

## The North Karelia lessons for prevention of cardiovascular disease

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### Abstract

**Background:** As a result of the high cardiovascular disease (CVD) rates in Finland in late 1960's, which became a source of national concern, a major community based programme for CVD prevention called the North Karelia project was established. Aim: The aim of the project was to carry out a programme of comprehensive community based interventions to reduce coronary heart disease (CHD) mortality and morbidity.

**Methods:** Using lifestyle modification methods and strategies for environmental change the programme aimed to reduce three main risk factors: smoking, elevated blood cholesterol and blood pressure. Several intervention settings and strategies in the community were used.

**Results:** Since the 1970's the CHD mortality in North Karelia has declined by more than 80%. Major reductions have been seen across the main three cardiovascular risk factors. Among both men and women, total serum cholesterol levels within the population declined by almost 20% and systolic blood pressure by about 10%. Smoking among men decreased from 52% to 33%, while among women a slight increase in smoking prevalence was recorded.

**Conclusions:** The North Karelia project has shown that a comprehensive, determined, theory-based community program can have a meaningful and positive effect on risk factors and lifestyles. Furthermore, these changes are associated with favorable changes in chronic disease rates and the health of the population.

**Key words:** cardiovascular disease, prevention, intervention, community-based project, risk factors

### Background

The North Karelia project was launched in Eastern Finland in 1972 [1] in response to local requests for urgent and effective assistance in reducing the burden from high levels of coronary heart disease (CHD) mortality. After the main cardiovascular disease (CVD) risk factors had been identified and the findings from epidemiological research carried out in Eastern Finland, in connection with the Seven Countries Study, [2] had been examined, the first major community-based project for CVD prevention was developed. This project aimed to reduce three main risk factors in the population: smoking, elevated blood cholesterol and blood pressure.

The North Karelia project was developed and implemented in co-operation with local and national authorities as well as experts with support from WHO. The aim of the project was to carry out a programme of comprehensive interventions through community organizations as well as by the individuals themselves. The programme used several strategies: innovative media and communication strategies, the systematic involvement of primary

health care, the involvement of several sectors in society such as schools and worksites, environmental changes, collaboration with industry and supermarkets and policy changes.

Knowledge from earlier epidemiological and medical studies was used to select the main and intermediate objectives for the programme. Results from studies carried out in North Karelia in late 1960's had shown that CHD mortality among men in the area was among the highest in the western world and that the levels of the main CVD risk factors: smoking, serum cholesterol and blood pressure, were exceptionally high in the area. Several behavioural and social theories were used to design the actual intervention programme [1]. In terms of behaviour modification, for example social learning theory, theory of planned behaviour, innovation-diffusion theory and communication-persuasion models were used.

### Results of the North Karelia project

During the first five years of the North Karelia project CHD mortality declined at a significantly greater rate than the national average (annual

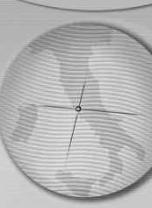
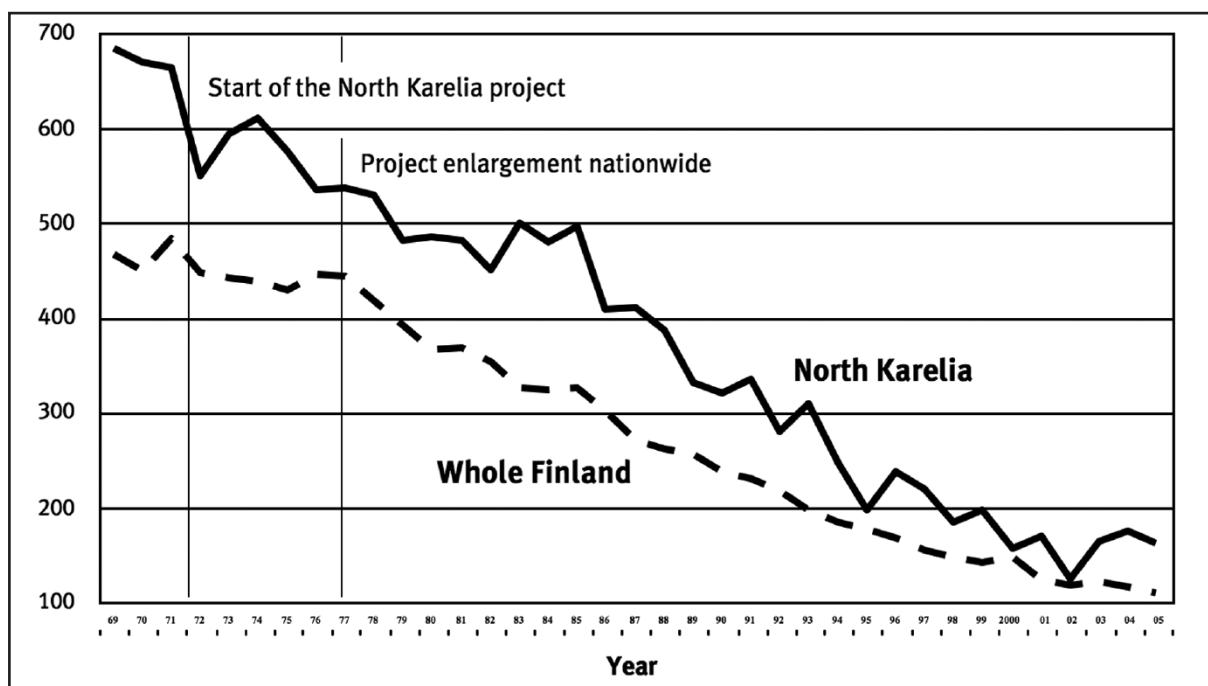


