

CORRESPONDENCE

Survival trends, coronary event rates, and the MONICA project

Sir—Since it is widely believed that dietary factors drive coronary events and deaths, we wondered whether secular changes in the intake of various foods would be correlated with the falls and rises in coronary events across different countries noted by the MONICA project (May 8, p 1547).¹

In 1984, S Seely compared coronary death rates with food intakes and noted that the food most highly correlated with coronary deaths was milk.² Meat, eggs, sugar, animal fats, and animal proteins were also positively correlated, whereas cheese intake was negatively correlated. Seely reasoned that atherogenesis takes many years, and used food-intake data from about 8 years before the year for deaths. We used Seely's method with more recent data from WHO, European, and other published sources and also found the highest correlation was with milk ($r=0.88$ in men aged 65–74 years, for the 20 Organisation for Economic Cooperation and Development countries providing data).

We were unable to obtain food-intake statistics to match the exact places studied by MONICA but present here our analysis for countries for which we could find published data of changes in intake during 1971–89 and changes in registered coronary deaths during 1978–93.

Changes in milk-protein consumption, up or down, accurately predicted changes in coronary deaths 4–7 years

later ($r=0.81$ for men aged 65–74 years, figure). Only one country (Portugal) had increased milk-protein consumption in that time, and coronary death rates had also risen. In the other 11 countries, milk-protein consumption and coronary deaths fell. Changes in butter consumption poorly predicted coronary death changes ($r=0.40$), whereas beef and cheese consumption were negatively correlated, although not significantly so.

This temporal analysis (to be published in full elsewhere) strongly supports Seely's conclusion that the principal dietary atherogen is milk and that the atherogenic moiety of milk is in its protein fraction and not in its fat. His finding also resolves the so-called French paradox,³ because wine consumption nationally is inversely correlated with milk consumption ($r=-0.69$).

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1 Tunstall-Pedoe H, Kuulasmaa K, Mähönen M, Tolonen H, Ruokokoski E, Amougel P, for the WHO MONICA (monitoring trends and determinants in cardiovascular disease) Project. Contribution of trends in survival and coronary-event rates to changes in coronary heart disease

mortality: 10-year results from 37 WHO MONICA Project populations. *Lancet* 1999; 353: 1547–57.

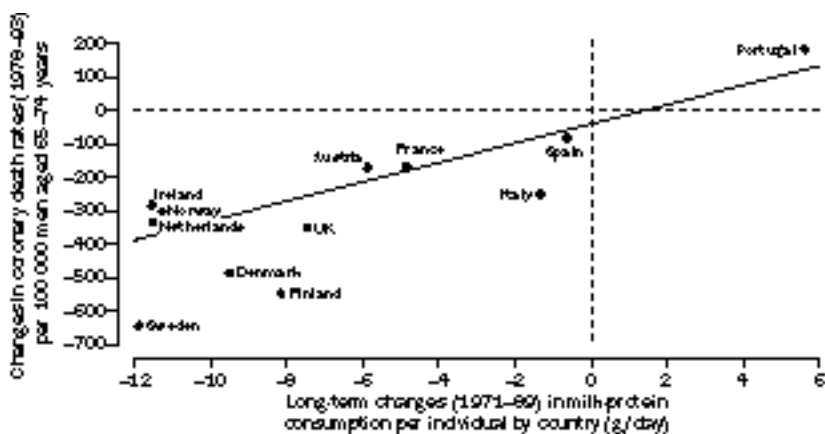
2 Seely S. Milk and atheroma II: epidemiology and theoretical aspects—milk oestrogens. In: Freed DLJ, ed. Health hazards of milk. Eastbourne: Baillière Tindall, 1984: 213–29.

3 Law M, Wald N. Why heart disease mortality is low in France: the time lag explanation. *BMJ* 1999; 318: 1471–80.

Sir—Effective national interventions to lessen the burden of cardiovascular deaths require a good understanding of the underlying epidemiology. The paper from the MONICA project¹ is thus invaluable. With the focus on patients younger than 65 years, there were two main conclusions. In countries where coronary heart disease (CHD) mortality is declining, about a third of the decrease due to improved case fatality (improved survival and, by implication, treatment) and two-thirds is due to a reduction in event rate incidence and, by implication, cardiovascular risk factors.

We can explore such macro observations through detailed and comprehensive modelling studies of all age-groups in two specific countries. In Scotland in 1994, there were 6205 fewer deaths than expected if there had been no decline from 1975 mortality rates. 40% of this decrease was attributable to treatments (initial acute myocardial infarction 11%, hypertension 9%, heart failure 8%, angina treatments 4% [aspirin, bypass surgery, and angioplasty], and secondary prevention 8%). 51% of the reduction was attributable to decline in measurable risk factors (via lower smoking rates 36%, lower cholesterol 6%, secular fall in blood pressure 6%, and increasing affluence 3%). That left 9% unaccounted for.² These findings, which were replicated in New Zealand, are consistent with studies in the USA and elsewhere in Europe.³ The modelling requires refinement. However, as in MONICA, the key findings remained robust across the most testing sensitivity analyses.^{2,3}

