

# Life style intervention in primary care and aspects on stroke prevention



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Cover illustration: Eleonor Lindgren following the model of Andrea Olivegren

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## ABSTRACT

**Aims:** To describe a self-administered preventive tool dealing with risk factors for cardiovascular disease and its effectiveness to engage persons in need of lifestyle changes. To evaluate the feasibility of implementing a preventive primary care program consisting of a screening tool and a self-administered health profile. To engage motivated individuals in need of lifestyle changes and to evaluate the effects after 1 year. To explore potential effects of physical activity on well-being among women, within a 32- year perspective. To study the incidence of first ever non-fatal and fatal stroke over a 32- year period with focus on stroke subtype, by consolidating endpoints, and associations with risk factors.

**Method:** A model for structured preventive work in primary care was developed and tested at a public primary care center (PCC). The model included a screening questionnaire offered to consecutive patients between 18-65 years of age followed by a self-administered health profile and follow- up. Subsequently, an intervention study was implemented in eight PCCs. Patients aged 18-79 years were presented with the tool, and then offered a health profile, a blood pressure (BP) and blood glucose check and a health dialogue. Main outcome measures were motivation level and change of lifestyle factors and BP, p-glucose, and body mass index (BMI) at 1-year follow-up. In the Population Study of Women in Gothenburg (PSWG) with 1 462 women, cross-sectional and prospective analyses were conducted concerning physical activity and well-being. In PSWG, main types of first-ever stroke and fatal stroke were identified and validated. Association with stroke and selected risk factors at baseline (smoking, physical inactivity, BMI, waist hip ratio (WHR), BP, perceived mental stress and low education) was tested. Association with atrial fibrillation (AF), diabetes, myocardial infarction and baseline hypertension was studied as survival time free from stroke.

**Results:** Subjects with less favorable lifestyle and higher motivation chose to participate. Good agreement was seen between screening tool and grading in the basal health profile (I). At 1-year follow- up significant reductions in BMI, WHR, waist circumference, BP and p-glucose were observed (II). Cross sectional analyses revealed strong associations between level of physical activity and well-being. Similar associations were observed when relating physical activity level at baseline to subsequent well-being after 12, 24 and 32- years. Changes in the individual's physical activity level and simultaneous changes in experience of well-being were correlated (III). Follow-up yielded 184 (12.6%) cases of first ever stroke, 18% of them fatal. The validation process reduced unspecified stroke diagnosis from 37% to 11%. Significant association with ischemic stroke was seen for high BMI, smoking and low education. Survival analysis showed significant higher risk of stroke in contemporary diabetes, atrial fibrillation and baseline hypertension but not myocardial infarction. (IV).

**Conclusions:** A pedagogic model engaging motivated individuals was feasible to implement in ordinary primary care. Several risk factors were significantly improved after one year suggesting applicability in lifestyle modification.

Strong associations were seen between physical activity level and reported well-being, both cross-sectionally and prospectively. Increased physical activity in sedentary individuals appears to promote perceived health and well-being. By specifying diagnoses

32-year stroke data quality was improved. Low education was associated with ischemic stroke. Smoking, obesity, atrial fibrillation, diabetes and hypertension were associated with higher stroke risk.

**Keywords:** Life style, prevention, promotion, risk factors, primary health care, health profile, public health, self-reported health, wellbeing, stroke, incidence, women.

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# SAMMANFATTNING PÅ SVENSKA

**Bakgrund:** Primärvården har en viktig uppgift i att arbeta förebyggande mot sjukdom och främjande för hälsa i mötet med patienten. Livsstilsfaktorer som t.ex. låg fysisk aktivitet, ogynnsamma kostvanor, stress liksom belastad livssituation kan påverka insjuknande i bland annat stroke, hjärtinfarkt och diabetes. Beteendeförändring kan få stora effekter på hälsan. Individerna som söker vården kan vara olika beredd att påbörja sådana. Kan enkla hjälpmedel, som livsstilsfrågor och hälsoprofil, påverka beredskap till förändring? Låg fysisk aktivitet påverkar hälsan men också upplevande av välbefinnande. Stroke är en folksjukdom som kostar mycket lidande för den drabbade och anhöriga utöver en stor samhällskostnad. Att finna metoder för att förebygga folksjukdomar som stroke kan få stor betydelse.

