

# Background, Principles, Implementation, and General Experiences of the North Karelia Project



Pekka Puska\*, Erkki Vartiainen\*, Aulikki Nissinen\*, Tiina Laatikainen<sup>†,‡,§</sup>, Pekka Jousilahti\*  
Helsinki, Kuopio, and Joensuu, Finland

## ABSTRACT

The extremely high mortality of cardiovascular diseases in the 1960s in Finland, particularly in the Eastern Province of North Karelia and especially that of coronary heart disease in men, caused great concern among the local population. Action to reduce the problem was demanded in a petition signed in 1971 by the representatives of the population. In response, the North Karelia Project was launched in 1972 to carry out a comprehensive preventive project, first only in North Karelia as a national pilot (1972 to 1977), and thereafter continuing in North Karelia but at the same time transferring the experiences to a national level. The intervention was based on the at-that-time relatively new scientific information on the main causal risk factors. A comprehensive population-based intervention was carried out, aiming especially at the reduction of the high levels of serum cholesterol, blood pressure, and tobacco use, emphasizing general dietary changes and smoking reduction. A comprehensive monitoring and evaluation program was designed and implemented to learn from the experience in preparation for national and international use. Presented here are the background, principles, and general experiences of this project, which has made major contributions both to the contemporary public health work for the prevention and control of heart disease and noncommunicable diseases and for research in the area.

Rates of cardiovascular diseases (CVD), especially those of coronary heart disease (CHD) and some other chronic noncommunicable diseases (NCD), started to increase after World War II in most Western countries, such as the U.S. and Finland. Finland was hit so hard that by the late 1960s, Finnish men had the highest mortality rates of CHD in the world. This, together with high rates of some other NCDs, like lung cancer, was reflected in the very bad public health situation and relatively low life expectancy. Finland was, at that time, after the difficult years of war and the post-war constraints, still a relatively poor country.

At that time, CVDs and NCDs in general were usually seen as “degenerative diseases” of ageing. However, active international research and studies like the Seven Countries Study and the Framingham Study started to draw attention to possible causal risk factors [1,2]. The risk factors emerging were especially high blood cholesterol, high blood pressure, and smoking. Unlike the causality axis for communicable diseases, these factors are strongly related to certain behaviors, especially to diet and tobacco use.

In Finland, the highest CVD mortality rates were in the easternmost province of North Karelia. Statistics about this were published in the newspapers, matching people’s own observations of many relatively young men dying of myocardial infarction. This all increased the awareness and general concern of the big problem. In January 1971, the governor of North Karelia, a powerful politician, convened

a landmark meeting of the local members of Parliament and many other representatives of the North Karelian population to discuss the problem. The meeting members signed a petition addressed to national authorities urgently asking the government to take action by starting a program to reduce the huge disease burden.

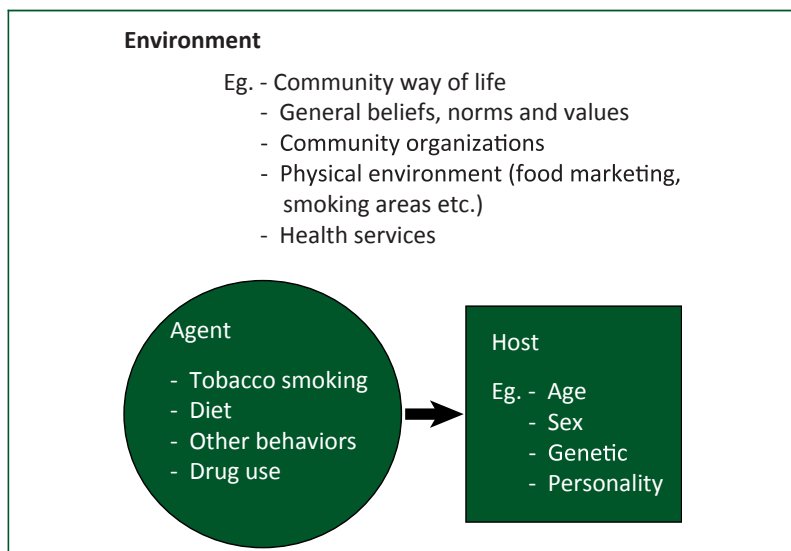
After this, the Finnish Heart Association set up a planning group with several Finnish experts, and contacts were established with the World Health Organization (WHO). With the emerging results of the epidemiological studies, the idea grew that something could probably be done to change the situation. In a large planning seminar in September 1971, the main principles of the North Karelia Project were outlined and further steps recommended.