Three strategic implications are clear. First, many additional lives could be saved if treatment was increased.⁴ Second, the impact of lower smoking



Long-term changes in milk-protein consumption and in coronary death rates in 12 European countries

rates is potentially immense. Since the effective components of tobacco control are now well described, the half-hearted smoking policies of so many countries, including the UK, are inexcusable. Third, healthy nutrition, including reduced lipid uptake, is also important. The greatest decreases in population blood cholesterol concentrations have been achieved in Finland, Australia, and Sweden,⁵ which have active prevention programmes integrated across national, community, and individual levels.⁵ The Scottish government initiative *Towards a Healthier Scotland*—a large community-based demonstration project that uses robust methods for the primary prevention of coronary heart disease—is therefore welcome. Can the English public health white-paper do even better?

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- 1 Tunstall-Pedoe H, Kuulasmaa K, Mähönen M, Tolonen H, Ruokokoski E, Amougel P, for the WHO MONICA (monitoring trends and determinants in cardiovascular disease) Project. Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA Project populations. *Lancet* 1999; **353**: 1547–57.
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Sir—The WHO MONICA Project¹ presents a skewed picture of coronary-artery disease since, by limiting the study to patients aged 35–64 years, it excludes more than 75% of women and more than 50% of the men with the disease. Inclusion of only the younger cohort may lead to erroneous conclusions such as that in J S Alpert's Commentary² that coronary events in men continue to outnumber those in women by four to one.

This ratio is not true for the community as a whole, since women account for 40–45% of the events recorded in the Myocardial Infarction Data Acquisition System (MIDAS), an audited database comprising all CHD

events in NJ, USA.^{3,4} In MIDAS, which uses the same definitions as WHO MONICA for fatal (International Classification of Diseases codes 410–414) and non-fatal (code 410) coronary-artery disease, the median age is 77 years for women and 68 years for men. Therefore, the WHO MONICA age limits exclude 83% of events in women and 61% in men. In MIDAS, the ratio of men to women was 2:32 in the 35–64-year age-group, 1:21 in the 65–74-year age group, and 0:54 in the 75-year and older age-group—overall, 1:30.

In agreement with WHO MONICA, we found a significant (50%) decrease in age-adjusted CHD mortality among patients aged 35–64 years during 1986–96. However, the decrease among those aged 65 years and older was less striking (33%). For non-fatal myocardial infarction, although rates remained quite constant in the younger cohort, they increased in those aged 65 years and older, rather than decreased. Similar trends were seen in men and women. Therefore, the trends were different in the older age-group in which most events occur, compared with those in the younger age-group addressed by the WHO MONICA investigators. In addition, in MIDAS, a slight decrease in total coronary events per year was seen between 1986 and 1996 in the younger age-group, whereas a slight increase was seen in the older age-group. Among patients aged 75 years and older, there was a 9.9% increase in the total number of coronary events per year from 16 923 in 1986 to 18 602 in 1996. The use of age-adjusted rates obscures the fact that coronary-artery disease is not truly prevented, but merely postponed.

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- 1 Tunstall-Pedoe H, Kuulasmaa K, Mähönen M, Tolonen H, Ruokokoski E, Amougel P, for the WHO MONICA (monitoring trends and determinants in cardiovascular disease) Project. Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA Project populations. *Lancet* 1999; **353**: 1547–57.
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Sir—Tunstall-Pedoe and colleagues¹ point out that age-related coronary events are generally declining in the population aged 35–64 years. There is a danger that this finding may be interpreted as a declining incidence of myocardial infarction in the whole population, for which there is little evidence. The relation between age and risk of cardiovascular events is strong and as the population becomes older, total event rates may remain stable or rise. Indeed, the lack of an upper age limit in the Atherosclerosis Risk in Communities (ARIC) study² (although in subanalysis they excluded patients aged >74 years), combined with the inadequacies of statistical adjustment for risk could explain the difference in outcome in the two reports. Although reductions in risks may lower the rate of coronary events at young ages, such interventions probably delay rather than prevent events. Indeed, coronary prevention may be an optimistic misnomer and coronary procrastination a better term. Obviously, procrastination of coronary disease is to be welcomed, but the distinction from prevention is important. Prevention implies cost-savings to the health service, whereas procrastination does not. This difference has important implications for health-service planning.

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- 1 Tunstall-Pedoe H, Kuulasmaa K, Mähönen M, Tolonen H, Ruokokoski E, Amougel P, for the WHO MONICA (monitoring trends and determinants in cardiovascular disease) Project. Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA Project populations. *Lancet* 1999; **353**: 1547–57.
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Authors' reply

Sir—Our first set of final results from the WHO MONICA Project generated worldwide interest, but correspondence in *The Lancet* targets what we left out. Two letters anticipate our further reports on the impact of changes, first in coronary risk factors and second in coronary care, on disease trends. Margaret Moss and David Freed blame everything on milk protein. Simon Capewell allocates individual percentage responsibility for change in coronary mortality to named