Övergripande syfte med forskningen var att utveckla strategier för främjande och förebyggande arbete i primärvården och att studera effekten av fysisk aktivitetsnivå på upplevt välbefinnande utifrån Kvinnoundersökningen i Göteborg. Syftet var också att i samma studie av kvinnor i 32-års perspektiv efterforska hur många som insjuknade i stroke i sina huvudtyper hjärtinfarkt och hjärnblödning, och vilka riskfaktorer som kunde hänga samman med risk för framtida strokeinsjuknande.

**Metod:** Sökande vid åtta vårdcentraler inom Göteborgs primärvård fick svara på livsstilsfrågor och erbjöds en självinstruerande hälsoprofil och ett hälsosamtal utifrån hälsoprofilen. Metoden utmärks av eget ansvar och delaktighet men också av stärkande/stödande förhållningssätt från personalen. Vid behov fanns åtgärder att erbjuda som t.ex. fysisk aktivitet på recept, stresshanteringskurs, rökslutargrupp. Uppföljning gjordes efter 1 år och samma mätningar gjordes som vid start. I Kvinnoundersökningen användes vid start och vid de återkommande uppföljningarna frågeformulär avseende grad av fysisk aktivitet och upplevd hälsa. Svaren jämfördes gällande samband på lång sikt men även avseende hur förändring av fysisk aktivitetsnivå påverkade upplevt välbefinnande. Typ av stroke fastställdes när så var möjligt genom noggrann journalgenomgång i de fall nationella patientregistret angav ospecificerad stokediagnos. Efter denna kvalitetssäkring gjordes analyser där uppgifter från studiestart 1968-69 om riskfaktorer för stroke såsom högt blodtryck, övervikt, stress, utbildningsnivå, fysisk aktivitetsnivå analyserades i relation till insjuknande i stroke under 32 år. Överlevnadstiden fri från stroke i relation till förmaksflimmer, diabetes, hjärtinfarkt och högt blodtryck beräknades.

**Resultat:** Det var genomförbart att använda livsstilsinstrumenten i primärvårdsverksamhet. Livsstilsfrågorna fångade in individer som ville delta i programmet och som angav mer av negativa livsstilsfaktorer och högre motivation till förändring än de som avstod från programmet. Vid 1-årsuppföljning sågs förbättring bland annat av blodsocker, blodtryck, kroppsmaßt såsom midja-stuss kvot och body mass index (BMI).

Vi fann starkt samband mellan grad av fysisk aktivitet och upplevt välbefinnande i tvärsnittundersökningar av Kvinnoundersökningen och fysisk aktivitet vid start var också relaterat till välbefinnande vid 12, 24 och 32-års uppföljning. Förändring i fysisk aktivitetsnivå var också relaterat till upplevt välbefinnande.

Valideringen av stokediagnoser medförde att ospecificerade stokediagnoser minskade från 37 % till 11 %. Det var signifikant samband mellan stroke och övervikt, rökning och låg utbildning. Det förelåg också samband över tid mellan högt blodtryck och stroke och risken ökade med ökande blodtrycksnivå. Likaså ökade risken över tid vid diabetes, förmaksflimmer och högt blodtryck men inte hjärtinfarkt.

**Slutsatser:** Det var genomförbart att använda en pedagogisk modell i primärvården för att fånga in motiverade individer med negativ livsstil. Vikt, BMI, midja-stuss kvot, blodtryck och blodsocker var signifikant förbättrade efter ett år tydande på tillämpbarhet för livsstilsmodifiering. Det förelåg starka samband mellan fysisk aktivitetsnivå och upplevt välbefinnande undersökt både prospektivt och i tvärsnitt. Ökad fysisk aktivitet hos tidigare stillasittande individer tycks bidra till upplevt ökat välbefinnande. Diagnoser från nationella patientregistret kunde valideras och ge kvalitetsförbättring i Kvinnoundersökningen avseende strokevariabler. Låg utbildning var associerat till hjärtinfarkt. Rökning och övervikt var associerat till högre stokerisk, liksom förmaksflimmer, diabetes och högt blodtryck.

