

- 2 Melhuish E, Belsky J, Leyland AH, Barnes J, and the National Evaluation of Sure Start Research Team. Effects of fully-established Sure Start Local Programmes on children and their families living in England: a quasi-experimental observational study. *Lancet* 2008; **372**: 1641–47.
- 3 Belsky J, Melhuish E, Barnes J, Leyland AH, Romaniuk H, and the National Evaluation of Sure Start Research Team. Effects of Sure Start local programmes on children and families: early findings from a quasi-experimental, cross-sectional study. *BMJ* 2006; **332**: 1476–81.

- 4 Hansen K, ed. Millennium Cohort Study: first and second surveys. A guide to the datasets. London: IOE, 2006.
- 5 Department for Education and Skills, Department for Work and Pensions. Choice for parents, the best start for children: making it happen. An action plan for the ten year strategy: Sure Start Children's Centres, extended schools and childcare. http://www.everychildmatters.gov.uk/_files/06EA29398072BE73E834DBA061584307.pdf (accessed Oct 30, 2008).

Can we eliminate inequalities in coronary disease? Absolutely

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The best way to eliminate inequalities in coronary disease is to eliminate coronary disease. In an important paper in today's *Lancet*, Mika Kivimäki and colleagues show that best-practice interventions on four classic risk factors—smoking, cholesterol, blood pressure, and diabetes—would go a long way towards this goal.¹

A socioeconomic gradient in coronary mortality is the norm in high-income countries, and increasingly in low-income and middle-income countries as well.² As summarised by Kivimäki and colleagues, previous studies suggested that the classic risk factors explain only a small fraction of this social gradient.¹ However, as Kivimäki and colleagues point out, these analyses simply standardised the risk-factor distributions of each social group to that of the whole population. The likely effect of best-practice interventions on coronary disease inequalities, in absolute and relative terms, has not previously been estimated.

To answer this important question, Kivimäki and colleagues analysed the Whitehall cohort of British civil servants in which 17 000 men, classified by civil-service grade, were followed up for coronary mortality over 15 years. As expected, low-status men had worse risk-factor levels—except for cholesterol—and higher coronary mortality than their high-status counterparts. Next, Kivimäki modelled what would have happened to coronary mortality had participants experienced either best-practice intervention or primordial prevention (lifelong optimum risk-factor levels). Best practice was defined as average reductions of 2 mmol/L in cholesterol, 10 mm Hg in systolic blood pressure, 1 mmol/L in blood glucose in individuals defined as pre-diabetic, a halving in prevalence of type 2 diabetes, and all smokers quitting.

According to this model, best-practice intervention would reduce the age-standardised 15-year rate difference in coronary mortality (comparing low-status with high-status groups) from 3.5 to 1.1 per 100 (figure). That is, absolute inequality would be reduced by 69%. This estimated reduction falls to 55% if only half of the smokers quit and increases to 86% under the primordial prevention scenario. The modelled effect on relative inequality was lower: under the best-practice scenario, the coronary mortality rate ratio was only reduced by 30%.

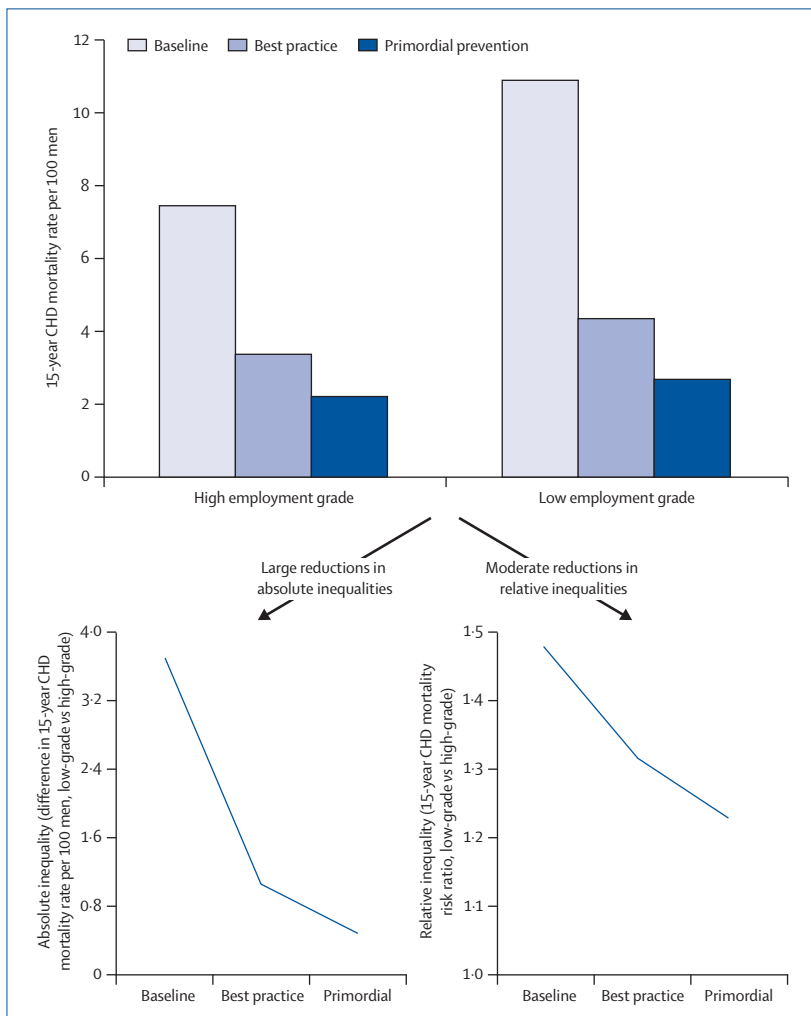


Figure: Modelled effect of intervention on coronary mortality, by social status
CHD=coronary heart disease. 15-year CHD mortality risks adjusted to age 55 years. Derived from reference 1.

