

other, cannot be clarified with the limited data available.

In the light of these studies, perhaps the most important issue to examine is the relevance and use of food and nutrition data in managing public health programs. The studies reported by Rush and Welch were relatively low cost, quick to perform, and provided timely data on both economic and health outcome variables. On the other hand, the studies reported by Popkin et al., while employing more reliable measurement methods, provided information some time after the events had occurred and were costly. Moreover, from the information presented, it is not known whether the data generated by either of these studies affected decisions on public health management by relevant Russian agencies or by international humanitarian assistance organizations.

Monitoring nutritional risk in a previously overweight, elderly population with a high rate of underlying illness is a tremendous challenge. The prevalence of low weight or low body mass index is a late and nonspecific indicator; therefore, early and more specific indicators of nutritional deprivation need to be developed. In addition, the studies of Rush and Welch and of Popkin et al. focused on outcomes related to protein-energy nutrition;<sup>3,4</sup> they did not address other aspects of nutrition, such as iron or vitamin deficiencies. Historically, micronutrient deficiency diseases, including goiter and rickets, have been significant problems in Russia and may reemerge as public health threats.<sup>13</sup> Because of the current transient economy, Russians must adapt their diets to shrinking incomes, and Russian food fortification programs may deteriorate; therefore, micronutrient deficiency disease rates also should be monitored.

Developing a Russian health surveillance system that provides reliable data on the current needs of elderly Russians—and, perhaps, all Russians—may be feasible. For example, in adjacent Armenia, a country severely affected by an economic

blockade, an emergency public health information system has successfully integrated facility-based anthropometric surveillance, small sample surveys of pensioners, morbidity and mortality reporting, market price surveys, and periodic national surveys on household food security to provide timely public health and nutrition data that are published in a regular bulletin.<sup>14</sup>

Both papers conclude that recent economic trends make it difficult for Russians dependent on state pensions, including elderly pensioners, to maintain adequate incomes. However, as Popkin et al. point out, other groups, such as large families and the unemployed, may also be at high risk of failing to meet their basic needs.<sup>4</sup>

There is a clear need to establish routine systems of monitoring trends in food security that include economic indicators as well as dietary intake and anthropometric data. If a nationally representative reporting system is not feasible, then efforts should focus on sentinel reporting in areas of the country and among demographic groups perceived to be at high risk. In characterizing a useful system, a recent Institute of Medicine report stressed the need to generate timely information on emerging nutritional problems, identify population groups most at risk, and define the causal factors that can be addressed by interventions.<sup>13</sup> □

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## Editorial: The Psychosocial Work Environment and Heart Disease

Over the past half century, we have greatly deepened our understanding of the roles of hypertension, high cholesterol, and other factors in coronary artery disease. In parallel but less dramatically, we have added to our knowledge about

the role of psychosocial factors. In this issue of the Journal, Johnson and colleagues in Sweden further expand our understanding of the possible causal contribution to cardiovascular disease, and especially coronary artery disease, of

occupational and nonoccupational psychological demands, control of the work

**Editor's Note.** See related articles by Johnson et al. (p 324), North et al. (p 332), and Nordentoft (p 347) in this issue.

process by employees, and social support at work.<sup>1</sup> Many of the earlier articles that have provided support for this "job strain" hypothesis, first proposed by Karasek,<sup>2</sup> have been published in this Journal.

Another important recent paper by Hlatky et al.<sup>3</sup> from North Carolina could be taken by some as contradictory to Johnson et al, with the results of Johnson et al. supporting a causal role for psychosocial factors in coronary artery disease and those of Hlatky et al. non-supportive. On close reading, however, much in the two papers can be reconciled. Both studies examined the hypothesis that jobs that place high psychological demands on workers and give them little control over the work process are causally related to atherosclerosis of the coronary arteries in particular. Together they provide good insight into directions of future research and a cautionary note about the obstacles to translating this type of research into practicable public health recommendations in the near future.

