The Risk of High Cholesterol among Construction Workers: Employment Relations or Behavior?

Norman J. Waitzman and Ken R. Smith
University of Utah

Abstract

On the basis of interview responses and medical exam results from the National Health and Examination Survey III, logistic regression was run to identify the odds of high cholesterol among working-aged males by occupational and industrial class. Statistically significant higher odds of high cholesterol were manifest among segments of young skilled, semiskilled, and unskilled construction workers relative to professional and technical workers, even after controlling for demographic and behavioral risk factors. Elevated blood cholesterol levels among construction workers have an occupational dimension that needs to be more fully explored and addressed.

Introduction

There has been surprisingly little integration of the burgeoning literature on socioeconomic inequalities in health with analyses of occupational health and safety. The occupational health and safety literature tends to embrace an "agent-event" epidemiological model, where workers encounter hazardous agents or processes that trigger adverse health events. Predispositions on the part of workers, in the form of unhealthy behaviors and habits, or on the part of employers in the form of imperfect dissemination of information or provision of health and safety training, also form an integral part of that model. There is no particular expectation, however, with regard to risk factors for cardiovascular disease in construction, say, except for its potential association with specific agents such as noise.

The socioeconomic determinants model of health highlights the inverse socioeconomic gradient of the myriad risk factors and diseases, including car-

Authors' address: Department of Economics, University of Utah, 1645 E. Central Campus Drive, Salt Lake City, UT 84112

diovascular disease, that give rise to the well-established inverse socioeconomic gradient in mortality (Adler and Ostrove 1999; Lynch and Kaplan 1997). In this literature, occupation forms an integral part of the socioeconomic environment. Stress associated with high-demand, low-control work, for example, has been shown to be associated with hypertension (Karasek et al. 1981; Waitzman and Smith 1994). A more general theory of allostatic load has been forwarded to address the socioeconomic gradient in blood cholesterol, another major risk factor for heart disease (McEwan and Seeman 1999).

A tighter integration of the occupational health and safety model with the social determinants model may contribute to new avenues for reducing workplace risk by identifying how employment relations broadly affect health and potentially contribute to the risk and consequence of workplace exposures. The motivation of the current analysis is to begin such integration with respect to blood cholesterol levels. Specifically, this study analyzes the extent to which risk for elevated blood cholesterol levels prevails among workers in skill-stratified segments of the construction trades relative to their counterparts in other occupations and industries and to isolate the extent to which a residual occupational risk is manifest beyond that associated with well-established demographic and behavioral risk factors.

Methods

Data/Sample

Individual-level data from the third National Health and Nutrition Examination Survey (NHANES III), conducted between 1988 and 1994, were used for the analysis. The NHANES is a nationally representative survey with extensive data on demographic, socioeconomic, and behavioral characteristics from respondent interviews and detailed biomedical information from a medical exam (Centers for Disease Control and Prevention 1994). Our analysis was restricted to the NHANES subsample of 3,538 working-aged male respondents in the labor force, 18–64 years of age as of the date of interview, receiving a blood test on the NHANES III.

Model

Cholesterol level was hypothesized to be a function of demographic, behavioral, and occupational characteristics. Stepwise logistic regression was used so as to assess the extent to which the odds of high cholesterol associated with occupational characteristics were confounded by certain demographic and behavioral risk factors.

Variables

The dependent variable, high cholesterol, used for the reported analyses was a dichotomous variable assigned the value of 1 if blood cholesterol was greater than or equal to 200 mg/dL, or if the respondent reported taking medication to lower blood cholesterol; 0 otherwise. Results from additional analyses using more stringent cutoffs for high cholesterol (240 mg/dL and 280 mg/dL) were not markedly different from those shown.

We employed a tripartite division of industry and a five-part division of current occupation to construct a seven- and nine-variable occupation/industrial classification scheme for the empirical analysis (Table 1). Professional, technical, and managerial workers in the service industry were expected to have the best health and therefore served as the referent group in the multivariate analysis.

Demographic covariates used in the analysis expected to influence cholesterol levels were age (continuous measure in years), race and ethnicity (trichotomous: white/black/ Mexican), and marital status (dichotomous: married or cohabiting/unmarried). To gauge the extent to which cholesterol levels were confounded by behavioral characteristics, measures of smoking (dichotomous: currently a smoker/not a smoker), alcohol consumption (dichotomous: three or more alcoholic beverages at least 60 days per year/less intense drinking), physical activity (the sum of regular physical activities such as walking, jogging, aerobics, other dancing, swimming, gardening, weight lifting, calisthenics, and other physical activity), and body mass (height in meters/weight in kilograms squared) were incorporated.

