

Exporting failure? Coronary heart disease and stroke in developing countries

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Developing countries and the burden of coronary heart disease and stroke

The burden of coronary heart disease (CHD) and stroke is considerable, representing 30% of all deaths worldwide, that is about 15 million deaths a year, of which 11 million are in developing or transitional countries.¹ Commentators have predicted a global epidemic of cardiovascular disease on the basis of current trends.² One enthusiast has even stated that *'In fact, cardiovascular disease is already the leading cause of death not only in developed countries but, as of the mid-1990s, in developing countries as well'*,³ a statement not supported by data in the World Health Report 2000.⁴ Citing statistics in this way undoubtedly fuels the view that 'something must be done', promulgated by bodies such as the World Heart Federation.¹ Clearly the absolute numbers of deaths should be related to the population at risk, which is substantially greater in developing countries of the world. The Global Burden of Disease study has attempted to provide a picture derived not only from mortality data but also from cardiovascular disability, some of which is consequent upon diseases other than coronary heart disease and stroke.⁵ This study demonstrated that while ischaemic heart disease and stroke were 5th and 6th in the 1990 league table of disability adjusted life years (DALYs), they contributed 20.4% of the DALYs in developed countries, but only 8.3% in developing countries.⁶ Concerns about the accuracy of international mortality data and the virtual absence of relevant incidence and disability data clearly need to be addressed urgently if the approach is to have validity.⁷

Epidemiological studies in developing countries, although small in number, provide evidence that stroke mortality rates tend to be higher than coronary heart disease rates,⁸ and may be considerably higher than in developed countries,⁹ but both stroke prevalence¹⁰ and coronary heart disease prevalence¹¹ are considerably lower, which may reflect more severe disease or worse health services, leading to higher case-fatality rates. The World Health Organization MONICA surveys, while dominated by developed countries, have data from China which experienced the lowest coronary heart disease event rates of any MONICA centre, but one of the highest annual relative increases among men, but not women.¹² Adverse risk factor changes in Chinese men, but not women, were associated with the increased male event rate.¹³ Surveys of cardiovascular risk factors in developing countries tend to show lower mean levels of blood cholesterol, blood pressure and body mass index; although urban levels may be closer to those found in developed countries.^{10,14,15} Smoking in developing countries is of growing

concern as consumption in the developed world tends to contract, but manufacturers' cigarette production and profits increase markedly.¹⁶ Of the 1.1 billion smokers worldwide, 800 million live in developing countries—with 300 million in China. It is to be expected that the cardiovascular disease consequences of smoking will be increasingly felt as these comparatively young smokers age.¹⁷ It has been estimated that current smoking uptake rates in China will result in 100 million deaths among the 0.3 billion men aged now under 30 years, with half of these deaths occurring in middle age.¹⁸

Health promotion for cardiovascular diseases: the evidence

The prevention of cardiovascular disease traditionally relies on the control of risk factors among individuals as a major element of any strategy. Such approaches—generally termed health promotion—are well illustrated by the Healthy Cities programme,¹⁹ the British Health of the Nation strategy,²⁰ the Adelaide Conference²¹ and the Ottawa Charter.²² Epidemiological evidence strongly supports the associations between cardiovascular diseases and smoking, high serum cholesterol, high blood pressure and physical inactivity. Modification of individual life style—stopping smoking, reducing dietary fat intake, avoiding obesity, and taking regular exercise—is a logical response to the growing risks of coronary heart disease and stroke. In addition, control of blood pressure with antihypertensive drugs and cholesterol lowering with statins reduce cardiovascular disease risk.^{23,24} Applying this knowledge in community programmes to prevent cardiovascular diseases would appear to be the best option for both developed and developing countries.

Multiple risk factor interventions

In the developed world, several community-based experiments were set up during the 1970s and 1980s, of which the North Karelia study in Finland was the most prominent.^{25,26} This project built upon the support of local community leaders and the general public and was intended to provide a unified and comprehensive approach involving mass media, workplaces, primary care, hospitals, schools and local communities. This involved training programmes, mobilization of public support through local leaders, formation of new social organizations such as housewives groups, and targeting of grocery shops and the food industry.