The effect of these interventions may be even greater than estimated here. Large reductions in stroke burden would be expected. The diabetes interventions appeared to contribute very little, but this could be an underestimate,³ and reductions in microvascular disease were not counted. Moreover, large underestimations remain due to regression dilution bias.⁴ So, for example, a 2 mmol/L reduction in cholesterol more than halves coronary disease⁵ rather than reducing it by a third.

Doubtless, heated discussion will follow on what constitutes best practice. For example, some might argue that an average reduction in systolic blood pressure of more than 10 mm Hg should be possible, whereas even a best-practice intervention is unlikely to enable all smokers to quit. Yet it seems clear that a variety of interventions could substantially reduce coronary disease inequalities, at least when measured on an absolute scale.

Kivimäki and colleagues' model also provides valuable insights into the contribution of different risk factors to absolute and relative inequality. For example, total concentrations of blood cholesterol were already lower in the low-status group at baseline, so cholesterol could not contribute to relative inequality. Yet cholesterol reduction still made a major contribution to the reduction in absolute inequality, because absolute benefits are directly proportional to baseline absolute risk⁶ which of course was higher in the low-status group. To paraphrase Kivimäki: the determinants of absolute inequality may be different from the determinants of relative inequality.

Kivimäki and colleagues' key message is clear: not only do the classic risk factors cause at least 80% of coronary disease⁷⁻⁹ and explain at least 70% of the fall in coronary disease seen in high-income countries since 1970,¹⁰ but addressing these risk factors could largely eliminate absolute inequalities in coronary disease. Yet what does Kivimäki's study in a high-income country mean for inequalities globally, and how can coronary risk reduction be achieved in disadvantaged populations?

In many low-income and middle-income countries, cardiovascular disease rates are now higher than in high-income countries, and the predictable shift in burden to the poor within those countries is well underway. Yet the classic risk factors explain almost all coronary

disease in these countries as well,⁹ so their contribution to emerging inequalities should also be similar. The costs of not acting on this new information are greater than ever—eg, if trends continue unabated, more heart attacks will occur in India over the next 5 years than have ever occurred in the UK.

Kivimäki and colleagues' key message might seem simple, but simple does not mean easy. There are enormous challenges to be overcome to deliver best-practice intervention to disadvantaged groups, who are often beset with competing priorities, resource constraints, and comorbidities.² Yet Kivimäki clearly shows that, if we are serious about eliminating social inequalities in cardiovascular health, we need to concentrate our efforts on the established risk factors and focus on absolute reduction in absolute risk.

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We declare that we have no conflict of interest.

- 1 Kivimäki M, Shipley MJ, Ferrie JE, et al. Best-practice interventions to reduce socioeconomic inequalities of coronary heart disease mortality in UK: a prospective occupational cohort study. *Lancet* 2008; **372**: 1648–54.
- 2 Commission on Social Determinants of Health. Closing the gap in a generation: health equity through action on the social determinants of health. 2008. http://www.who.int/social_determinants/final_report/en (accessed Oct 29, 2008).
- 3 Danaei G, Lawes CMM, Vander Hoorn S, Murray CJL, Ezzati M. Global and regional mortality from ischaemic heart disease and stroke attributable to higher-than-optimum blood glucose concentration: comparative risk assessment. *Lancet* 2006; **368**: 1651–59.
- 4 MacMahon S, Peto R, Cutler J, et al. Blood pressure, stroke, and coronary heart disease. Part 1: prolonged differences in blood pressure: prospective observational studies corrected for the regression dilution bias. *Lancet* 1990; **335**: 765–74.
- 5 Law MR, Wald NJ, Rudnicka AR. Quantifying effect of statins on low density lipoprotein cholesterol, ischaemic heart disease, and stroke: systematic review and meta-analysis. *BMJ* 2003; **326**: 1423–30.
- 6 Jackson R, Lawes C, Bennett D, Milne R, Rodgers A. Treatment with drugs to lower blood pressure and blood cholesterol based on an individual's absolute cardiovascular risk. *Lancet* 2005; **365**: 434–41.
- 7 Magnus P, Beaglehole R. The real contribution of the major risk factors to the coronary epidemics: time to end the "only-50%" myth. *Arch Intern Med* 2001; **161**: 2657–60.
- 8 WHO. The world health report 2002: reducing risks, promoting healthy life. 2002. <http://www.who.int/whr/2002/en> (accessed Oct 29, 2008).
- 9 Yusuf S, Hawken S, Ounpuu S, et al, on behalf of the INTERHEART Study Investigators. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004; **364**: 937–52.
- 10 Tobias M, Taylor R, Li-Chia YKH, Mann S, Sharpe N. Did it fall or was it pushed? The contribution of trends in established risk factors to the decline in premature coronary heart disease mortality in New Zealand. *Aust N Z J Public Health* 2008; **32**: 117–125.