

# Community intervention programs to prevent cardiovascular disease

## *SBU Summary and Conclusions*

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### **Introduction**

The prevention of disease is a mission of major importance to society and the individual. The SBU report Longer Life and Better Health presents various examples of interventions that have successfully prevented disease and injury.

Cardiovascular diseases, primarily myocardial infarction and stroke, are the primary causes of morbidity and mortality in western nations, including Sweden. To assess the scientific knowledge about the effects of population-based (community intervention) programs to prevent cardiovascular disease, SBU and Sweden's National Institute of Public Health collaborated in the following review. This review of the scientific literature has been limited to:

- a) projects which focus on entire populations,
- b) projects that address multiple risk factors concurrently,
- c) programs that compare the effects of interventions with trends in a control population, and where the results have been published in the scientific literature,
- d) prevention programs directed at individuals without earlier cardiovascular disease (primary prevention). Hence, this report does not include prevention programs directed at individuals who previously experienced symptoms of cardiovascular disease (secondary prevention).

As part of this assessment project, SBU and the National Institute of Public Health arranged a seminar with researchers who actively participated in several of the large community intervention programs. The seminar revealed no new information that would alter the findings, and the participating researchers agreed with the main thrust of the conclusions.

### **Cardiovascular diseases and their risk factors**

Myocardial infarction and stroke represent the most common diseases of the heart and vessels. Myocardial infarction and angina pectoris are both expressions of coronary heart disease. Myocardial infarction usually occurs when blood flow to the arteries that supply the heart itself – the coronary arteries – become constricted or completely blocked by plaque or blood clots.

Formation of blood clots in the arteries supplying the brain is the most common reason for stroke. Stroke may result from clots that form in the brain itself, or clots that form in the heart, aorta, or arteries of the neck, which break loose and flow to the brain. Slightly over 10% of stroke cases result from cerebral hemorrhage.

Mortality from cardiovascular disease has declined in western nations in recent decades – in Sweden by approximately 30%. The most important reason for this decline is the improved survival rate among victims of myocardial infarction or stroke.

To prevent disease one must understand its causes. An example would be certain types of infectious diseases, the history of which shows how medicine (vaccinations) and community intervention (improved hygiene and nutrition) have effectively contributed toward preventing disease.

The causes of cardiovascular diseases are only partially understood, and involve the complex interaction between heredity and environment, where both harmful and protective factors interact. Over 200 potential risk factors for cardiovascular diseases have been identified. These risk factors are more thoroughly surveyed in males than in females.

Risk factors which cannot be influenced include old age, male gender, and inherited susceptibility to myocardial infarction and stroke. The most important of the risk factors which can be influenced include smoking, cholesterol-related disorders, and high blood pressure. The risk for disease onset is greatest when a combination of these risk factors are present. Convincing scientific evidence shows that the risks for myocardial infarction and stroke decline when blood pressure and cholesterol levels are reduced and when one stops smoking.

Other factors associated with an increased risk for cardiovascular disease include diabetes, obesity, and deficient physical activity. Research in recent decades has also shown that social factors play a major role in the risk for myocardial infarction and stroke.

Risk factor levels in the Swedish population have improved since the early 1970s. Blood pressure and cholesterol levels have declined in both sexes. The percentage of men who smoke has steadily declined while smoking has increased among poorly educated, young and middle-aged women.

Since many of the risk factors depend somewhat on life style and health behavior, an obvious strategy has involved attempts to prevent cardiovascular disease through programs aimed at changing life style.

## **Scope of the problem**

Annually in Sweden, approximately 40 000 people suffer a myocardial infarction and approximately 35 000 suffer a stroke. Mortality from myocardial infarction is high - more than one third die early in the course, and of those who survive, many suffer chronic heart failure or angina. Stroke results in severe disability due to paralyses,

speech disorders, etc. No other physical disease requires more beds in Swedish hospitals and nursing homes. Myocardial infarction is the most common, and stroke is the third most common cause of death in Sweden (cancer is in second place). Hence, any opportunity to prevent these diseases should be taken.