The effects of the North Karelia programme were measured by comparison with another Finnish county, Kuopio.²⁷ This county's population had a baseline survey of cardiovascular risk factors conducted at the same time as North Karelia and this

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was repeated over two decades. There were no demonstrable differences in risk factors between the intervention region and Kuopio over the duration of the study (Table 1) and the coronary heart disease mortality trends showed similar downward trends throughout all counties of the country (Figure 1).

Several other influential community-based studies conducted in the USA (Stanford Heart Disease Prevention Program (Three

Table 1 Trends in major cardiovascular risk factors in North Karelia and Kuopio, 1972–1992

	Men		Women	
	North Karelia	Kuopio	North Karelia	Kuopio
Smoking % current				
1972	52	51	12	13
1977	43	43	9	11
1982		42		16
1987		39		16
1992		37		20
Serum cholesterol mmol/l				
1972	7.1	6.9	7.0	6.8
1977	6.7	6.8	6.6	6.5
1982	6.3	6.3	6.2	6.0
1987		6.2		5.9
1992		5.9		5.5
Blood pressure mmHg				
1972	149/92	146/93	153/93	148/92
1977	143/89	146/93	142/87	144/89
1982	145/87	147/89	142/85	144/85
1987		/88		/84
1992		/84		/80

NB: Data from 1987 showed no difference between counties, but exact figures not reported.

Source: refs 26, 27

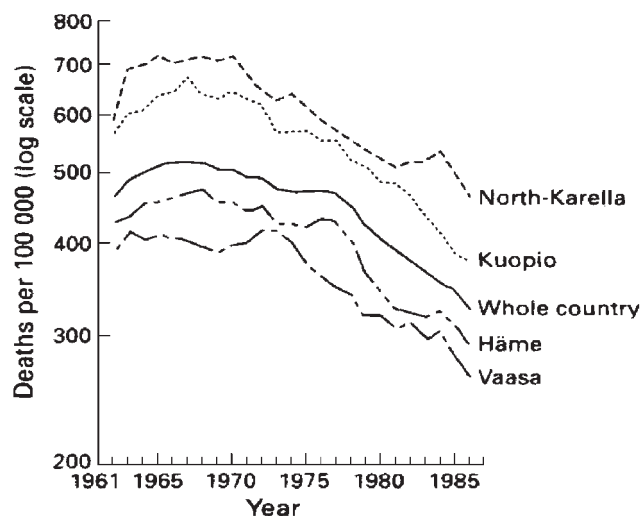


Figure 1 Finland ischaemic heart disease mortality trends 1961–1985, males aged 35–64 years. The figure shows the declining trend in ischaemic heart disease mortality throughout counties of Finland and for the whole country. Source: Valkonen T. Trends in regional and socioeconomic mortality differentials in Finland. *Int J Health Sciences* 1993;3(3/4):157–66

Cities);²⁸ Stanford Five-City Project;²⁹ Minnesota Heart Health Program;³⁰ and Pawtucket Heart Health Program³¹) failed to detect changes in cardiovascular risk factors or disease events which could be attributed to the health promotion programmes. A recent report from the Stanford Five-City project found no difference in the decline in cardiovascular disease event rates in intervention and control cities, and concluded '... some influence affecting all cities, not the intervention, accounted for the observed change.'³² Intriguingly, these uniformly disappointing developed country programmes have been reported as successes.^{1,33}

In parallel with the community-based experiments, health promotion interventions targeted at individuals or families were the subject of several large randomized controlled trials. The study populations differed between trials: some targeted the whole population whereas others identified 'high risk' subjects, and others conducted a combined approach in the workplace. These trials which included a range of interventions (e.g. dietary modification, giving up smoking, increasing exercise, together with limited pharmacological treatment in some trials), have also failed to provide convincing evidence of reductions in cardiovascular morbidity and mortality. However, small but significant reductions in blood pressure, blood cholesterol and smoking prevalence were observed.^{34,35}