During the planning stage it was quite obvious that any major control of CVDs in North Karelia would be largely dependent on the possibilities of primary prevention. Findings of the previously mentioned epidemiological studies had already suggested the causal role of certain risk factors, thus opening the possibility for prevention. While several trials were planned to “prove the causality,” the problem of randomly allocating thousands of people in the community to change or not change their lifestyle for years became obvious. Many pointed out that the risk factors were very closely linked with community lifestyles and that the target of the intervention should be the whole

The authors report no relationships that could be construed as a conflict of interest.

From the \*Department of Health, National Institute for Health and Welfare (THL), Helsinki, Finland; †National Institute for Health and Welfare, Chronic Disease Prevention Unit, Helsinki, Finland; ‡University of Eastern Finland, Institute of Public Health and Clinical Nutrition, Kuopio, Finland; and the §Hospital District of North Karelia, Joensuu, Finland. Correspondence: P. Puska (Pekka.Puska@thl.fi).

GLOBAL HEART  
© 2016 World Heart Federation (Geneva). Published by Elsevier Ltd. All rights reserved.  
VOL. 11, NO. 2, 2016  
ISSN 2211-8160/\$36.00  
<http://dx.doi.org/10.1016/j.jheart.2016.04.010>



**FIGURE 1. Classical agent – host – environment model as applied to chronic noncommunicable diseases.**

community. This was clearly relevant for North Karelia, where the level of the risk factors was generally very high and related to the generally unhealthy diet and commonness of smoking.

These considerations, combined with the historical background, guided the adoption of a community-based strategy. The central task became to shift the risk-factor profile of the entire North Karelian population through community-based comprehensive intervention influencing general lifestyles. The reasoning behind this was that merely intervening on clinically high levels of risk factors would have only a limited population effect and also, the risk-related lifestyles were features of the social and physical features of the community.

The community-based approach that was adopted is actually similar to what is nowadays often called the “ecological approach.” A reference can also be made to the classical concept in public health: host – agent – environment. In CVD and NCD prevention, there is much emphasis on the link between the risk factors and human disease (agent – host). Only recently has there been more emphasis on the environment and policies to change them. [Figure 1](#) shows the classical agent – host – environment model, as applied to NCDs.

### THE PROJECT OUTLINE AND MAIN PRINCIPLES

After the planning seminar and after further preparatory work, the project activities were started in 1972. In January 1972, a large baseline survey was launched in North Karelia and in its matched reference area. Large representative population samples were involved, with carefully standardized methods. The survey was completed in April 1972,

by which time more detailed plans for the intervention were ready. On World Health Day, April 7, 1972, the intervention was started and several monitoring systems were activated.

The original project was planned for 5 years (1972 to 1977). After this period, the experience and many results of this “national pilot project” looked favorable, but it was felt important to continue. However, at the same time, the North Karelian experience was starting to be transferred to the national level. North Karelia thus became a “demonstration project” for national applications.

