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Regarding "Associations Between Socioeconomic Status and Cancer Survival"

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Dear Editors

Zhang–Salomons et al. (1) are to be commended on their interesting and important study of the associations of ecologic income status with cancer survival in Canada and the United States. Although critical of a previous study of my research group compared with their own (2, 3), our two groups seem to have found much common ground, and although we differ on some interpretations and suggest a number of method caveats, I think that Zhang–Salomons et al. (1) have provided clear direction for future research in this and related social epidemiologic fields of study. Their study clearly identified the need and so powerfully echoed the call of many for the validation of ecologic measures of socioeconomic status (SES), particularly in Canadian contexts.

Our common ground concerns US analyses. Zhang–Salomons et al. (1) observed the same significant and generally large income–cancer survival associations across all income measures and most cancer sites in Detroit, MI, that we previously observed in Detroit and other American metropolitan areas (3–6). Although not emphasized by Zhang–Salomons et al. (1), they also failed to find evidence of such income–cancer survival associations for most cancer sites in Toronto (see their Table 3). Again, this pattern was consistent with patterns of findings observed by our research group in Toronto, Detroit, and elsewhere in America. However, I strongly disagree with Zhang–Salomons et al. (1) on one of their central interpretations of these patterns. They suggested that SES–cancer survival gradients were similar in Detroit and Toronto. Even using their preferred SES measure (census tract [CT] median household income), such seems not to be the case. For example, among cancer types arguably of the greatest public health significance, the income–survival gradients observed in Detroit were much larger practically than those observed in Toronto: breast (respective relative risks for dying of, 1.89 versus 1.37), prostate (relative risks, 2.04 versus 1.22), colon (relative risks, 1.36 versus 1.07; p = not significant), and lung (relative risks, 1.39 versus 1.13).

Our group developed and repeatedly tested a health insurance theory to explain such divergent patterns of SES–cancer survival in Canada and America. For example, we observed that SES–breast and prostate cancer survival gradients were smaller in more prevalently insured Hawaii than other states and that such gradients were larger among younger non–Medicare-eligible patients. Such an SES–age interaction was not observed among Canadian patients (4). Although Zhang–Salomons et al. (1) challenged the veracity

of our health insurance theory, they did not offer an alternative theoretic perspective. Our group previously discussed our rationales for ruling out a number of potential alternative explanations (6). Notwithstanding the criticism of Zhang–Salomons et al. (1), our health insurance theory seems to have held up well to empirical testing. Recent American studies that linked cancer registries with personal-level health insurance measures consistently found that uninsured and underinsured statuses are associated strongly with relatively late diagnosis, lack of access to the best available treatments, and, ultimately, poorer survival (7–11).

SES MEASUREMENT

Our group has preferred to use area-based poverty or low-income measures of SES for a number of reasons. First, they hold much face validity (i.e., most have a good sense of what it means to be poor and what an impoverished neighborhood looks like). Second, they are similarly based in the United States and Canada on the economic strain experienced by households that must spend much of their incomes on the essentials of life. To the extent that such so-called market-basket measures conceptually identify households with relatively low purchasing power, they probably are close proxies of the inability to purchase high-quality health insurance. Finally, their construct and predictive validities are fairly well developed now in the United States (12–14), if not yet in Canada (15). Zhang–Salomons et al. (1) critiqued our use of such dichotomized income measures on the grounds that they may obscure socioeconomic gradients. Their point would be well taken for studies of individual-level income. However, as an ecologic measure, such compositional measures may, for example, describe CTs well (e.g., 10%, 20%, or 40% of CT households below and 90%, 80%, or 60% of CT households above the federally established poverty criterion), and noted validations suggest that they tend to expose, rather than obscure, any extant socioeconomic gradients.

Zhang–Salomons et al. (1) presented little rationalization for their own preferred ecological SES measure—CT median household income—beyond its better support of what seems to be their preferred hypothetical stance, that is, that statistically and practically significant socioeconomic–cancer survival gradients exist in Canada. True, it is a continuous variable as they noted, but it contextually defines a given CT with only one point along what is typically a very long continuum. For example, a typical CT composed of 4000 persons or 1000 to 2000 households, characterized by a single income value (e.g., median = $50,000), may actually range in its household incomes by $200,000 to more than $500,000 in Detroit and Toronto. I think that such variance or error is particularly problematic in that our group repeatedly observed that it is significantly associated with other ecologic characteristics, such as population density and area. We originally critiqued the province-wide study of Boyd et al. (2) and Zhang–Salomons et al. (1) because it included, but did not account for, ecologic units of analysis that ranged in size from 0.10 to more than 4000 km^2. It should be noted that even in the greater metropolitan Toronto area, CT areas range greatly, from 0.10 to 200 km^2, with larger areas lying near its exurban to rural fringes. It seems unlikely that any such extremely small and extremely large ecologic measures, although characterized by the same median household income value, have the same meaning (16).

PERSONAL VERSUS COMMUNITY RESOURCES

Zhang–Salomons et al. (1) reported that they could not reproduce some of our group's reported results. It does not seem that theirs is an exact replicate of our previous analyses. Most importantly, given the centrality of geocoding to research design in this field, our group went to great lengths in sampling to maximize geocoding rates. In contrast to the geocoding rate of 90% of Zhang–Salomons et al. (1), our group achieved overall rates close to 95%, approaching 98% for the most common types of cancer. Whereas our group used Mantel–Haenszel models, Zhang–Salomons et al. (1) used Cox proportional hazards models. Presently, in systematically replicating and temporally updating the province-wide analysis of Boyd et al. (2) and Zhang–Salomons et al. (1) (1986 to 1988 and 1995 to 1997 breast, prostate, and colon cancer cohorts followed up for 5 years), we found that two variables did not meet the underlying assumption of Cox proportional models: age at diagnosis and year of diagnosis (Gorey, Fung, Luginaah, Balagurusamy, Mohammad, Holowaty, unpublished data). It does not seem that they accounted for this modeling problem in any of their previous analyses.

Cox models, stratified on age and year of diagnosis and adjusted for important ecologic covariates (population density and area [proxies for rural-urban status]), showed no significant SES–cancer survival associations in Ontario among cohorts for the 1980s or 1990s for either poverty- or median income–based SES measures. Moreover, these analyses suggested that ecologic SES measures might have different meanings in rural and urban areas (there were modest "SES"–survival associations in rural areas, and all such associations in Toronto were nonsignificant). My group hypothesizes that larger exurban to rural ecologic measures are better proxies of community resources (e.g., health care service endowments) and more predictive in Canadian contexts, and that smaller urban measures are better proxies of personal resources and more predictive in American contexts. We presently are engaged in a California–Ontario study to test these hypotheses. We look forward to continuing this discussion with our provincial colleagues, ultimately working together to advance our understanding of the actual meanings of ecologic SES measures in Canada and therefore advance understanding of the meanings and practical policy implications of any observed socioeconomic gradients.

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