Smoking cessation programmes

Probably one of the best planned randomized controlled trials at the community level in health promotion was the Community Intervention Trial for Smoking Cessation (COMMIT) study. This involved 11 community pairs, one community in each pair being randomized to receive smoking cessation activities through public education, through health care provider programmes, through work site interventions and through improving cessation resources in the community.³⁶ Over \$10 million were spent on these activities, with it being intended that there would be multiplier effects through matched funding. Process evaluation indicated that the intervention went ahead as planned. The primary aim was to reduce the prevalence of heavy smoking. The outcome was a non-significant net reduction of 0.7% (95% CI: -3%, +2%). The cost-effectiveness was around \$50 000 per heavy smoker who quit (although the CI included a negative value, i.e. the resources put into the programme could have actually increased the numbers of heavy smokers). It is clear that the additional resources expended during such programmes are not yielding the expected benefits. Perhaps we should have anticipated these results given that the tobacco industry is constantly advocating health education as the means to prevent minors taking up smoking. It is clear they know it simply does not work.

Health promotion policy for developing countries

The evidence from health promotion experiments in developed countries has not dented enthusiasm for the health promotion. The evidence linking risk factors with cardiovascular disease is not disputed, but the best efforts of doctors and nurses working on lifestyle change with individuals and their families appear to be remarkably limited, even when augmented by mass media and community activities. This lack of evidence of benefit has not deterred strong advocacy for exporting health promotion

to developing countries.^{1,3} More recent United States recommendations for developing countries focus reasonably enough on the research agenda (better vital statistics, monitoring of cardiovascular disease), but continue to promote the same failed interventions for tobacco and blood pressure control.³⁷ It has been claimed that public health interventions are not costly: '*many developing countries have a relative abundance of workers ... (who) can be applied to these tasks.*'³⁸ The opportunity costs of diverting such staff from maternal and child health care may prove to be considerable.

One of the few evaluations of health promotion in a developing country³⁹ demonstrated 5-year reductions in hypertension and smoking prevalence of 19%, and of 77% for hypercholesterolaemia (6.5 + mmol/l). However, the prevalence of obesity (BMI 30 + kg/m²) increased by 56% and diabetes by 15%. The intervention involved extensive use of mass media, fiscal and legislative measures, together with community, school and workplace health education, to promote healthy nutrition, increased exercise, smoking cessation and reduction in alcohol intake.

These effects on risk factors are far greater than those reported in previous randomized controlled trial evaluations which may reflect the uncontrolled nature of the evaluation. Two independent cross-sectional surveys were performed five years apart in an island population that had been uniformly exposed to intervention. Although methods were standardized and response rates were high, it seems likely that the fiscal and legislative actions were more effective than the health education approaches. Indeed, the fall in blood cholesterol levels was attributable to Mauritian government action in changing the composition of cooking oil from largely palm oil (high in saturated fatty acids) at the time of the initial survey to wholly soya bean oil by the 5-year follow up survey, because of concerns about the high levels of blood cholesterol uncovered in the initial survey.⁴⁰ No information is given about cigarette pricing, but in Papua New Guinea marked reductions in smoking prevalence were observed following price increases.⁴¹ Similarly taxes on alcohol may have prompted the decline in heavy drinking and may have led to falls in blood pressure. The increases in obesity and diabetes suggest that lifestyle advice to increase exercise and eat healthily did not have the desired effects.

The Mauritian study emphasizes the important role of government in population approaches to prevention. The clinical high risk approach is inevitably more expensive. For example, in Mexico, an analysis of the drug costs of controlling high blood pressure showed that the 1996 annual costs of thiazide diuretic and ACE-inhibitor treatments represented 1% and 44% respectively of the annual Mexican minimum wage.⁴² In India, while the annual cost of statins (simvastatin) is far less than in England at £67 versus £500, this amount far exceeds the Indian minimum wage.⁴³ The failure of governments to make, often difficult, decisions about tobacco, alcohol and food pricing and its availability is a more powerful determinant of cardiovascular disease risk than the failure of individuals to heed health education messages. People eat, smoke and drink what is affordable and available to them.