## **Population based prevention**

Most healthcare resources are expended on individuals who have already been affected by disease. However, community based intervention programs attempt to reach an entire population with preventive activities. The most common activities involve various forms of information and education (ie, information on risk factors and how they might be avoided or altered), and other measures such as legislation (eg, prohibiting tobacco sales to minors) or taxes (eg, on alcohol and tobacco). At the community level, interventions may be targeted at influencing opinion leaders, engaging voluntary associations, or influencing supermarkets, restaurants, schools, and the workplace.

Cardiovascular disease prevention programs in the community are often directed toward changing lifestyle factors. Many people may be on the threshold of disease but still feel healthy, eg, they may have preliminary signs of diabetes, genetic blood lipid disorders, or elevated blood pressure. A problem associated with prevention is that individuals often do not experience the symptoms of disease and, hence, may have little motivation to change their life style.

Also, not everyone in a population benefits equally from preventive interventions. On one hand, it appears that the benefits of preventive interventions are greatest if particularly exposed individuals with multiple risk factors can be reached. On the other hand, others argue that the greatest benefits are achieved by changing the risk factor patterns in the entire population. Although individuals with multiple risk factors are more often affected by myocardial infarction and stroke, they are relatively few in number. Consequently, preventive interventions directed only toward this group have a relatively minor influence on the total number of cases in the population. Rather, most of those affected are found in the large group with moderate changes in risk factors. Assuming this, a reduction in blood pressure and cholesterol levels across the entire population, and reducing the percentage of smokers would constitute the most important interventions for preventing cardiovascular disease in the greatest number of individuals. Such a "massstrategy" is rooted in the assumption that the relation between risk factors and the risk of disease is continuous. This assumption provides the foundation for the community intervention programs aimed at preventing cardiovascular disease.

## **Community intervention projects**

Since the 1970s, numerous prevention programs have targeted entire populations. Most of these projects combine health promotion activities directed at the entire population with individually targeted activities to identify and treat high-risk individuals.

This report reviews only those community intervention programs which have:

- targeted multiple risk factors concurrently,
- monitored changes in risk factors, morbidity, and mortality in both the population targeted for prevention and in a comparable control population,
- published the results in scientific journals.

Of the many projects which have been initiated in recent decades, only eight meet the inclusion criteria. These eight projects have monitored changes in risk factor levels over time. Only one project presented morbidity data, and two projects presented mortality data.

The most well known project in the Nordic countries is the North Karelia Project, which started in 1972. Since then, mortality from cardiovascular disease declined approximately as much in North Karelia as in the remainder of Finland. This declining trend began before the North Karelia project was launched. It is doubtful whether any significant effects can be attributed to the project.

A concurrent project in the United States, the Stanford Three Community Study, lasted only 2 years. During the short life of the project, risk factor levels declined in both communities where the program was implemented, while the levels changed only slightly in the control population.

A Swiss project, the Swiss National Research Program, reported fewer smokers, but the cholesterol levels did not differ in the control communities, and body weight increased in the intervention communities. In this project, population based preventive interventions were implemented with low to moderate intensity. A large German project, the German Cardiovascular Prevention Study, reported small improvements related to risk factors. An Irish project, the Kilkenny Health Project, found increases in diastolic blood pressure and blood cholesterol levels among males in the intervention area. The scientific designs of these three studies make them difficult to evaluate.

The 1980s witnessed the start of three large projects in the United States. The Stanford Five City Project suggests that a supportive environment, where non-smoking is the norm, can reduce smoking in the population. The findings, however, rely on repeated examination of all participants, a factor which may enhance their tendency to stop smoking. The Pawtucket Heart Health Program reported no substantial effects. The authors themselves conclude that the results provide little support for the hypothesis that community interventions— whether they be at the individual, group, or organizational, or community levels — lead to the kind of lifestyle changes that influence risk factors.

The most comprehensive of the three U.S. projects during the 1980s was the Minnesota Heart Health Program. This project also was unable to report any statistically significant effects. The project is the only one which analyzed the effects of both morbidity and mortality from cardiovascular disease. A reduction in coronary heart disease was

reported. This decline was the same in the control communities as in the intervention communities. The incidence of stroke remained unchanged in both areas.