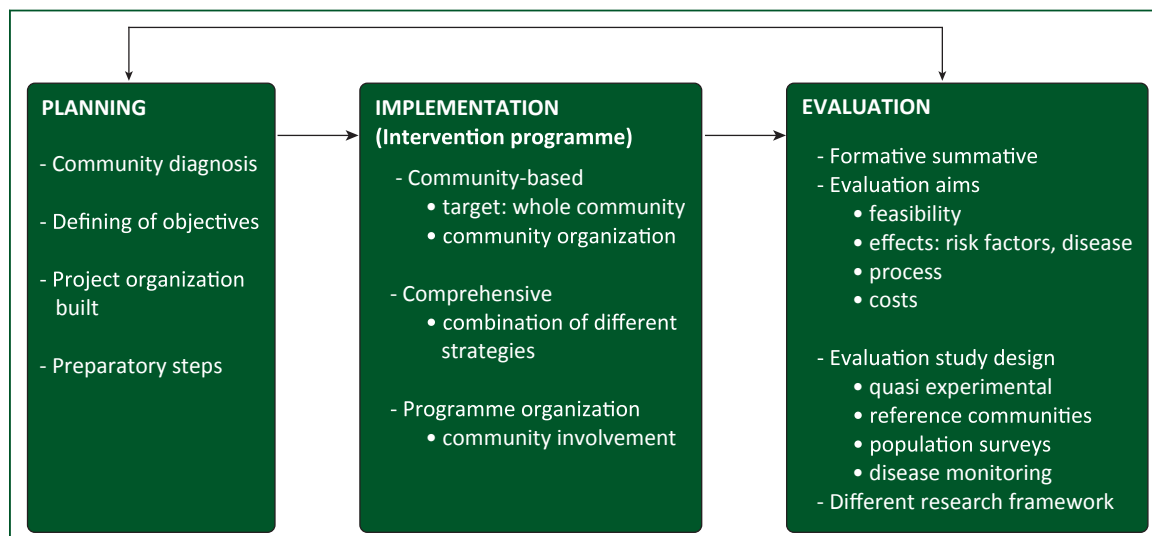
In 1997, after 25 years, having witnessed huge favorable changes in the CVD and NCD rates and in the general public health situation in North Karelia, the project as a formal entity was stopped. The work in North Karelia has of course continued, coordinated by the North Karelian Center for Public Health, with the national promotion and monitoring continued and strengthened by the National Institute for Health and Welfare (THL).

The main aim of the North Karelia Project was, in accordance with the petition, to carry out a program to reduce the burden of CVDs, and later, more generally, NCDs. It was obviously recognized that the project team did not claim to fully understand what caused the high rates of CHD and CVD in North Karelia and in Finland, but doing nothing was not an option. Results from epidemiological studies had shown the obvious role of some risk factors.

This information matched with the local situation: the prevalence of the emerging risk factors was very high in the area. Smoking among men was very common, and the general serum cholesterol level was extremely high due to very high intake of saturated dairy fat. Thus, the essence of the project was to target these risk factors in the population, to see if the prevalence could be reduced, and if so, to see how much that would reduce disease rates.

There was also special attention paid to the large group of people with special high risk: persons with high blood pressure and with previous myocardial infarction or stroke. Registration and follow-up of >15,000 hypertensives was organized in the local health centers, and secondary prevention groups were run for heart disease patients. These were visible practical activities in local communities and “prevention entry points” for the health services. The idea was that patients, often talking about their diseases, would spread information on the risk factors in their neighborhood.

The community-based approach that was adopted meant that that in an attempt to change risk-related behaviors and lifestyles in the community, the project worked with all sectors of the North Karelian community and also tried to gain national support and changes, especially after 1977. Thus, the project applied the principles of intersectoral work and “Health in All Policies” [3]. It should also be noted that the community approach used in the North Karelia Project meant that the project itself did



**FIGURE 2. The major elements in a community-based project, as applied in the North Karelia Project.**

not do the intervention. The role of the project was to show the way, to catalyze, to coordinate, to assist, to give feedback, and to evaluate.

The different elements of the project, from planning to implementation and evaluation, are shown in Figure 2, although it should be emphasized that, especially with the continuation, the work with different elements took place continuously.

### BEHAVIORAL AND SOCIAL FRAMEWORK

When the aim of the intervention was to change certain lifestyles in the community, that task entered the realm of behavioral and social sciences. Numerous studies and practical experience show that merely informing people about the need to change their lifestyles is not enough. Behaviors are deeply embedded in the social and physical environments.