Figure 1. Coronary heart disease mortality (/100 000) in Finland and in North Karelia among men aged 35–64 years.



Data source: Statistics Finland

decline -2.9% vs -1.0%). Later on the nationwide decline also accelerated [3]. Since the early 1970's, the CHD mortality in North Karelia has declined by over 80% and the remarkable difference in CHD mortality, that existed between North Karelia and the rest of Finland, at the end of the 1960's (672/100 000 vs 465/100 000) has more or less disappeared [3,4] (Figure 1).

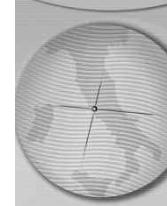
At the beginning of the North Karelia project the cardiovascular risk factor levels, especially among men, were very high in North Karelia [1,5]. Smoking prevalence among 30-59 year old men was 52%, mean serum cholesterol was 6.9 mmol/l and systolic blood pressure 149 mmHg. During the first five years smoking prevalence decreased to 44% (-15%), serum cholesterol to 6.5 mmol/l (-6%) and systolic blood pressure to 143 mmHg (-4%). This decline in risk factors has continued and in 2002 smoking prevalence

among men in North Karelia was 33%, mean serum cholesterol 5.7mmol/l and systolic blood pressure 137 mmHg (Table 1). The reduction in risk factors is clearly a result of major lifestyle changes such as dietary changes (Figure 2). Even though the risk factor reduction has been remarkable, at the population level some of the risk factors are still relatively high compared to other western countries.

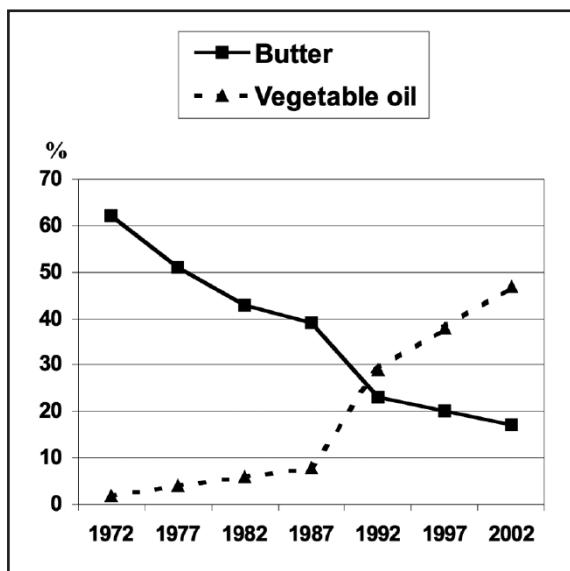
It has been estimated, that until the end of the 1980s, all of the observed mortality decrease was explained by the changes in the main risk factors [6]. In the past 15 years, mortality has decreased beyond the initial predictions, based on risk factor changes. Reduction of the main risk factors, smoking, serum cholesterol and blood pressure as well as improved treatment for coronary heart disease patients account for 53% and 23% of the total reduction, respectively [7]. Although new

Table 1. Main risk factors in North Karelia between 1972 and 2002 among men and women aged 35-59 years.

Year	Men			Women		
	Smoking (%)	Serum cholesterol (mmol/l)	Blood pressure (mmHg)	Smoking (%)	Serum cholesterol (mmol/l)	Blood pressure (mmHg)
1972	52	6.9	149/92	10	6.8	153/92
1977	44	6.5	143/89	10	6.4	141/86
1982	36	6.3	145/87	15	6.1	141/85
1987	36	6.3	144/88	15	6.0	139/83
1992	32	5.9	142/85	17	5.6	135/80
1997	31	5.7	140/84	16	5.6	133/80
2002	33	5.7	137/83	22	5.5	132/78



**Figure 2. Prevalence of butter and vegetable oil use in cooking among women aged 35-59 years in Finland.**



Data source: The National FINRISK Study

medications and technologies increases the likelihood of morbidity and mortality reduction, the greatest potential for CVD prevention, at population level, lies in primary prevention and the reduction of risk factors. This can be achieved by facilitating and supporting healthy lifestyle changes.

### Why success in North Karelia?

Extensive medical research has given lots of knowledge on the causes and mechanisms of the development of cardiovascular diseases. Much is also known about the principles of the prevention. The difficulty lies in how can the existing knowledge be best applied for effective prevention in real life, both in community settings and nationally. Some lessons can be learned from the long term experiences in North Karelia and its national application.

