

Letters to the Editor

Socioeconomic Status and Cardiovascular Response

John Lynch and his associates suggest that low socioeconomic status might potentiate the effects of increased cardiovascular reactivity on the progression of carotid atherosclerosis, on the basis of an interesting analysis of data collected as part of the Kuopio Ischemic Heart Disease Risk Factor Study in eastern Finland.¹ As we have reported little or no association between blood pressure reactivity and both future blood pressure level and ischemic heart disease incidence,²⁻⁴ we are particularly interested in the results reported from the Kuopio study and have considered reasons for discrepancies between these findings and ours.

First, the choice of stress task in the Kuopio study is an unusual one. "Reactivity" studies have generally preferred mental stress tasks (such as mental arithmetic), for sound theoretical reasons,⁵ or the cold pressor test. Lynch et al., on the other hand, used the anticipation of maximum bicycle exercise, calculating systolic blood pressure reactivity as the difference between anticipatory systolic blood pressure and seated resting pressure. There is now substantial evidence that the magnitude of such anticipatory cardiovascular reactions is related to training history,⁶ and this may reflect variations in physical fitness. Fitness is not one of the covariates Lynch et al. selected for assessment, even though data related to this were collected in the study. In addition, the Kuopio study has actually measured cardiovascular reactions to mental stress.⁷ Do reactions to mental stress provide confirmatory evidence that the interaction between reactivity and socioeconomic position predicts the progression of carotid atherosclerosis?

Second, we have some concerns regarding the data analyses that were performed. Why is a continuous variable like reactivity reduced to a rather arbitrary

binary (high, low) variable, with consequent loss of statistical power? Most important, what is the justification for pursuing post hoc pairwise comparisons when the overall interaction F statistic does not meet the conventional criterion of statistical significance? Consider Table 1 in the Lynch et al. article: only 1 of the 9 interaction effects is statistically significant, providing little justification for postulating an important degree of interaction.

Third, the main focus of the article is on the potentiating influence of adverse socioeconomic circumstances on cardiovascular reactions to stress. Such interactions should, however, be given credence only if there are main effects of both reactivity and socioeconomic position. While the main effects of socioeconomic position have been reported for these data,⁸ main effects of reactivity have not, to our knowledge, been reported.

Finally, as indicated earlier, we have recently reported analyses from the Whitehall II² and Caerphilly Collaborative Heart Disease^{3,4} studies showing that blood pressure reactions to stress provide minimal independent prediction of blood pressure and incident ischemic heart disease risk. Reanalyses of these data sets revealed no significant interactions between socioeconomic position and reactivity in the prediction of prospective outcomes. □

Douglas Carroll, PhD
George Davey Smith, MD

Douglas Carroll is with the School of Sport and Exercise Sciences, University of Birmingham, Birmingham, England. George Davey Smith is with the Department of Social Medicine, University of Bristol, Bristol, England.

Requests for reprints should be sent to Douglas Carroll, PhD, School of Sport and Exercise Sciences, University of Birmingham, Birmingham, England B15 2TT.

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Lynch et al. Respond

Doug Carroll and George Davey Smith have raised several concerns, and we thank them for their interest in our study. We agree that our measure of systolic blood pressure reactivity is unconventional, but that does not necessarily disqualify it as a valid way to assess the underlying phenomenon of cardiovascular response to stress. We have already shown that this measure predicts incident hypertension in middle-aged men.¹ The period preceding exercise is characterized by emotional, behavioral, and physiological arousal similar to that evoked by challenging mental tasks and the cold pressor test. The bike test portends a serious and potentially stressful physical challenge for the participant, and reactivity scores derived by this method may not be as sensitive to the problems of "task engagement" that can arise with computer-based mental challenges. In addition to the measure of reactivity derived from the bicycle test, the Kuopio Ischemic Heart Disease Risk Factor Study also collected, as part of the 4-year examination, a set of reactivity measures derived from a battery of computer-based mental challenges. The reactivity measures based on mental challenges also show cross-sectional relationships with carotid atherosclerosis.² We were aware of the potential for the bicycle-based reactivity measure to be affected by prior exercise and/or fitness levels, but preliminary analyses revealed the same results stratified by fitness level or excluding those who reported bicycling as their main form of conditioning physical exercise. Reactivity was only modestly correlated with maximal oxygen uptake ($r = -0.14$) and not related to exercise considered to be aerobically conditioning ($r = 0.02$).

Analyses conducted with continuous versions of the variables produced essentially the same conclusions. The variables were dichotomized for consistency with previous publications that have used these measures of cardiovascular reactivity and socioeconomic position.³⁻⁵ The overall F statistic test investigates any differences

among the categories, but because we had hypothesized a priori that the particular combination of low socioeconomic status and high reactivity would be related to the greatest progression of carotid atherosclerosis, we felt that this pairwise comparison was appropriate. We are sympathetic to the general point raised by Carroll and Davey Smith in regard to the inconsistent significance of F statistics under the conventional criteria. However, we are also aware of the power problems related to assessing interactions. Greenland has suggested that the precision of the interaction estimate may be only one quarter that of the main effect estimate.⁶ Levels of statistical significance reflect both magnitude of effects and sample size and thus represent inherently confounded information.⁷ There is nothing magical about the 5% confidence level. Its overly rigid application for delineating the importance of findings, particularly for interactions, should be approached with caution.

Finally, Carroll and Davey Smith remind us that claims of interaction should be given credence only when there is evidence of main effects. In analyses yet to be published, we have shown that, in models adjusted for age and the technical factors described in the article, the measure of systolic blood pressure reactivity based on anticipation of the bicycle test is a statistically significant and important predictor of carotid atherosclerosis. □

John Lynch, PhD, MPH
Susan Everson, PhD, MPH
George Kaplan, PhD

The authors are with the Department of Epidemiology, School of Public Health, University of Michigan, Ann Arbor.

Requests for reprints should be sent to John Lynch, PhD, MPH, School of Public Health, Department of Epidemiology, 109 Observatory St, Ann Arbor, MI 48109-2029.

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On Contraception and Abortion in Armenia

I am disturbed by the research study on abortion in Armenia recently published in the Journal.¹ The authors of the study make a case for improved preventive contraceptive services, which I applaud. Having worked in the field of family planning since 1981, I appreciate the importance of preventive family planning services for women. However, to argue their case, the authors make some false statements about abortion that I feel need clarification.

The impetus for this study seems to be the decline in fertility, the increase in maternal mortality, and the increase in infertility rates between 1980 and 1995 in Armenia. It appears that the covert, if not overt, research question being addressed is the following: Is abortion the cause of these public health changes in Armenia? As the article continues, though, it becomes clear that the researchers are unable to answer this question and, instead, confuse correlation with causation. Yes, fertility has declined, maternal mortality has increased, and infertility has increased. However, the researchers fail to prove that these public health changes can be attributed to the high rates of abortion in Armenia.

Lacking modern or effective birth control methods, women in the USSR and Eastern Europe have historically used abortion as their method of birth control.² Given the lack of alternatives and the typical rate of fertility, it makes perfect sense that a 40-year-old woman would have had an average of 8 abortions.

It is not abortion, or what the authors call "induced abortion," that leads to high rates of maternal morbidity; rather, it is illegal and/or poorly performed abortions that can result in infection, infertility, or even death. However, continuing a pregnancy and giving birth is also very dangerous to women's health in the developing world;