A persistent and major problem here is the lack of unifying theory to serve as a guide. However, there are and were already during the project's implementation sound principles in behavioral and social sciences to guide the way in planning, implementing, and evaluating a community-based health program. Several North Karelia Project articles and the monograph describe 4 theoretical and somewhat overlapping frameworks for behavioral change, often used and referred to in the project [4,5]:

- Behavior change approach,
- Communication-behavior change approach,
- Innovation-diffusion approach, and
- Community organization/social policy approach.

These approaches were merged in a unified model shown in Figure 3. In this model, the external input from the project affects the community via mass media communication to the population, amplified through

interpersonal communication and practical activities. The message is especially transferred to people through formal and informal opinion leaders.

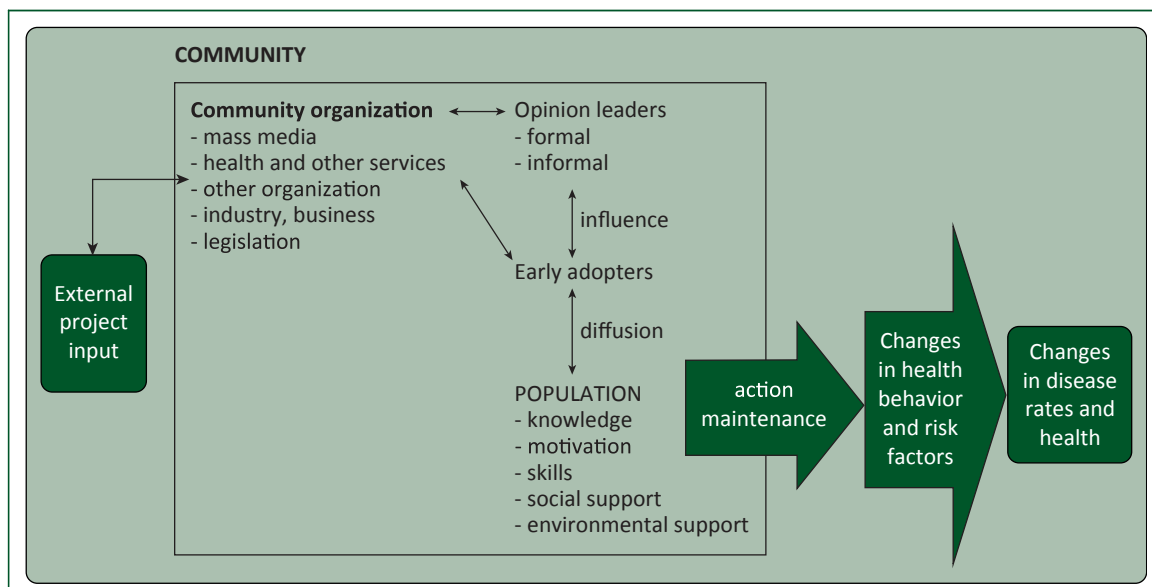
This 2-pronged emphasis aimed to spread and expand knowledge, to persuade, to teach practical skills, and to provide the necessary social and environmental support for the change and maintenance of the new healthy habits in the population. The acquisition and maintenance of the new behaviors ultimately resulted in more favorable risk factor profile, reduced disease rates, and improved health of the population.

### EVALUATION

A comprehensive evaluation was planned and implemented to learn about the experience for national and also international use. The evaluation framework was divided into summative and formative evaluations. With many of the activities, various forms of formative evaluation was built in, which is also reported in many publications.

The summative evaluation was carried out over given periods of time via large population surveys. Because the original project period was 5 years, the first summative evaluation covered the period from 1972 to 1977 [6]. Thereafter, major population surveys have been implemented at 5-year intervals. The surveys have used independent, cross-sectional population samples. During the early years, these large population surveys were carried out in North Karelia and the "matched reference area" for the evaluation of the project. Later, other areas of Finland were included, and the activity has been developed into a national health monitoring system, carried out by THL.