Johnson et al. carried out a nested case-control study of cardiovascular deaths from a representative national sample of Swedish men. Over a 14-year follow-up period, 521 deaths from cardiovascular disease occurred. Work environment exposure scores were assigned to cases and controls by linking lifetime job histories with a job exposure matrix. The strengths of this study include the prospective study design and an attempt to estimate lifetime occupational exposure to psychological demands, work control, and social support at work. The design of the study also allowed for adjusting the cardiovascular mortality risk for smoking, exercise, and some measures of social class such as education. Limitations of the study include a measure of psychological demand based only on responses to two questions. No information was included on cholesterol, hypertension, or occupational exposures during the 14-year follow-up period.

Hlatky et al. examined the cross-sectional and prospective relationship between job strain (low control job and high psychological demands) and significant coronary artery disease documented by angiography at baseline and by subsequent nonfatal myocardial infarction or cardiac death during a 5-year follow-up period. Job strain was assessed by a self-administered questionnaire that focused on the subject's current job. Of the 1489 patients enrolled in this study, 62% had significant coronary artery disease on angiography, 14% had insignificant coro-

nary artery disease, and 24% had no disease. The strengths of this study include well-defined homogeneous study outcomes, a prospective component, and information on all the well-established risk factors for coronary artery disease such as high cholesterol. The limitations of the study include the possibility of selection bias in the referral process of patients for angiography and self-reported psychosocial information restricted to the current job. Despite the limitations of each study, both are important because they were designed with the limitations of past studies in mind.

Results of the studies are not in major conflict. Both studies found that psychological demands were higher in the unaffected, namely, control subjects in the Johnson study ( $P = .026$ ) and patients with normal angiography in the Hlatky study ( $P = .0001$ ). Neither study could show that the hypothesized combination of high psychological demands and low job control (high job strain) was associated with an elevated disease risk. Thus, neither supports the specific a priori job strain hypothesis.

Johnson and Hall, however, had previously modified the job strain hypothesis to include the protective role of high levels of social support at the work site.<sup>4</sup> (Hlatky et al. did not separate job control from its combined effects with high psychological demands.) In the present study, Johnson et al. report in the multivariable analyses a significant protective effect for jobs with the highest levels of job control. The odds ratio for the comparison of cumulative exposures from 5 to 25 years using the highest quartile of subjects who reported the highest levels of job control as baseline against the three lower quartiles was 1.6 to 1.83. The strongest association with the risk of cardiovascular disease found by Johnson et al. was the combination of low control and low social support at work with a significant odds ratio of 2.62. The Johnson et al. study thus suggests that an employee's ability to control the planning and execution of work may be one of the more important psychosocial aspects of work. In this psychosocial dimension, the work environment may well have both negative and positive impacts on cardiovascular morbidity.

Future research suggested by authors of these papers includes improving methods for assessing exposures, exploring the role of these job-related psychosocial factors in other chronic diseases, and examining the interaction between occupa-

tional and nonoccupational exposures. Both direct mechanisms and indirect pathways through such known cardiovascular risk factors as hypertension need to be investigated.

The job strain hypothesis was developed with repetitive assembly line work in mind. A great challenge for the future is to explore the role of psychosocial factors in the very large and rapidly changing sectors of our economy such as health care and other service industries. Another paper in this issue of the Journal begins to point the way. North et al. examine the relationship between the psychosocial work environment and sickness absence in both female and male British civil servants.<sup>5</sup> For over 6000 men and 3000 women, subjective and objective assessment of both job control and demands was prospectively related to rates of sickness absence. This paper is interesting because it includes both men and women, focuses on the nonindustrial sector of the economy, and addresses a health measure that is related to productivity. The relationships between gender, level of job in terms of management vs nonmanagement, and length of job absences were complex, but they are supportive of the potential beneficial effect of increasing the level of job control for all types of employees.

Another more specific challenge is to identify which components of such global concepts as job control have strong relationships with adverse health effects (while yet being open to alteration in intervention studies). Although the concept of job control may initially appear simple, it probably has several components that cannot be simply defined. For example, it is still to be determined whether the cardinal focus is on the objective work environment or on the perception of control by the worker. Although some of the appeal of the control concept resides in its apparent simplicity, the desired elaboration of what should be incorporated into the concept of job control will be a complex task. New technology, demographic shifts in the workforce, changes in the value and the security of skilled and unskilled work, and heightened world competition all may affect relationships between work organization and health.<sup>6</sup>

While better understanding of the complex relation of the psychosocial aspects of work to health is unlikely to lead to proven preventive strategies in the near future, long-range benefits could be great. These could extend beyond cardiovascular health to other systems, including

musculoskeletal and mental health. Adam Smith in *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776) emphasized the potential of modern methods in the production of wealth but he did not neglect their potential also to produce adverse effects in the workforce.