Results

Odds ratios from logistic regressions on high cholesterol are given in Table 2. In the results for the full sample, ages 18–64 years (columns 1–4), odds ratios exhibited a general inverse relationship to occupational class by skill requirement, as expected, but only among construction workers did the elevated odds reach statistical significance in any of these models. Skilled and semiskilled construction workers (MIDCON) had marginally significant odds of high cholesterol relative to professional and technical workers in the service industry, as did unskilled construction workers (BOTCON) in the age-adjusted model (column 1). With additional controls for demographic and behavioral characteristics, the relationship was not significant (column 2). Results from the more refined, nine-part occupational partition (columns 3 and 4) revealed that the results from the more aggregate model masked a larger and highly significant association between unskilled construction work performed strictly within the construction industry (BOTPURE) and elevated

TABLE 1

Construction of Nine Occupational/Industrial-Class Variables Used in Empirical Analyses

Industry	Occupation Professional/ Technical/ Managerial	Skilled/Semiskilled Nonconstruction	Skilled/Semiskilled Construction	Unskilled Nonconstruction	Unskilled Construction
Trade/Service	Referent (767)	MIDNON (2,169)	MIDSOME[a]	BOTNON (1,093)	*BOTSOME*[b]
Manufacturing/ Mining/Agriculture	*TOPNON* (346)				
Construction	TOPCON (44)	*MIDSOME*[a] (148)	*MIDPURE*[a] (317)	*BOTSOME*[b] (29)	*BOTPURE*[b] (132)

Note. The construction of all variables was based on reported current occupation and industry of respondents in the labor force as of the interview date for the NHANES III survey. Number of sample respondents in each cell in parentheses.

[a]Cells combined to form *MIDCON* cell in seven-class variable analyses.

[b]Cells combined to form *BOTCON* cell in seven-class variable analyses.

TABLE 2

Odds Ratios for High Cholesterol by Occupational and Industrial Category

Occupation/ Industry[a]	Ages 18–64 Years				Ages 18–44 Years				Ages 45–64 Years			
	Age Adjusted (1)	Fully Adjusted (2)	Age Adjusted (3)	Fully Adjusted (4)	Age Adjusted (5)	Fully Adjusted (6)	Age Adjusted (7)	Fully Adjusted (8)	Age Adjusted (9)	Fully Adjusted (10)	Age Adjusted (11)	Fully Adjusted (12)
TOPNON	0.97	0.89	0.97	0.89	1.14	1.08	1.14	1.08	0.74	0.66*	0.74	0.66*
TOPCON	0.90	0.85	0.90	0.85	1.80	1.76	1.80	1.77	0.43*	0.39*	0.43*	0.39*
MIDNON	1.06	1.04	1.06	1.04	1.26*	1.21	1.26*	1.21	0.78	0.80	0.78	0.80
MIDCON	1.28*	1.19			1.49**	1.39*			1.00	0.93		
MIDSOME			1.43	1.29			1.99***	1.86**			0.82	0.72
MIDPURE			1.21	1.15			1.32	1.24			1.14	1.08
BOTNON	0.98	0.95	0.98	0.95	1.18	1.11	1.18	1.11	0.71*	0.72	0.72*	0.73
BOTCON	1.52*	1.47			1.65*	1.48			1.41	1.61		
BOTSOME			0.83	0.80			0.89	0.68			0.73	1.08
BOTPURE			1.82**	1.76*			1.92**	1.81*			1.93	1.87
N	3,548	3,117	3,548	3,117	2,457	2,125	2,457	2,125	1,091	992	1,091	992

Note. Odds ratios, with professional, technical, and managerial workers in the service industry as the referent, are derived from logistic regression models performed on the NHANES III survey. High blood cholesterol defined as GE 200 mg/dL *or* taking medication to lower cholesterol. The full-adjusted model includes controls for age, race/ethnicity, marital status, and measures of the following behavioral factors: smoking, alcohol consumption, and physical activity as described in the text.

[a]See Table 1 for occupational and industrial variable construction.

* $p \leq .10$.

** $p \leq .05$.

*** $p \leq .01$.

cholesterol (column 3). With additional demographic and behavioral controls, the effect remained large but achieved only marginal significance (column 4). Additional analyses confirmed that elevated cholesterol among blacks in such unskilled work acted to confound the results and reduced the significance on the occupational variable.