# LIST OF PAPERS

This thesis is based on the following studies, referred to in the text by their Roman numerals.

- I. Blomstrand A, Lindqvist P, Enocsson Carlsson I, Pedersen N & Bengtsson C. Low-budget method for lifestyle improvement in primary care.  
*Experiences from the Göteborg Health Profile Project.*  
Scandinavian Journal of Primary Health Care 2005; 23: 82-87.
  
- II. Blomstrand A, Ariai N, Baar A-C, Finbom-Forsgren B-M, Thorn J, Björkelund C. Implementation of a low-budget, lifestyle-improvement method in an ordinary primary healthcare setting: a stepwise intervention study.  
BMJ Open 2012; 00:e001154.
  
- III. Blomstrand A, Björkelund C, Ariai N, Lissner L & Bengtsson C. Effects of leisure-time physical activity on well-being among women: a 32-year perspective.  
Scandinavian Journal of Public Health 2009; 37: 706-712
  
- IV. Blomstrand A, Blomstrand C, Ariai N, Bengtsson C, Björkelund C. Stroke incidence and association with risk factors in women - a 32-year follow-up of the *Prospective Population Study of Women in Gothenburg*. (Submitted).

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# ABBREVIATIONS

AF	Atrial fibrillation
BMI	Body Mass Index
BP	Blood pressure
CT	Computed tomography
DALYs	Disability Adjusted Life Years
EQ-5D	EuroQol-5D
FS	Fatal stroke
GQL	Gothenburg Quality of Life Instrument
HR	Hazard ratio
HRQoL	Health related quality of life
HS	Hemorrhagic stroke
ICD	International Classification of Diseases
IS	Ischemic stroke
MI	Myocardial infarction
NS	Non-specified stroke
OR	Odds ratio
PC	Primary Care
PCC	Primary care center
PSWG	Population Study of Women in Gothenburg
QALYs	Quality Adjusted Life Years

SA	Subarachnoid hemorrhage
SD	Standard deviation
SOC	Sense of coherence
TS	Total stroke
VAS	Visual analogue scale
WHO	World Health Organization
WHR	Waist-hip ratio

## PREFACE

In the preface I would like to present my professional background that has formed my interest in both preventive and promotive work before and after onset of severe illness. My previous work as a physiotherapist provided a special experience and knowledge about body and soul as an entity. Earlier life events and ongoing experiences in social and working lives play a role in how we feel and in bodily manifestations. The confident close relation to the patients has contributed to my interest and experience about normal psychology and bodily manifestations of emotional and other mental expressions including stress reactions. Several years as a teacher in physiotherapy have increased my awareness about the importance of motivation and strengthening self- efficacy in our professional attitude in diagnostic and therapeutic work. Further, my background as a physiotherapist has given me a dimension of clinical feeling concerning normal range of motion and feel of tense muscles in relation to mental status. As a GP I initiated the first “Dagmar project” in Gothenburg, aimed at early and coordinated rehabilitation and as project leader I recruited the necessary competencies for teamwork: physiotherapist, occupational therapist, psychologist, social counselor and regularly an orthopedic consultant. We worked close together with the social insurance authority and the employment agency. The collective knowledge from this teamwork increased my interest and competence concerning vulnerable patients with medical, social and personal problems constituting a complex feeling of illness and a problematic lifestyle. As a GP I have felt these clinical experiences most valuable in patient contacts and this has contributed to my interest in the biopsychosocial approach. My own experience in complicated consultations was often being a biological teacher for the patients who are the real experts on their experiences. Together we have then outlined thoughts and structure concerning information, therapy and support concerning lifestyle modifications. Preventive and health promotive work has been important for me. Our major diseases are often heralded by long time adverse lifestyles and the development of methods for early risk factor prevention and salutogenic strengthening is urgent. Lifestyle intervention where the individual herself is the driving force can be a key option. Health promotion is important for patients with chronic diseases such as stroke and preventive and promotive efforts can often in my experience go hand in hand. Methods to facilitate such interventions by including the patients own will and efforts have for many years been my interest. One of our major diseases is stroke in which I have special interest not only concerning primary prevention strategies but also concerning secondary prevention and health promotion strategies, the latter being extremely important after stroke both for the person himself/herself and their relatives. I was one of two GPs in Sweden who participated in The National Board of Health and Welfare work “National

guidelines for stroke care” and was responsible for the outline of the primary care part called “in the long run”. After this I was asked to do the endpoint work for stroke in the Population Study of Women in Gothenburg, (PSWG), for the years 1992-93 – 2000-01 which was in line with my interest in stroke. Further this work provided a possibility to study risk factors associated with stroke among women.