A smaller, Swedish community intervention project was implemented in an area with a particularly high incidence of cardiovascular disease (Norsjö in Västerbotten County). Preliminary analysis of the data reflect a sharper decline in cholesterol levels in Norsjö than in the control area. However, the results have not been published, and therefore the Norsjö project does not meet the inclusion criteria for this review.

Also reviewed were school- and workplace-based projects where prevention efforts were aimed at multiple risk factors concurrently. The school-based programs demonstrate a potential to influence risk factors, provided the programs are intensive and long-term.

The scientific quality of the workplace-based intervention studies has been consistently weak. Nevertheless, it appears that interventions which address smoking are those that have the greatest impact.

Health services-based intervention programs aimed at cardiovascular disease, including several Swedish projects in the primary care services, were surveyed. Favorable trends in risk factor levels were consistently reported, at least in the short-term. Generally, the projects did not include comparison populations. Hence, the net effects of the programs could not be assessed.

Despite increasing evidence suggesting the impact of psychosocial factors on cardiovascular morbidity and mortality, these factors were not addressed in most of the community intervention projects.

A thorough economic analysis of the eight projects which met the inclusion criteria is not feasible. Only two projects – the Minnesota Heart Health Project and the North Karelia Project – provided information that would allow a rough estimate of costs. Since none of the projects were able to show a significant difference in morbidity or mortality from cardiovascular disease compared to the control populations, it would not be meaningful to express the results in terms of cost effectiveness. The cost of the Minnesota Program was estimated to at approximately 40 million Swedish kronor (SEK) for a 5-year project in a community of 50 000 inhabitants (converted to current monetary value). The direct project costs of the North Karelia Project from 1971 through 1979 were estimated at 5 million SEK (not adjusted to current monetary value).

Despite the ambitious efforts of the large community intervention projects, the reported outcomes have been negligible. The scientific ideals of clinical intervention studies (where subjects are randomly assigned to intervention and control groups) are not easily applied to community based projects. When investigating entire communities, rather than individuals, the conditions for statistical analysis become less favorable. Basically, there are no satisfactory scientific methods for analyzing population studies of this type. Even overlooking the problems in statistical methodology, the differences between the intervention and control areas have been minor, without showing conclusive benefits from the community intervention programs.

Information concerning the type and intensity of the interventions is often deficient, representing a weakness in the projects which have been assessed. The major variations in reporting make it difficult to systematically analyze the effects of community intervention programs generally.

A possible explanation for the declining trends in risk factor levels found in the control populations of several studies could be that information was transmitted from the project intervention areas to the control areas. However, it should also be noted that these trends were already under way when many of the projects started.

## **Conclusion and recommendations**

The following literature review does not question the negative role played by smoking, high blood pressure, unhealthy diet, lack of exercise, and social factors in the occurrence of myocardial infarction and stroke. However, there is no conclusive scientific evidence that would support starting new, large-scale community intervention programs - such as those assessed here- aimed at preventing cardiovascular disease. The eight large community intervention projects reviewed in this report have not demonstrated any significant effects on risk factor levels or disease incidence beyond those observed in population at large. Although favorable changes in cardiovascular risk factors - and in some projects even reduced mortality rates - were observed in intervention areas, simo the brain. Slightly over 10% of stroke cases result from cerebral hemorrhage.

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Numerous projects aimed at preventing cardiovascular disease are underway in Sweden. They are seldom designed to facilitate an appraisal of their results. Scientific expertise within these projects must be strengthened to permit full assessment of the outcomes and avoid misinterpretation.

The SBU review reveals deficiencies in the stringency of assessment and illustrates a major need for methodology development. This applies to assessment of both the process and outcome of community intervention programs. Not least, the social processes that make it possible to impact on the major public health diseases need to be analyzed.

The following literature review addresses the methods used by the major projects from the 1970s and 1980s to impact on cardiovascular disease via large community intervention programs. It is important to attempt to prevent disease, based on the scientific evidence. The experiences gained from the population studies reviewed here may provide a basis for conducting less comprehensive and more focused studies of how cardiovascular disease can best be prevented in the population.

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