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Annotation: Disparity in Cancer Survival and Alternative Health Care Financing Systems

The primary objective of the interesting and clever study by Gorey et al. in this issue of the Journal is to compare medical outcomes in two metropolitan areas: one, Toronto, Ontario, operating under Canada's single-payer system, and the other, Detroit, Mich, existing within the "insurance-driven US system."[1] The authors hypothesize that for persons of low socioeconomic status (SES), survival is better in Toronto than in Detroit. A secondary hypothesis is that the direct relationship between SES and cancer survival seen in many Western nations should be relatively weaker in Toronto than Detroit. The survival figures for most major cancer sites corroborate both hypotheses. The authors conclude that a likely explanation for these findings is greater access to preventive and therapeutic care in Toronto.

It's not easy to test mega-hypotheses concerning optimum strategies for organizing and financing health care. A controlled trial involving, say, the randomization of cities or neighborhoods to one or another health care financing scheme is infeasible at present. We are left, as Gorey et al. are, with devising observational studies to evaluate alternative health care systems. Cancer survival, which is sensitive to prompt diagnosis and therapeutic quality, makes a conceptually reasonable end point. The availability of population-based cancer survival data is a particular advantage.

Gorey et al. reason that people of low socioeconomic status are likely to be more affected by health care financing issues than their more affluent counterparts. That is, in a system with substantial barriers to care, the affluent may be better able to maneuver their way to early diagnosis and high-quality oncologic treatment. It is this focus on SES that makes this study especially informative and differentiates it from an earlier study by the US General Accounting Office, which found little cancer survival difference between Canada and the United States.[2]

Studies of SES and cancer face a number of problems, not the least of which is the absence of individual-level socioeconomic information in cancer registries. The authors resort to an ecological (census tract–based) measure of SES. Although ecological fallacy is a generic worry, a number of recent studies have established the value of such ecological measures of SES,[3,4] especially when researchers—like Gorey et al.—limit their inferences to areal variables, such as residence in a low-, middle-, or high-income area, rather than individual income status.

Does "low socioeconomic status" mean the same thing in Toronto as in Detroit? The authors compare *relative* socioeconomic tertiles, that is, categories derived from low-, middle-, and high-income areas within countries. In *absolute* income terms, though, the two cities differ greatly. For the critical low-income census tracts, the median income (in US dollars) was $30 400 in Toronto and $17 800 in Detroit. It may well be absolute, rather than relative, income that primarily determines that mix of lifestyle, physical environmental, and even health services factors that affects cancer survival. One might ask, with respect to the intercountry comparison, whether the Toronto "low-income" areas are loaded with truly higher-SES tracts with more favorable survival experience. Or, similarly, whether a direct relationship between SES and survival in Toronto is obscured by not making the "low-income" group low enough. Gorey et al. address these questions. They perform some finer quintile analysis and note in the discussion that the nonsignificance of the association between SES and survival in Toronto obtains. Moreover, Toronto's survival advantage is maintained in a comparison of the Canadian city's poorest quintile (median income = $28 000) with Detroit's second poorest (median income = $26 300).

Socioeconomic status reflects a host of biological, behavioral, and social systemic factors, some individual-level, others aggregate in nature. The question arises whether residents of Detroit's low-SES tracts differ from residents of Toronto's low-SES tracts in characteristics other than medical care that influence cancer survival. These characteristics might include smoking, body size, diet, alcohol intake, physical activity, use of medication, chemical exposure, immune status, and so on—our knowledge of the factors influencing survival from various malignancies is far from complete. One could even speculate that there is something about the social environment of Toronto, compared with Detroit, that confers a survival advantage through some as yet unrecognized cascade of psychological, neurological, endocrine, or immune phenomena that somehow influences the behavior of residual malignant cells and precancerous lesions. Although differential access to health care is a reasonable, even likely, explanation for the survival advantage of low-SES residents of Toronto, it is difficult to rule out some of these alternative explanations. To argue, as the authors do, that overall smoking rates are comparable for Canada and the United States does not preclude the possibility that smoking prevalence is higher in Detroit's low-SES areas than in Toronto's. As they point out, few country- and SES-specific data are available on smoking and other characteristics potentially linked to both SES and cancer survival. The authors' ongoing efforts to incorporate individual-level data on prognostic and treatment-related variables may help bolster the argument that the intercountry survival differential primar-

Editor's Note. See related article by Gorey et al. (p 1156) in this issue.

ily reflects differences in diagnosis and treatment.