This thesis contains a description of a low budget method aimed to reach motivated individuals in need of lifestyle change. It also reports the result of testing the impact of physical activity, a well-known important lifestyle factor, on well-being both from a cross-sectional and longitudinal perspective in the PSWG. Finally I report the results of an endpoint analysis in the PSWG concerning stroke, a prerequisite for testing the association between stroke and modifiable risk factors, a subject that is in line with other components in the thesis.

# BACKGROUND

## Health

Health is a concept that represents many dimensions and the definition varies over time and between cultures. The goddess Hygeia is the symbol for maintaining health and the “wholeness” of the body. Further by keeping the body fit she symbolizes prevention of disease by teaching people how to live right and how to use the body’s strong powers of self- healing. Those who lived right maintained their health and avoided diseases, a message that can be discussed from an ethical point of view. Hippocrates looked upon health from a holistic perspective but much later in the 17th century Descartes introduced a dualistic perspective on body and soul representing different entities albeit mind could interact with the soul at the pineal gland. This dichotomization was referred to as “Descartes error” by the neurologist Antonio Damasio (1).

The WHO definition from 1948 is the following: “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. During 1980 to 2000 a broader approach was applied where the declaration of Alma Ata 1978 is a key event. Initially, health was considered a state but has over time been looked upon as a resource with the individual being active and responsible. Bircher (2) defines health as “a dynamic state of well-being characterized by a physical and mental potential, which satisfies the demands of life commensurate with age, culture, and personal responsibility”. Aaron Antonovsky’s theories rooted in medical sociology point out that health arises when the individual has a sense of coherence (SOC)(3, 4). Health and illness are not mutually exclusive. The determinants of health are multifactorial and could be listed by WHO as: income and social status, education, physical environment, social support networks, genetics, health services, the person’s individual characteristics and behaviors and gender. The WHO International Classification of Functioning, Disability and Health (ICF) <http://www.who.int/classifications/icf/en/> highlights health and health-related domains in a list of body function and structure and a list of domains of activity and participation. The ICF endorsed by all 191 member states in 2001. It is now the framework for measuring health and disability at individual and population levels. Disability is not seen as only a medical or biological dysfunction but social aspects are also taken into account. This emphasizes that the concept of health has developed from

a static to a dynamic entity with possibilities for the individual to take an active role with support from health services when needed.

In relation to health the concepts of disease and illness must also be considered (5). ICF has been fruitful in communication between community actions, health care offers and individual needs and to stimulate joint efforts in promotive and preventive actions and in rehabilitation.

Disease is defined by the diagnosis of medical science while the English word illness is characterized by symptoms that are experienced by the individual. However the mutual association between perceived self-rated health, which corresponds to the illness concept and mortality is strong and shown in several studies (6)

## Measuring health

Is it possible to measure health? Health is in one sense a self-perceived experience that is difficult to operationalize but on the other hand health also includes several aspects common for humans. Several instruments have been developed for the assessment of health-related quality of life. A variety of reasons exist for measuring health such as for planning public health work, following secular trends in the society, securing quality in the working process, cost-benefit analysis, comparison between regions, examining gender aspects and for inter-individual and intra-individual comparisons. Burström showed in 2001 that self-rated health is a strong predictor of subsequent mortality and therefore may be a useful outcome measure (7).

