Authors' objectives
To assess the effectiveness of multiple risk factor intervention in reducing cardiovascular risk factors, total mortality and mortality from coronary heart disease (CHD) among adults.

Searching
MEDLINE was searched from 1966 to April 1995 using topic terms such as 'coronary heart disease' and 'stroke', as well as textwords including 'prevention' and 'multiple risk factor'. Specific interventions searched for were smoking cessation, dietary change, exercise, weight loss, blood-pressure control and cholesterol-lowering. This search was supplemented by checking citation indices and the reference lists of the RCTs, and by consultation with experts. Authors were contacted for additional unpublished data. The search strategy is available from the authors.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) of primary prevention of CHD by multiple risk factor interventions using counselling and education, with or without pharmacological treatments, in general populations, occupational groups and high-risk groups with follow-up of over 26 weeks were included. Studies of children or adults only under 40 years, as well as trials of secondary prevention were excluded.

Specific interventions included in the review
Specific interventions and multiple risk factor intervention including: smoking cessation, exercise, dietary advice, weight control, antihypertensive drugs and cholesterol-lowering drugs.

Participants included in the review
Adults aged 17 to 73 years were included.

Outcomes assessed in the review
The outcomes were changes in systolic and diastolic blood-pressure, smoking rates, blood cholesterol concentrations, total mortality and mortality from CHD.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the authors performed the selection.

Assessment of study quality
Whilst not stated as a priori quality criteria, the authors assessed RCTs on adequacy of randomisation and follow-up, completeness of data collection and reporting, and adherence to intention to treat. The authors do not state how the papers were assessed for quality, or how many of the authors performed the quality assessment.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.

Methods of synthesis
How were the studies combined?
Odds ratios (ORs) were used to summarise clinical event treatment effects, and logistic regression to pool estimates for groups of trials. Risk factor effects were assessed as net changes, i.e. the difference in the intervention group minus that in the control, which allows for secular trends, measurement habituation effects and regression to the mean. Net changes for continuous variables were pooled by using the standard deviations and sample sizes of intervention and control group as weights. Changes in smoking were expressed as net changes in prevalence of smoking, and pooled estimates were calculated by weighting using the inverse of the variance for each study, with the pooled standard error calculated as the square root of the inverse of the sum of weights. Fixed-effect and random-effects analyses were carried out.

How were differences between studies investigated?
Sensitivity analyses were performed by inclusion and exclusion of trials, since characteristics of the interventions or the participants varied between trials. The effect of intervention was related to the initial risk of CHD using event rates in the control group and the combined control and intervention group. In addition, the relationship between baseline risk factors and the size of changes in risk factors in each of the trials was examined through weighted least-squares regression, using the sample sizes as weights.

Results of the review
Fourteen RCTs (146,261 patients) were included; 9 (132,185 patients) reported both disease events and changes in risk factors as outcomes, and 5 (14,076 patients) reported risk factor outcomes only.

There were significant net decreases in systolic and diastolic blood-pressure, -4.2 mmHg (95% confidence interval, CI: -3.8, -4.6, P<0.0001) and -2.7 mmHg (95% CI: -2.5, -2.9, P<0.0001), respectively. The net decrease in systolic blood-pressure was based on 13 RCTs as no data were available for one study; the comparable net decrease in diastolic blood-pressure for the 13 RCTs was 2.1 mmHg (95% CI: -1.9,-2.3, P<0.001). The decreases in smoking prevalence and blood cholesterol were 4.2% (95% CI: -3.6, -4.8, p<0.0001) and 0.14 mmol/L (95% CI: -0.12, -0.16, p<0.0001), respectively. In the 9 trials with clinical end points, the pooled OR for total and CHD mortality were 0.97 (95% CI: 0.92, 1.02) and 0.96 (95% CI: 0.88, 1.04), respectively. Statistical heterogeneity between studies, with respect to changes in mortality and risk factors, was due to trials focusing on hypertensive participants and those using considerable amounts of drug treatment, with only these trials showing significant reductions in mortality.

Authors' conclusions
Multiple risk factor interventions comprising counselling, education, and drug treatments were ineffective in achieving reductions in total mortality or mortality from cerebrovascular disease when used in general or workforce populations of middle-aged adults. Changes in risk factors were modest, were related to the amount of pharmacological treatment used and in some cases may have been overestimated due to regression to the mean, lack of intention to treat analyses, habituation to blood-pressure measurement, and use of self-reports of smoking. Interventions using personal or family counselling, and education with or without pharmacological treatments, seem to be more effective at reducing risk factors and mortality in high-risk hypertensives. If implemented through standard health education, methods may have limited use to the general population.

CRD commentary
The authors have undertaken a good systematic review, adhering to most of the key criteria. The review provides a good outline of the interventions, participants, outcomes, and designs included within the review, as well as the search strategy, methods of analysis and heterogeneity. The study information and the results are clearly set out. Unfortunately, the review does not discuss the process by which decisions of relevance, judgements of quality or the process of data extraction are made. In addition, the review does not explicitly state the criteria for assessing the quality of the primary studies. No cost information is provided. In the concluding discussion, the authors provide an outline of the context of the review in terms of settings, the quality of the data and the limitations of the designs.

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Other publications of related interest

2. Chambers LW. Identifying individuals at increased risk of coronary heart disease has only small effects on mortality in populations. Evidence-Based Health Policy and Management 1998;2:14.

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Subject indexing assigned by NLM

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.