In addition, the evaluation has used other data sources, especially national mortality data, special CVD registers (WHO MONICA [Multinational Monitoring of Trends and Determinants in Cardiovascular Disease]), and the national



**FIGURE 3. The community intervention model of the North Karelia Project.**

cancer register. In addition, national disability data and national hospital discharge data, etc., have been used. Very important both for the evaluation and the intervention have been the rapid health behavior surveys carried out twice a year in North Karelia and, since 1978, annually in all of Finland.

The evaluation, methods, and material have been described in numerous journal articles and the main reports of the project [5,6].

### RESULTS AND GENERAL EXPERIENCES

The very rich and comprehensive preventive work that was carried out and also developed over the years in North Karelia, following the above described principles, and the results of the North Karelia Project have been presented and discussed in numerous articles and reports on the project, including in this issue of *Global Heart*.

The evaluation showed that already during the initial 5-year period of the North Karelia Project, major favorable changes were observed in dietary habits, hypertension control, and smoking. These changes were significantly greater than in the reference area. These changes and the associated changes in serum cholesterol and blood pressure levels of the population continued after 1977 in North Karelia, whereas with increased national action, major changes also started to take place in all of Finland. Table 1 shows the changes in the population levels of the target risk factors in North Karelia from 1972 to 2012, based on the surveys.

The original main objective of the North Karelia Project was the reduction of the extremely high CHD mortality. This did, indeed, take place, associated with the population risk factor changes. In 35 years, the annual

age-adjusted CHD mortality rate among the 35- to 64-year-old male population in North Karelia declined 85%. Similar reduction was noted for CVD mortality as a whole and all-cause mortality among both sexes. Simultaneously, a big reduction also took place in cancer mortality among men, mainly due to reduction in lung cancer mortality.

The experience clearly showed that this kind of comprehensive and theory-based intervention in North Karelia had within 5 years already led to major favorable changes in risk-related lifestyles and biological risk factors. Of great importance is the observation that the risk factor changes were rapidly associated with major favorable improvements in the CVD and NCD situation in the area. Thus, with chronic diseases and the adult population, it is possible to achieve major results in a relatively short time.

The target changes during the original project period took place specifically in North Karelia. During the continuation, the changes continued there, but similar changes also took place in the rest of Finland. This is actually in accordance with the original aim of the project, i.e., for North Karelia to be a demonstration leading the way for all Finland. The trend in age-adjusted CHD mortality among men aged 35 to 64 years in North Karelia and in all Finland can be observed in Figure 4.

The experiences of the project and Finland show the great potential of population-based prevention. An example is the calculation that in 2006, compared with the annual numbers in 1969 to 1971, there were 4,478 fewer deaths in all of Finland and 370 fewer deaths in North Karelia among men aged 35 to 74 years, in spite of the fact that the age structure over the years had markedly shifted so that the number of older people had much increased. For women aged 35 to 74 years, there were 4,4476 fewer deaths in all of Finland and 245 fewer deaths in North

**TABLE 1.** Main risk factors in North Karelia between 1972 and 2012 (men and women aged 30 to 59 years)

Year	Men			Women		
	Smoking (%)*	Serum Cholesterol (mmol/l)	Blood Pressure (mm Hg)	Smoking (%)*	Serum Cholesterol (mmol/l)	Blood Pressure (mm Hg)
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	5.6	137/83	22	5.4	132/78
2007	31	5.4	138/83	18	5.2	134/78
2012	27	5.5	135/84	23	5.4	129/79

\*Smoking by Finnish criteria. Gives higher rates than daily smoking.

Karelia. More than 80% of this reduction was due to decline in CVD deaths.

Another example is the calculation that if the CVD mortality rates had stayed at the pre-program level (1969 to 1971), in 2006, with the current age structure, there would have been 14,000 more CVD deaths in Finland in the age group 35 to 74 years. Almost one-half of that would have been among persons younger than 65 years of age. The life expectancy at birth rose in Finland from 66.4/74.6 years (males/females) in 1971 to 75.8/82.8 years, and in North Karelia from 64/72 years to 75/81 years.