A survey of instruments was presented by WHO in 2002 (8). Health-related quality of life is commonly measured by EQ-5D (9, 10) including a scale from 0-100 and five questions concerning functional capacity and/or SF-36 (11-14) with 36 questions dealing with eight dimensions. The Göteborg Quality of Life (GQL) instrument has been used as a well-being indicator and is a multi-item questionnaire based on the WHO definition of health (15). "Cantril's ladder" is a visual analogue or global assessment of an individual's life satisfaction, whereby the individual is asked to imagine a ladder where the bottom (0) is the worst possible life and the top (10) the best possible life (16). The instrument is considered a valid measurement of "global well-being" (17).

The International Classification of Functioning, Disability and Health (ICF) is WHO's framework for measuring health and disability at both individual and population levels. The ICF was officially endorsed by all 191 WHO member states in the 54th World Health Assembly on the 22 of May 2001 (resolution WHA 54.21). DALYs (8) is a measure of overall disease burden expressed as the number of years lost due to ill-health, disability or

early death. The QALY (8) is a measure of the value of health outcomes. Since health is a function of length of life and quality of life, the QALY was developed as an attempt to combine the value of these attributes into a single index number. A questionnaire measuring Sense of Coherence (SOC) (comprehensibility, manageability and meaningfulness) consists of 29 questions in the long version with answers on a scale from 1 to 7 (3).

In Sweden the National Board of Health and Welfare (<http://www.socialstyrelsen.se/english>) and the Swedish National Institute of Public Health (<http://www.fhi.se/en/>) present public health reports based on surveys and also report life expectancy and morbidity data based on the death registry. Further the SOM (society, opinion, media) Institute at University of Gothenburg, presents surveys and trends concerning Swedish habits, behavior and opinions with respect to society, politics and media ([http://www.som.gu.se/som\\_institute/](http://www.som.gu.se/som_institute/)). The reports include aspects of health and life satisfaction.

## Public Health in Sweden

The Public Health Report 2013 contains information about the development of public health between the years 1991 and 2011. The National Board of Health and Welfare (Socialstyrelsen) and the Swedish National Institute of Public Health (Folkhälsoinstitutet) both contribute to this report. The Public Health Agency of Sweden (Folkhälsomyndigheten) was established on January 1, 2014 and is a merger of the Swedish National Institute of Public Health and the Swedish Institute for Communicable Disease Control (Smittskyddsinstitutet). Further most of the work concerning environmental health and the responsibility for the environment and public health reports at the National Board of Health and Welfare will also be transferred to the new agency. Data are imported from the Hospital Linkage System (HLS), the Cause of Death Registry (CDR) and the Central Bureau of Statistics (SCB).

In the reports, development of life expectancy, self-rated health, morbidity, mortality and some indicators of health determinants are given. Life expectancy 2011 was 83.7 years for women and 79.8 years for men. Sweden has one of the highest life expectancies in the world and during the last decades the gender difference has decreased. Level of education has a stronger impact on life expectancy than gender. Self-reported health was poorer among those with compulsory education than among those with post-secondary education. According to SCB which has followed self-reported health since 1980 low educated persons show impaired health over time, and their life expectancy has not developed as positively as in persons with higher



education. Women generally report somewhat worse health and also anxiety, particularly those with low education. Women with lower education also show shorter life expectancy. The favorable decreasing mortality in cardiovascular diseases is more marked for men, which explains the gender differences are diminishing. The percentage of obese persons appears to have increased since 2004. Fourteen percent of the grown up population has a BMI corresponding to obesity.

Physical activity at leisure time has in our society a growing role since work has become increasingly sedentary. There is also an increasing body of evidence showing a strong association between physical activity and risk for diabetes type 2 and risk for cardiovascular diseases, stroke and dementing diseases (18-22). Overall no significant differences during 2004-12 were reported. More women aged 65-84 years reported sedentary life style during the entire period. Lower educated men and women both report lower leisure time physical activity compared with those with higher education. In Sweden prescriptions for physical activity (FaR) from medical authorities, particularly through PC, have shown to increase physical activity among sedentary individuals (23)

