Scand J Work Environ Health 1987;13(1):70-72

<https://doi.org/10.5271/sjweh.2078>

Issue date: Feb 1987

The healthy worker effect. Selection of workers and work forces.

by [Wilcosky T, Wing S](#)

The following articles refer to this text: [2013;39\(3\):241-258](#);
[2013;39\(5\):521-530](#); [2015;41\(3\):259-267](#)

This article in PubMed: www.ncbi.nlm.nih.gov/pubmed/3576148

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

The healthy worker effect

Selection of workers and work forces

by Timothy Wilcosky, PhD, Steve Wing, PhD¹

WILCOSKY T, WING S. The healthy worker effect: Selection of workers and work forces. *Scand J Work Environ Health* 13 (1987) 70–72. The favorable health status of employed populations in comparison to that of the general population is often called the “healthy worker effect,” and most researchers feel that it results from the selection of healthy individuals during the hiring process. However, other mechanisms may also contribute to the healthy worker effect. In particular, the healthy worker effect may reflect the selection, for epidemiologic study, of relatively advantaged workforces in terms of socioeconomic status and health. Evidence of differential health by socioeconomic status within the workforce is reviewed, and its possible role in the healthy worker effect is discussed.

Key terms: mortality, occupation, selection, socioeconomic status.

Because epidemiologic studies of employed populations typically find lower mortality rates than those of the general population, comparisons of workers with the general population may fail to detect excesses of occupationally related disease. The favorable health status of employed populations is often called the “healthy worker effect” (9). Some researchers feel that the selection of healthy individuals by employers during the hiring process is the major cause of this effect (1, 8). In addition persons in the general population who are too ill to be hired and keep a job may have a much higher mortality rate than do actively employed individuals, and the general population, including both employed and unemployed individuals, therefore has relatively high mortality.

Differences between the mortality experience of specific groups of workers and the national population may, however, reflect important socioeconomic influences in addition to the selection of healthy persons for employment. For example, low socioeconomic status is associated with unemployment (10), as well as with poor health (3, 5), and a selection process based on socioeconomic status rather than health at the time of hire could therefore still indirectly lead to health differences between the employed and general populations. Low socioeconomic status could also contribute to the healthy worker effect through the traditional health selection mechanism by promoting poor health. As discussed later, another possible mechanism involving socioeconomic status emphasizes the heterogeneity of mortality rates within the employed population.

Occupation, labor market segmentation and economic sectors

Even in the absence of health selection at the time of hire, mortality variation within the working population could generate the relatively low mortality rates typically associated with the healthy worker effect. For example, the Whitehall study (7) of British civil servants found the 10-year mortality of workers in the lowest employment grade to be three times higher than that in the highest grade. If the rates in the general population were intermediate, workers in the highest employment grade would show a healthy worker effect, while those in the lowest grade would have excess mortality.

Evidence of differential health by occupation within the work force comes from a variety of sources. In Great Britain and Scandinavia, for example, one study showed that male unskilled and semiskilled workers had a pronounced mortality excess (6), and the authors suggested that nonoccupational risk factors associated with social class partially accounted for this excess. Disease risk factors like cigarette smoking also vary by occupation, such that smoking is more prevalent among blue-collar workers than among white-collar workers, and within industries smoking is associated with lower status occupations (14). The possible impact of differential risk factor distributions on health outcomes across occupations is illustrated by the high correlation ($r = 0.72$) between the standardized mortality ratio for lung cancer and the proportional ratio for cigarette smoking among the 25 occupational orders in Great Britain (13). Since high status workers tend to have relatively low mortality, morbidity, and risk factor levels, a substantial part of the healthy worker effect in some occupations may reflect socioeconomic differences between the workers and members of the general population.

¹ Department of Epidemiology, School of Public Health, University of North Carolina, Chapel Hill, North Carolina, United States.

Reprint requests to: Dr T Wilcosky, Department of Epidemiology, School of Public Health 201 H, University of North Carolina, Chapel Hill, NC 27514, USA.

Although variation in socioeconomic status by occupation can help explain some of the disease deficits and excesses observed among groups of workers, occupation by itself comprises only one of several aspects of employment related to socioeconomic status. Recent work describing the socioeconomic heterogeneity of workplaces and work forces (2, 16) is especially relevant to the consideration of the healthy worker effect. This literature distinguishes economic sectors (the organization of firms and industries) from labor market segmentation (the existence of distinct job markets within firms or industries). Both concepts have potential importance for health-relevant working and living conditions. The economic center, or monopoly sector, tends to have big firms with large market shares and long range economic planning (among other characteristics) such that they are less affected by disruptions in economic cycles than are firms in the periphery, or competitive sector, which are smaller, more labor intensive, and more subject to short-term disruptions. Within these sectors, primary labor markets with opportunities for promotions, job protection, and higher wages can be distinguished from secondary labor markets with more temporary employment, lower wages, and poorer work conditions.

The literature on economic sectors and labor market segmentation provides an important guide for considering the generally favorable mortality experience of occupational cohorts. Specifically, most occupational cohort studies focus on the most favored workers in terms of both labor market and economic sector dimensions. For example, such studies typically exclude employees who work for relatively brief periods in a given company. Nicholson (12) points out that virtually every industry includes a two-component employment pattern with a large number of transient workers and a smaller number of long-term employees. The health experience of transient workers may be worse than that of workers with stable jobs due to occupational exposures and/or living conditions; therefore epidemiologic studies of the latter group could give a misleading overview of the association between employment and health.