Stratification of the analysis by age group brought into sharper relief instances of significantly elevated odds of high cholesterol associated with occupational class that were muted in the analyses that incorporated all working-age respondents. Results on respondents ages 18–45 years (columns 5–8) demonstrate that the significant associations between occupation and high cholesterol suggested by the analyses of the entire cohort primarily reflected the experience of younger workers. Skilled and semiskilled construction workers experienced 29 percent higher odds of elevated cholesterol than did their counterparts in professional and technical jobs in the service industry in this age group; such elevated odds remained marginally significant even with additional demographic and behavioral controls (column 6). With the more refined partitioning of construction occupations (columns 7 and 8), it is evident that this significant risk of elevated blood cholesterol among skilled and semiskilled construction workers was most pronounced among those with looser occupational or industrial ties to construction (MIDSOME) than their counterparts who did strictly construction work within the construction industry (MIDPURE); such workers were at nearly twice the risk for high cholesterol than the referent group, even when controls were incorporated for demographic and behavioral risk factors (column 8). Similar elevated risk was again manifest among unskilled construction workers (BOTPURE), although confounding by race once again yielded a marginally significant odds ratio in the fully adjusted model (column 8).

Results on older workers (columns 9–12) provide evidence of a switch in the risk of high cholesterol between the referent group and other occupational classes, particularly among nonservice industry workers in the professional, technical, and managerial group; there were marginally significant reduced odds of high cholesterol among such workers in construction as well as in manufacturing, mining, and agriculture. Such a switch could be related to the so-called healthy worker selection effect, where less healthy workers in construction have a higher propensity to retire or switch to other industries prior to age 65 years than do workers in the service industry, leaving counterparts who are healthier in the sample. Further analysis with longest rather than current occupation, which was beyond the scope of the current analysis, could potentially address this issue. Odds of high cholesterol among unskilled older construction workers remained high among these workers (columns 11 and

12), although the association narrowly missed the cutoff for significance based on a 90 percent confidence interval.

Conclusion

Our findings indicate that the risk for high blood cholesterol was significantly greater for skilled and semiskilled male construction workers as well as for unskilled construction workers, ages 18–45 years, than for professional and technical workers in the service industry. These elevated risks were not attributable strictly to common behavioral risk factors for heart disease, such as smoking, obesity, high alcohol consumption, or low levels of physical activity. Nor were the elevated risks associated strictly with certain demographic risk factors such as race or ethnicity or marital status. Indeed, the presence of a significant association of minority race with high cholesterol levels, even after controlling for the critical behavioral factors above, raises the question as to the extent to which that association may itself be due to facets of the social environment, including the low status and poor conditions that minority workers disproportionately face on the job. The relationship between unskilled construction work and high cholesterol in our analysis, as noted above, was particularly confounded by race.

Among skilled and semiskilled workers, the risk of high cholesterol was particularly acute among those construction workers that had looser ties to the construction industry: those who were in skilled or semiskilled nonconstruction occupations within the construction industry or those semiskilled or skilled construction workers outside the construction industry. The level of occupational detail on the NHANES III public-use data set did not permit a more detailed analysis of the specific occupations for such workers, and the extent to which employment relations, such as extent of coverage by collective bargaining agreements or exposure to specific job conditions, may have contributed to heightened risk.

Our findings support the conclusion, as did earlier work on occupational risks for hypertension (Karasek et al. 1981; Waitzman and Smith 1994), that residual risk for high blood cholesterol levels is associated with features of occupation and employment that are not readily attributable to demographic and behavioral characteristics. Such risk may be associated with heightened allostatic load, as suggested in some of the literature on socioeconomic gradient in cholesterol levels (McEwan and Seeman 1999). Although our findings suggest that the risk is more acute in construction than in other trades, further research on employment relations and occupational conditions in construction is required to isolate the precise dimensions of such risk.

References

Adler, Nancy E., and Joan M. Ostrove. 1999. "Socioeconomic Status and Health: What We Know and What We Don't." *Annals of the New York Academy of Sciences,* Vol. 896, pp. 16–30.

Centers for Disease Control and Prevention. 1994. *Plan and Operation of the Third National Health and Nutrition Examination Survey, 1988–1994: Vital and Health Statistics 1.* Atlanta: Centers for Disease Control and Prevention.

Karasek R. A., D. Baker, F. Marxer, A. Ahlbom, and T. Theorell. 1981. "Job Decision Latitude, Job Demands and Cardiovascular Disease: A Prospective Study of Swedish Men." *American Journal of Public Health,* Vol. 71, pp. 694–705.

Lynch, John W., and George A. Kaplan. 1997. "Understanding How Inequality in the Distribution of Income Affects Health." *Journal of Health Psychology,* Vol. 2, no. 3, pp. 297–314.

McEwen, Bruce S., and Teresa Seeman. 1999. "Protective and Damaging Effects of Mediators of Stress: Elaborating and Testing the Concepts of Allostasis and Allostatic Load." *Annals of the New York Academy of Sciences,* Vol. 896, pp. 30–48.

Waitzman, Norman J., and Ken R. Smith. 1994. "The Effects of Occupational Class Transitions on Hypertension: Racial Disparities among Working-Age Men." *American Journal of Public Health,* Vol. 84, no. 6, pp. 945–50.