Alcohol consumption is reported to be the lowest in ten years but mortality in alcohol related diseases has increased in women aged 65-84 (24). However Andreasson highlighted alcohol consumption in age group 19-25 years and reported an increase in treatment for alcohol dependence among young women and that the rate increase was greatest in older women (25). The percentage of adult daily smokers has decreased and it was reported that 11% of persons between the ages 16-84 were smokers, and in women more than men. Further they report that cardiovascular mortality has decreased 58% among women with longer education while the corresponding decrease for women with shorter education is 20%. Incidence of cardiovascular disease including stroke has decreased over time but less favorably in the working ages. In the age group 35-44 years stroke has increased 21% for women and 15% for men since the mid -1990s. The increase is most marked among those with short education and the difference in incidence between groups with different educational backgrounds has increased. In the age group 45-64 years reduced stroke incidence was reported among men but not among women (24). Among the elderly with the highest stroke incidence the most favorable decrease is seen in men resulting in a decreasing gender gap. The National Guidelines for Methods of Preventing Disease was published in 2011. The lifestyle habits that the guidelines discuss are tobacco use, hazardous use of alcohol, insufficient physical activity and unhealthy eating habits (26).

## Lifestyle and Health

Lifestyle factors have a major impact on health. Negative lifestyle is associated with common diseases such as myocardial infarction, stroke and diabetes (27). Over the last decades there has been a trend of reduced physical activity and increased sedentary lifestyle (28, 29). Low physical activity is associated with the metabolic syndrome (30) and a growing body of evidence shows effects on brain health as reflected by emotional and cognitive functions (31, 32). Sedentary lifestyle was associated with CVD mortality (33) and moderate physical activity was associated with better brain health (34, 35). In a review, a total of eleven studies reported that regular physical activity is associated with an increase in life expectancy of 0.4 – 6.9 years (36). Lack of physical activity is a modifiable risk factor for both hemorrhagic and ischemic stroke. Moderately intense physical activity is sufficient attaining a risk reduction (37).

Men who were overweight or were obese but fit were at lower risk of CVD mortality than men who had normal weight but were unfit (38). Another study did not find that higher levels of physical activity negated the effects of excess weight (39). One report commented that increased amount of walking in urban areas could reduce the costs of the National Health Service through positive effects on many health outcomes among others type 2 diabetes, dementia, and cerebrovascular and ischemic heart disease (40). Retrospectively reported low level of physical activity from age 15 showed significant association with depressive symptoms later in life (41). Body mass index (BMI) has increased over the last decades both in men and women (42). Central fat distribution has become more common among women (43). Women report more perceived mental stress (43) and have increased their alcohol consumption compared to earlier generations of women (25). Men have reduced their physical activity, increased their body mass index (BMI) and waist circumference, and diabetes has become more prevalent (44). A healthy diet, moderate amounts of alcohol, being physically active, and not smoking could prevent a major part of myocardial infarctions in women (45). In UK women over age 50, two thirds of all deaths of smokers are caused by their smoking (46). The risk of death from cigarette smoking continues to increase among women and the increased risks are now nearly identical for men and women (47). Socioeconomic factors are major determinants for lifestyle and are independently associated with increased incidence of cardiovascular disease (48, 49). From the British Whitehall cohort it was reported that more than 50% of socioeconomic differences in mortality could be explained by health habits (50). From Finland it was reported that smoking, low vegetable consumption and low physical activity explained a substantial part of educational level differences in cardiovascular

and all-cause mortality both genders (51). Obesity has an impact on self-assessed health and health-related behavior in terms of physical activity for both men and women while overweight solely in men (52). The Doetinchem Cohort Study found an association between level of physical activity and health related quality of life and interestingly also a positive effect of adopting a more active life style on bodily pain and on health domains such as vitality and social functioning (53).