It should be noted that the reduction in CVD mortality was predominantly due to reduction in incidence. The short-term case fatality changed relatively little, although there was major improvement in clinical treatment. Analyses, also reported in this issue, show how the observed reductions in population risk factor levels can explain most of the decline in CHD mortality. Of the single risk factors, the reduction in serum cholesterol level in the population had the greatest impact. This indicates how most of the decline in CVD and cancer rates has likely been due to reduction in risk factors, i.e., due to primary prevention, although improvements in therapy have also contributed.

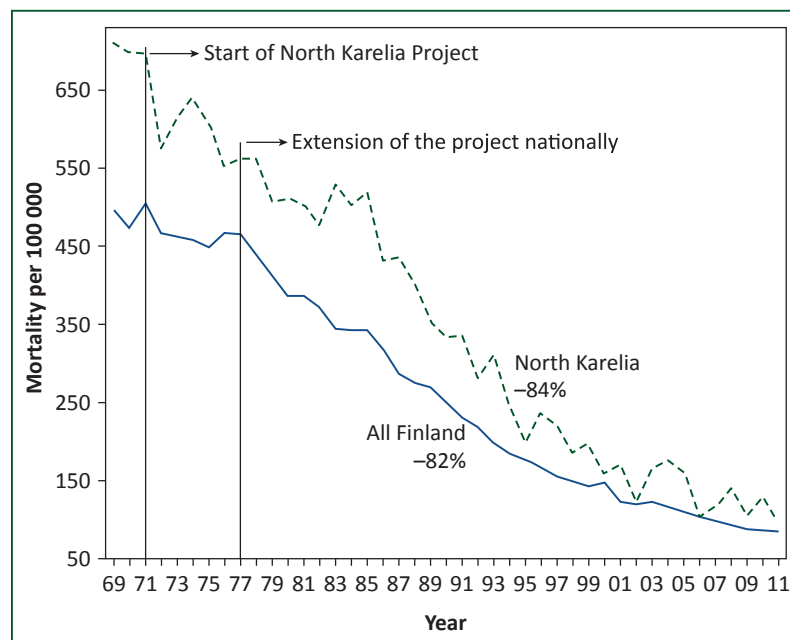
## DISCUSSION

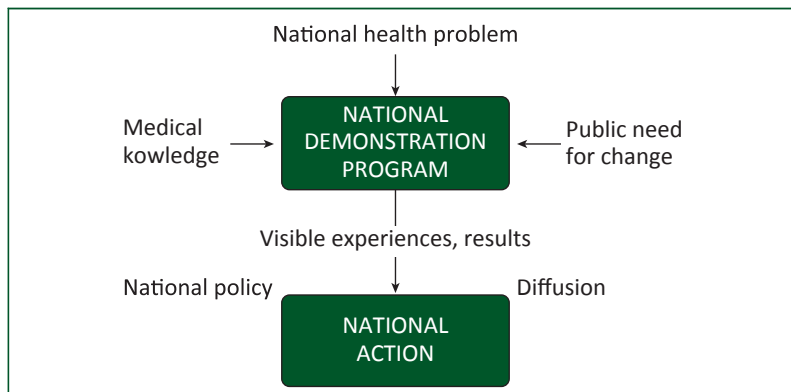
During the start of the project there was fairly little knowledge and experience about the possibilities for CVD prevention. In spite of that, the young and dedicated project team had a strong belief that some reduction of the high CVD rates in North Karelia could be possible. The team relied on the evidence from the early epidemiological studies.

Professor Martti Karvonen, in his speech on National Heart Day in 1970 in Joensuu, said that the heart disease rate could be halved by elimination of the known risk factors. Now, some 35 years later, the annual CHD mortality rate among the working-age population is 85% lower! We believe that CHD and stroke are approached too late in life as preventable diseases.