The content of the programme and characteristics of the interventions have been crucial in achieving substantial results in North Karelia. A fundamental factor of the success in North Karelia was the community based approach that in the start of the project was quite new innovation for chronic diseases. Programmes involving community organization with environmental and policy based measures receive clearly better results than pure educational and individual approaches [8,9].

Community organization means involvement and collaboration with various sectors of the community. Experiences from North Karelia emphasize the important role of primary health care, voluntary organizations, food industry and supermarkets, worksites, schools and local media.

Good understanding of the community and close collaboration, beneficial to both actors, with various organizations are essential elements of successful community intervention programmes. Involvement and continuous dialogue with the people is important for the full participation of the population.

The dose or scale of exposure to the intervention is an important aspect. Many projects have good principles and nice plans but the actual intervention over years in the community remains scarce. To create an intensive intervention with adequate exposure to the intervention is very challenging in community-settings especially when larger communities are in concern.

Resources are usually limited and long term funding sources do not exist. In North Karelia project the various partnerships, involvement of all possible sectors and stakeholders in the community and active and enthusiastic participation of the local population enabled the intensive implementation of the programme. A lot of practical work was carried out over years and clearly touching the people in many ways.

One of the strengths in North Karelia project was dedicated leadership and appropriate institutional basis. The overall national co-ordination has been based at the National Public Health Institute which is under the Ministry of Social Affairs and Health. Links to universities were useful for broadening the scientific work.

Collaboration with national and international experts and with WHO initially helped the North Karelia project when selecting the relevant intermediate objectives and designing the actual intervention programme. Collaboration and support from both the formal community decision-makers and informal opinion leaders became crucial for the successful implementation of the programme.

### From North Karelia to national action

The North Karelia project provides an example of the long-term experience and potential of sustained heart health promotion work. After the early success of the pilot project with significant reductions in both risk factors and CHD mortality, intensive and comprehensive activities were started on the national level. Several major actions such as the national tobacco legislation and nutrition policy took place soon after the establishment and first promising results of the project. For national implications it was important that the project worked in close contact with national health policy makers throughout the programme.

The long term maintenance of the programme is also enhanced if health promotion activities are integrated into the routines of business, government and education [10]. In North Karelia project the close collaboration with food manufacturers and retailers led to several successful innovations and developments. With increasing national interest food industry and business have responded and government has contributed with respective policy changes.

Table 2 shows the major elements of the Finnish national action for successful prevention of cardiovascular diseases. Much of the work was developed or supported by the experiences in North Karelia. The experience emphasizes combining strong and credible leadership with broad collaboration. Also it could be noted that a strong driving force for both policy decisions and involvement of industry was the mobilization of population itself.

### International aspects

The North Karelia project was the first comprehensive community-based programme that was able to demonstrate a positive impact on cardiovascular mortality and morbidity. This was achieved by the alteration of lifestyle factors at a population level and thus resulted in a reduction in the major cardiovascular risk factors. Since its inception, the project has received a great deal of international interest, especially in terms of its methodology and the activities undertaken as well as for the experiences gathered throughout

the programme. Since the early 1980's, North Karelia project international visitors' programmes have been regularly organized in Finland. So far over 2000 international experts have taken part in these seminars.

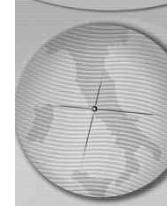
**Table 2. National action in cardiovascular disease prevention in Finland.**

<b>Major elements of Finnish National Action in cardiovascular disease prevention</b>
1. Research and international research collaboration
2. Health services (especially primary health care)
3. North Karelia project and other demonstration programmes
4. Health promotion programmes (coalitions, NGOs, collaboration with media)
5. Schools, educational institutions
6. Collaboration with industry and business
7. Policy decisions, intersectoral collaboration, legislation
8. Health monitoring system: health behaviour, risk factors, nutrition, morbidity, mortality
9. International collaboration

The experiences gathered during the North Karelia project have been widely used by international networks working on chronic disease prevention, for example, the WHO/EURO CINDI programme. Such networks, as well as sharing their experiences in international conferences and meetings, have gone on to create similar applications of the programme in their various countries. For example, in Isfahan in Iran, the Isfahan Healthy Heart Program has been running intensively since the 1990's, after which many similar programmes such as the Alberta Heart Health Project in Canada and the Heart of Mersey in Liverpool, in the UK have been established.

### Conclusions

The North Karelia project in Finland has shown that well-planned, theory based and intensive community-based programmes can have a substantial impact on the lifestyle and risk factors of a population. Furthermore, these changes were very rapidly reflected in the incidence of cardiovascular disease and, later on, in cancer rates. As a major demonstration project the North Karelia project has contributed greatly to the development of a national programme. The decline in CHD mortality, seen in Finland during the past decades, is the most rapid in the world and the overall health of the adult population in the country has markedly improved. Thus the project clearly demonstrates the great potential of population-based prevention programmes, the cost-effectiveness of major public health improvements, while supporting the principles of WHO strategies for the promotion and control of chronic non-communicable diseases [11, 12].


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