With regard to economic sectors and the healthy worker effect, most occupational cohort studies are concentrated in the big firms that characterize the economic center. Although workers from small companies could be aggregated into a single large study population, the operational difficulties of such studies are considerably greater than those for a study of a single large company with centralized records. Table 1, which presents estimates from the National Occupational Hazard Survey (11) of urban workplaces in the United States, illustrates the potential for divergent results between studies of large and small companies from different economic sectors. Workers in plants with more than 500 employees are four times more likely to have preemployment physical examinations than plants that employ fewer than 250 workers, and therefore health

Table 1. Selected laborforce characteristics by plant size.

	Plant size			All plants
	Small (8-249)	Medium (250-500)	Large (> 500)	
Number of employees ^a (in millions)	15.4	10.9	12.0	38.3
Percentage of employees in plants that require preplacement physical examinations	19	49	83	48
Percentage of employees in plants that provide periodic medical examinations	12	29	65	34
Percentage of employees in plants with industrial hygiene services	3	19	57	24
Percentage of employees in plants with a safety committee	23	59	90	54
Percentage of employees in plants with a health unit	3	18	80	31

^a These counts are the denominators for the percentages that follow.

selection is more likely in large plants. Once hired, workers in large plants also have much greater access to services that protect their health. Table 1 shows that plants with 500 or fewer workers account for over two-thirds of the employees in urban workplaces, and the health status of the general population is therefore heavily weighted by the health experience of employees in smaller workplaces. To a large extent, the healthy worker effect may reflect the selection of work forces for study rather than selection of individuals into the work force.

Discussion

Although selection for good health at the time of hire may account for only part of the healthy worker effect, this explanation tends to eclipse the possible importance of socioeconomic heterogeneity within the working population. Comparisons of workers with the general population are generally based on the assumption that disease excesses among the workers result from occupational hazards and disease deficits reflect health selection, while potential confounding from socioeconomic differences receives little attention. As illustrated by the excess mortality of low-skilled workers in Great Britain and Scandinavia (6), the healthy worker effect observed in other studies may be just one end of a spectrum of biased comparisons.

An understanding of the healthy worker effect has implications for nonoccupational as well as occupational researchers. Participants in genetic family studies (15), community-based cohort studies (17), and other studies of selected individuals (4) may differ socioeconomically from more heterogeneous reference

populations, and their mortality will be relatively low or high. Since most measures of health and disease show a socioeconomic gradient, researchers should expect a disparity in such outcomes when relatively homogeneous groups are compared to the general population.

References

1. Fox AJ, Collier PF. Low mortality rates in industrial cohort studies due to selection for work and survival in the industry. *Br J Prev Soc Med* 30 (1976) 225—230.
2. Hodson R. Worker earnings and corporate economic structure. Academic Press, New York, NY 1983.
3. Kitagawa E, Hauser P. Differential mortality in the United States: A study in socio-economic epidemiology. Harvard University Press, Cambridge, MA 1973.
4. Lew EA, Seltzer F. Uses of the life table in public health. *Milbank Mem Fund Q* 48 (1970): 4 (part II), 15—37.
5. Logan WPD. Cancer mortality by occupation and social class 1851—1971: A joint publication of the Government Statistical Service and the International Agency for Research on Cancer (WHO). International Agency for Research on Cancer, Lyon, and Her Majesty's Stationery Office, London 1982. (IARC scientific publication no 36 and Studies on medical and population subjects no 44).
6. Lynge E, Jeune B. Excess mortality among male unskilled and semi-skilled workers: A negative slope with age. *Scand J Soc Med* 11 (1983) 37—40.
7. Marmot MG, Shipley MJ, Rose G. Inequalities in death — Specific explanations of a general pattern? *Lancet* 1 (1984) 1003—1006.
8. McMichael AJ. Standardized mortality ratios and the "healthy worker effect": Scratching beneath the surface. *J Occup Med* 18 (1976) 165—168.
9. McMichael AJ, Haynes SG, Tyroler HA. Observations on the evaluation of occupational mortality data. *J Occup Med* 17 (1975) 128—131.
10. Moser KA, Fox AJ, Jones DR. Unemployment and mortality in the OPCS Longitudinal Study. *Lancet* 2 (1984) 1324—1328.
11. National Institute for Occupational Safety and Health. National occupational hazard survey. Volume III (Survey analysis and supplemental tables). US Government Printing Office, Washington, DC 1977. (DHEW (NIOSH) publication no 78—114).
12. Nicholson WJ. Research issues in occupational and environmental cancer. *Arch Environ Health* 39 (1984) 190—202.
13. Office of Population Censuses and Surveys. Occupational mortality: The Registrar General's decennial supplement for England and Wales, 1970—72. Her Majesty's Stationery Office, London 1978. (Series DS no 1).
14. Sterling TD, Weinkam JJ. Smoking patterns by occupation, industry, sex, and race. *Arch Environ Health* 33 (1978) 313—317.
15. Tanaka K, Nishigouri S, Kameda S, Kajiyama K, Kunihiro K, Jimi S, Tokudome S, Yamaguchi M. Decreased mortality among relatives of patients with systemic lupus erythematosus. *Am J Epidemiol* 118 (1983) 728—731.
16. Wallace M, Kalleberg AL. Economic organization of firms and labor market consequences: Toward a specification of dual economy theory. In: Berg I, ed. *Sociological perspective on markets*. Academic Press, New York, NY 1981.
17. Wing S, Tyroler HA, Manton KG. The participant effect: Mortality in a community-based study compared to vital statistics. *J Chronic Dis* 38 (1985) 135—144.

Received for publication: 6 November 1986