The increased risk of cardiovascular disease among relatively affluent urban populations brings demand for effective treatments, such as statins and coronary artery bypass surgery, stroke units,⁴⁴ leading to inflation in health care costs,⁴⁵ and also a desire for

inappropriate investigations or ineffective treatments, such as mechanical ventilation for moribund stroke patients. In poorer countries, such demand may well be accepted by governments anxious to please the voting and party-coffer contributing upper and middle classes, and may lead to diversion of resources from immunization and maternal and child health programmes.

So, what do we do?

Rather than exporting our tired and failed models of health promotion to developing countries, what should we do? At the 53rd World Health Assembly, the World Health Organization adopted the following resolutions: member countries should develop: '*a national policy framework taking into account healthy public policies creating a conducive environment for healthy lifestyles; fiscal and taxation policies towards healthy and unhealthy goods and services; to establish programmes for the prevention and control of non-communicable diseases; to assess and monitor mortality and morbidity attributable to non-communicable disease; and to promote the effectiveness of secondary and tertiary prevention and support the development of guidelines of cost-effective screening, diagnosis and treatment for NCDs.*'⁴⁶ Currently, WHO's main concern is with surveillance of cardiovascular disease, which would undoubtedly strengthen both the evidence to support the anticipated growing incidence of cardiovascular diseases and provide a means of monitoring interventions. Enthusiasm for non-communicable disease prevention and control programmes and clinical medicine remains and may wreck the more important, and more difficult issues of creation of conducive environments, fiscal and taxation policies.

The central role of poverty in determining health and avoidance of both communicable and non-communicable diseases is widely accepted and is at the heart of a new UK government policy, the first target of which is to halve the proportion of people living in poverty.⁴⁷ Sector-wide approaches—in which donors and lenders contribute to a single basket that funds the entire health sector—are now being promoted as the way forward,⁴⁸ but require careful evaluation.⁴⁹ However, the inter-relationships and competing priorities of other government ministries suggests that cross-sectoral approaches will be needed if the sort of apparently successful health promotion seen in Mauritius is to occur elsewhere.

It is essential that context-appropriate health research and health interventions take place in developing countries. Exporting research results and intervention methods in health promotion from industrialized countries ignores the fact that expectations, costs and burdens of disease vary between developing countries almost as much as between an abstract 'developed' or 'developing' country context. Scientists in developed countries should support health research in non-communicable disease prevention, but the old models of using naïve populations to test hypotheses of interest to the developed country are not acceptable. For example, classical epidemiological methods⁵⁰ showing variation in blood pressure distributions over time, between places and in migrants, versus non-migrant populations, provide a convincing case for environmental determination of population blood pressure distributions.⁵¹ Demonstrating that polymorphisms for the ACE gene do not contribute as much variance to blood pressure distributions in Nigerian, Jamaican and US populations as body mass index and salt intake does not contribute greatly to primordial prevention, whatever the

authors may claim.⁵² Although genes may explain some of the between-individual variation in risk factors such as blood pressure and obesity, they cannot explain the rapid increases in prevalence of obesity over the last two decades. It has been argued that the US environment is a potent and global cause of obesity: 'The U.S. model is now being exported around the world and has met with great success in producing obesity everywhere it has been tried.'⁵³ Understanding why the US environment has these adverse effects is the critical research question.

Newer research models, such as the long-term, training, infrastructure and capacity building used by the International Clinical Epidemiology Network (INCLIN) is of considerable importance in generating true developed-developing country collaboration,⁵⁴ and provide a means by which cardiovascular disease monitoring, evaluation of interventions, and locally relevant health policy can be developed.

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