and environmental). Such efforts promise to enhance prevention of CVD by identifying the underlying mechanisms that support or hinder cardiovascular health.

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Author affiliations: Industrywide Studies Branch, Division of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, Cincinnati, Ohio (Leslie MacDonald, Sherry Baron); Alexander L. Cohen, Ph.D., Consultant, Incorporated, Cincinnati, Ohio (Alexander Cohen); and Biostatistics and Epidemiology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health, Cincinnati, Ohio (Cecil Burchfeil).

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