The North Karelia Project has undoubtedly led the way for improved public health in Finland and also contributed greatly to the international work in CVD and NCD prevention and health promotion, as also described in this issue of *Global Heart*. An important question is how experiences from a demonstration area are transferred to the national level. The North Karelia experience is that this does not take place through an administrative decision but is a gradual process of diffusion of the innovations over the years. It involves much media interest and coverage, but also contribution to health policy decisions during various planning phases (Fig. 5).

The project results also gave strong support to the idea that population-based CVD and NCD prevention is the

**FIGURE 4.** Age-adjusted coronary heart disease mortality rates of men aged 36 to 64 years in North Karelia and all of Finland in 1969 to 2011.



**FIGURE 5. Moving from a pilot/demonstration program to national action, as in the North Karelia Project.**

most cost-effective way for the control of these diseases and for major public health improvements. Influencing risk-related lifestyles through comprehensive health promotion and policies is a cheap and sustainable way to improve public health; a message of relevance especially to the developing countries with great economic constraints. Influencing environments conducive for healthier lifestyles is also important for benefiting all population groups and reducing health inequities. It should be emphasized that especially during the early years of the North Karelia Project, the community was relatively poor and the project work was quite inexpensive, comprising community organization activities.

A common misunderstanding is that the work in North Karelia was easy, and other countries face much greater problems. In fact, in the 1970s, the evidence base was much weaker than now, the cardiology community was skeptical, the area was of low socioeconomic level and relatively poor, and North Karelia was a dairy farming area resistant to reduction in the use of dairy products. Of course there were advantages: the awareness of the problem, the need to do something, and good community organization. At the end of the day, the critical issues for success were correct theory base, comprehensive work with the population, and much hard work in the community.

Several North Karelia Project publications have listed more specific factors in the project intervention that the team has felt were of importance for the success [5]. They include the following:

- appropriate theory-base,
- flexible intervention,

- intensive intervention in the field,
- working with the population,
- community organization,
- official authority,
- work with health services,
- limited targets and outcome orientation,
- bottom-up and top-down,
- monitoring and feed-back, and
- focus on North Karelia then the national level.

It should be noted that in spite of the excellent results and the great health improvement in North Karelia and in Finland, there is still much work to be done. The CVD situation 40 years ago was so poor that there is still a lot of room for improvement. Although rates of tobacco use are among the lowest in Europe, some 15% of adults still smoke daily. Diets can be improved and daily physical activity can be much increased.

Experience has shown that positive developments cannot be taken for granted. Ongoing support is needed from experts, policy makers, and the public. At the same time, progress in any country is increasingly dependent on international development. Therefore, it is of vital importance that preventive work led by the WHO is taken up by all countries and also supported by non-governmental organizations worldwide.

The North Karelia experience from epidemiology to public health action is a powerful demonstration of how the epidemic of CVDs, and more generally of major NCDs, can be much reduced when the population risk factors and determinants change. Population-based prevention through changes in lifestyles and environments is, indeed, the most cost effective and sustainable way of controlling the contemporary big epidemic of CVDs and of improving health. In the current global situation, this is a powerful lesson.

## REFERENCES

1. Keys A. *Coronary heart disease in seven countries*. New York: American Heart Association, Monograph No. 29, 1970.
2. Dawber TR, Moore FE, Mann GV. *Coronary heart disease in the Framingham Study*. *Am Pub Health Nations Health* 1957;47:4–24.
3. Puska P, Ståhl T. *Health in all policies – the Finnish initiative: background, principle, and current issues*. *Annu Rev Public Health* 2010;31: 315–28.
4. Puska P, Nissinen A, Tuomilehto J, et al. *The community-based strategy to prevent coronary heart disease: conclusions from the ten years of the North Karelia Project*. *Ann Rev Publ* 1985;6:147–93.
5. Puska P, Vartiainen E, Laatikainen T, Jousilahti J, Paavola M, editors. *The North Karelia Project: From North Karelia to National Action*. Helsinki: Helsinki University Printing House, 2009.
6. Puska P, Tuomilehto J, Salonen J, et al. *Community control of cardiovascular diseases. The North Karelia Project*. The Regional Office for Europe. Copenhagen: World Health Organization, 1981.