In the progress of the division of labor, the great body of people comes to be confined to a very few simple operations. . . . The man's whole life is spent in performing a few simple operations . . . [he] naturally loses, therefore, the habit [of solving problems]. . . . The torpor of his mind renders him not only incapable . . . of rational conversation . . . [but] equally incapable of defending his country in war.<sup>7</sup>

Opportunities to gather new insights should be plentiful. We are in an historical period in which changes in both technology and the world economy are causing continual and rapid change "in the way work is designed, allocated and performed."<sup>8</sup> Psychosocial research in this area not only directs our attention to

the existing nature of work but it also illuminates the ways in which changes in the design of work might improve health by preventing premature cardiovascular disease and perhaps other disorders. As great is the challenge to understand the role of occupational psychosocial factors in promoting health, the still greater challenge lies in demonstrating scientifically that it is both feasible and effective to change the work environment. Dr Y. Ian Noy reminds us that our challenge is to understand not only the actual, but also the possible.<sup>8</sup> □

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## Editorial: Paradox as Paradigm—The Health Outcomes of Mexican Americans

The biomedical model has long dominated the public health research agenda. Specification of disease in terms of a biomedical model assumes that group-level associations are crude attempts to describe an underlying biologic mechanism at the individual level.<sup>1,2</sup> This is a reductionist paradigm. It assumes that group-level variables do not cause disease and group-level correlations represent poor substitutes for causal mechanisms at the individual level. The paradox of Hispanic health represents a group-level correlation between ethnicity and mortality that cannot be explained in terms of an individual-level model. As a result, it challenges the hold biomedicine has on the public health research agenda and calls into question the widespread practice in public health of addressing group-level risk with individual-level models and interventions.

The paradox of Hispanic health has its origin in Mexican immigration to the United States. Mexican Americans are the second largest ethnic group in the southwest, yet 50% of Mexican Americans were born in Mexico.<sup>3</sup> Thus, recent Mexican immigration to the United States has resulted in a Mexican American population with strong cultural ties to

Mexico. In addition, Mexican Americans tend to be poorer, less educated, and medically underserved compared with non-Hispanic Whites. Despite these presumed socioeconomic risks, Mexican Americans are astonishingly healthy. Mexican American rates of infant mortality and low birthweight are equivalent to non-Hispanic Whites and half that of Blacks,<sup>4-7</sup> and the overall mortality rate among Mexican Americans is lower than that of non-Hispanic Whites.<sup>8</sup> This is a paradox of profound importance. Historically, biomedicine has explained the increased risk associated with ethnicity either in terms of genetic differences related to race or factors directly related to socioeconomic status (e.g., lack of access to health care services). However, the health outcomes of Mexican Americans are contrary to these individual-level models of risk.

The health outcomes of Mexican Americans suggests that our understanding of the relation between ethnicity and mortality is based on ecologic fallacy. Ecologic fallacy can occur when correlations at the group level are the basis of causal inferences at the individual level and vice versa.<sup>2</sup> According to Susser,<sup>1</sup> this definition is rarely conceded because

biomedical notions of causality have shaped our assumptions related to the meaning of the term "ecologic." It never occurs to a biomedical theorist that a group-level variable could cause disease (e.g., Greenland & Robins<sup>9</sup>). Thus, it is wrongly assumed, group-level correlations are meaningful only for hypothesis generation.<sup>1,2</sup> The paradox of Hispanic health indicates that group-level associations between ethnicity and mortality have been inappropriately reduced to causal inferences at the individual level. As a result, much of our understanding of the disparity in health outcomes between Whites and Blacks appears to be based on ecologic fallacy.

For example, lack of access to adequate prenatal care among disadvantaged Black mothers is assumed to account for some of the ethnic differences in infant mortality. However, the effectiveness of prenatal care is based on group-level correlations between the types of mothers who get prenatal care and those who do not.<sup>10</sup> These studies do not account for fact that the mothers who get prenatal care are also the mothers who

**Editor's Note.** See related article by Cobas et al. (p 394) in this issue.