This study by Gorey et al. provides a useful perspective on the extent to which health care organization affects an important outcome, namely, cancer survival. Because the observational nature of this single study makes inferences less than definitive, replication in other settings would be valuable (assuming one could find other examples of comparable areas having the felicitous combination of different health care systems and good registry data).

The disparity in cancer survival among low-SES residents of Toronto and Detroit begs explanation. The very existence of such a disparity reminds us that social and biological factors interact in complex ways to determine total and cause-specific mortality. If the survival difference between Toronto and Detroit is truly attributable to structural differences in health care delivery, that has important public health implications. If, however, the Canadian survival advantage is not due primarily to health care system differences, then we need to figure out what else is at work. In further investigating this and similar disparities in cancer survival, therefore, we stand to learn quite a bit, not only about the workings of health care, but also about the progression of malignant disease. □

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Annotation: Evaluating OSHA's Ethylene Oxide Standard and Evaluating OSHA

LaMontagne and Kelsey's article on the ethylene oxide standard of the Occupational Safety and Health Administration (OSHA)[1] is well motivated. Studies in which the effectiveness of OSHA's standards is evaluated by independent objective investigators are essential. The agency has promulgated 26 substance-specific standards and more than 60 safety standards. Public skepticism about the benefit of these regulations is to a large extent rooted in the agency's inability to demonstrate clearly that compliance has significantly reduced workplace injury and illness. Many factors complicate the issue: Chronic or latent workplace-induced diseases such as neoplasia may manifest themselves after the employee leaves the workplace; to verify a relationship between work and disease is sometimes difficult; and the confidentiality that attaches to workers' medical records impedes investigation. Furthermore, innovative technology introduced before or during regulation and independent of it may reduce the incidence of injury or disease.

In 1995 the Congressional Office of Technology Assessment, in appraising OSHA's analytical approach, reviewed the mortality, morbidity, and injury data in the workplace from 1972 to 1993.[2] Mortality, the easiest to document, showed a significant decline. The decline in workplace injury and illness taken from the National Safety Council statistics must also be considered impressive in view of the difficulty of acquiring firm data. Byssinosis (brown lung) has virtually disappeared since the issuance of the Cotton Dust Standard,[3] but the agency is not under the illusion that the standard alone was responsible for the benefits. Innovations in the handling of cotton and improved ventilation systems removed the hazardous by-products of cotton dust. Nonetheless, the standard, which entailed possible citations and fines for failing to provide a safe and healthful workplace within permissible exposure limits, was the driving force for both the technical innovations and the health benefits.

Mahoney et al. have shown that the number of hepatitis B virus infections among health care workers declined from 17 000 in 1983 to 400 in 1995—a decline 1.5 times greater than that in the general population.[4] In addition to the 1986 guidelines for health care workers,[5] one must credit the decline also to the implementation of universal precautions spurred by the human immunodeficiency virus (HIV) epidemic and the joint advisory statements by the Department of Labor and the Department of Health and Human Services. The emergence of safe recombinant DNA–derived vaccines preceded the regulation and clearly played a significant role. But the promulgation and subsequent implementation of the Bloodborne Pathogens Standard,[6] with its mandate that employers offer and pay for hepatitis B vaccination, dramatically accelerated the decline in incidence. For a few other standards, the information has been collected. The Cadmium Standard[7] reduced exposures and decreased adverse health effects.[8] Other standards resulted in significant decreases in deaths and injuries from explosions or fires.[9,10] Although in most cases documentation is unavailable, the known benefits are a consequence of the implementation of requirements that entail efficient and effective monitoring of the workplace.

LaMontagne and Kelsey identify numerous opportunities for exposure-reduction intervention in their paper.[1] However, they equate the "action level" with overexposure, which overstates the regulatory intention. For any health standard where exposure to the inhalation of toxic substances is a hazard, the benchmark is the permissible exposure limit. That means a limit, determined by risk assessment, that is economically and technologically feasible. The Supreme Court identified this limit in terms of risk:

> Some risks are plainly acceptable and others are plainly unacceptable. If for example, the odds are one in a billion

Editor's Note. Dr Yodaiken is a senior medical advisor in the Occupational Safety and Health Administration (OSHA), the Department of Labor (DOL). The views expressed here are his and not necessarily those of OSHA or DOL.

See related article by LaMontagne and Kelsey (p 1119) in this issue.