



Response to Invited Commentary

MacDonald et al. Respond to “Search for Preventable Causes of Cardiovascular Disease”

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Initially submitted March 5, 2009; accepted for publication March 11, 2009.

Abbreviation: CVD, cardiovascular disease.

We appreciate the comments by Dr. Cullen (1) on our review of practices in the collection and use of occupational data in population-based cardiovascular studies (2), and we agree with many of his points and recommendations. In this reply, we offer some clarification and respond to Dr. Cullen’s remark that occupational cohort studies are a “better solution” to “retrofitting” population-based studies, since our view is that both designs offer complementary advantages to investigating the contribution of workplace social and environmental conditions for the distribution and occurrence of cardiovascular disease (CVD).

The idea for our review grew out of broader discussions about 1) how socioeconomic status is used in health research for outcomes with established occupational risks and 2) how to improve surveillance and etiologic research on understudied and hard-to-reach worker populations, such as racial/ethnic minorities and those in nonstandard (e.g., temporary) work arrangements associated with insecure, low-quality jobs (3–5). Population-based cohorts are often larger and more sociodemographically diverse than occupational cohorts and, because participant recruitment and follow-up are not governed by employment type or longevity, these studies overcome barriers associated with the study of hard-to-reach workers; additionally, these studies routinely gather extensive individual risk data and high-quality health measures, and they often conduct long-term follow-up. We noted that occupational data will most likely be from self-reports and/or exposure estimation. Additionally, population-based studies are not well suited to investigations of rare exposures (6). Notwithstanding the practical limitations

identified by Dr. Cullen for quantitative exposure assessments, semiquantitative exposure indices may be possible (7, 8). Further, we maintain that the inclusion of self-reports of industry, occupation, and the more prevalent exposures previously linked to CVD provides a scientifically sound and cost-effective way to investigate the contribution of workplace exposures to CVD.

We appreciate Dr. Cullen’s drawing attention to the healthy worker effect, in which poor health serves as a barrier to job entry (healthy hire) and retention (healthy survivor) (9). These effects have implications for all worker health investigations, irrespective of study design, and care must be exercised in making decisions about appropriate intracohort comparisons (6). Correspondingly, when examining workplace associations within population-based data sets, it is important to choose reference groups among the *employed* segment of the sample to avoid biased (underestimated) effect estimates. We concur with Dr. Cullen that examination of the role of work in the development of CVD is extraordinarily complex. The potential for reciprocal relations between employment conditions and health-related lifestyle factors (10), coupled with strong correlations between occupational exposures and socioeconomic status (11), calls for alternatives to the traditional strategy of isolating effects by adjusting for potential “confounders” (12). Although there are attendant conceptual and analytical challenges, movement toward investigations of “integrative effects” would permit simultaneous consideration of socioeconomic status *and* environmental exposures, as well as generate actionable knowledge relevant

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to distal and proximal risks from work and other major life domains.

The attributable risk estimate of 15% cited by Dr. Cullen between workplace hazards and respiratory disease is in line with or low for CVD, which has been estimated to range from 16% to 55%, depending upon whether occupational factors are considered to act independently or, as is more likely, in combination and whether exposures are transient or persistent (13–20). We concur with Dr. Cullen's assessment that preventable occupational risks represent an important opportunity to reduce the burden of CVD.

ACKNOWLEDGMENTS

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The findings and conclusions in this response are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

Conflict of interest: none declared.

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