## Health inequities

Sir Michael Marmot, a front man in this field, is known for the motto “Closing the gap in a generation”. The Commission on Social Determinants of Health was created to promote health equity (54). He claims that “if there is a genuine desire to change, if there is a vision to create a better and fairer world where people’s life chances and their health will no longer be blighted by the accident of where they happen to be born, the color of their skin, or the lack of opportunities afforded to their parents, then the answer is: we could go a long way towards it”. Social health determinants are different worldwide. Thus economic resources, culture, religion, gender and social services are different. Further medical knowledge and organization of medical care differ. The best health outcomes are found when medical care is based in the PC and when promotion and prevention are balanced with curative care (55). Health practitioners have the possibility to affect society’s decisions about health (54). A more coherent effort to include social causes of poor health in a broader target of health promotion should then be a headline goal. Marmot states that “In calling to close the gap in a generation, we do not imagine that the social gradient in health within countries, or the great differences between countries, will be abolished in 30 years. But the evidence, produced in the final report<sup>1</sup> of the Commission on Social Determinants of Health, encourages us that significant closing of the gap is indeed achievable” (54). He also states that “at the centre of this action is empowerment of the people, communities, and countries that currently do not have their fair share. The knowledge and the means to change are at hand. What is needed now is the political will to implement these eminently difficult but feasible changes. Not to act will be seen, in decades to come, as failure on a grand scale to accept the responsibility that rests on all our shoulders” (54).

Gender differences have been discussed when it comes to health inequities. From PSWG was reported that the strongest socioeconomic correlate of health outcome was the husband’s occupational category even if the women were employed in 1968 (56). In the Whitehall II study women’s life style was associated with their partner’s social class (57). Another study from Canada reported that strain of housework was strongly related to poor health for

women but not for men (58) and although most women in Western countries work today they still take a major part in family responsibilities (59). However from Sweden was reported that much of the psychosocial gradient in CHD risk seemed to be linked to psychosocial stress both in men and women (60)

Health behaviors such as smoking, alcohol, diet and physical activity explain much of the social inequalities seen in the Whitehall II study with 24 years of follow up and four follow-up assessments (50). However the relations are multidimensional and complex (61) A relationship exists between low income and health (62, 63). A comparison between 26 developed countries utilizing the Luxembourg Income Study between 1980 and 2005 showed that the well-known relation between poverty and mortality was not exclusive but also dependent on clear differences in welfare regimes (64). A paradigm change has been proposed based on social determinants to address poor health among populations (65). The politicians in the city of Malmö, Sweden, with 300 000 inhabitants initiated in 2010 a commission, The Commission for a Socially Sustainable Malmö, to report scientifically based recommendations regarding how to reduce inequities in health in the future (66)

## Primary Care

According to WHO PC is the core of the health system and the Alma Ata declaration 1978 identified PC as the important keystone in health services. WHO declared “Primary Health Care Now More Than Ever” in 2008 (67). WHO states: “There is a substantial body of evidence on the comparative advantages, in terms of effectiveness and efficiency, of health care organized as people-centered primary care. Despite variations in the specific terminology, its characteristic features (person-centeredness, comprehensiveness and integration, continuity of care, and participation of patients, families and communities) are well identified. Care that exhibits these features requires health services that are organized accordingly, with close-to-client multidisciplinary teams that are responsible for a defined population, collaborate with social services and other sectors, and coordinate the contributions of hospitals, specialists and community organizations” (67). The PC was considered the base for health care and should include preventive, promotive, therapeutic and rehabilitative interventions. WHO reports that people are healthier, wealthier and live longer today than 30 years ago. Challenges for health services have changed over time. Today many individuals present with complex symptoms and multiple illnesses, particularly among elderly people. This challenges service delivery to develop more integrated and comprehensive case management. WHO points

out some worrisome trends exemplified by health systems that focus disproportionately on a narrow offer of specialized curative care. A rapid increase of knowledge within medical science has prompted an excessive specialization among health-care providers. A risk can be that a narrow focus of many disease control programs can counteract a holistic approach to the individuals and families they deal with. From this may follow that the need for continuity in care is not supported (68). Further resources can be allocated to clusters around curative services at great cost, impeding the potential of primary prevention and health promotion to prevent up to 70% of the disease burden (69, 70). PC was stated to be the base in the health care system and the provider of person-focused care over time (55). Starfield stated a strongly held belief that primary care is the base of the health care system, and defined the key features of primary care as the following: the first point entry to a health care system, the provider of person- focused, not disease-oriented care over time, the delivery of care for all but the most uncommon conditions, and the part of the system that integrates or coordinates care provided elsewhere or by others (55). The background of many primary care consultations can be multifactorial i.e. not solely medical diagnoses but also psychological or social stress. Health psychology has an increasing role (71). Impressions from both the outer world and our inner world are perceived and sensed in the body. A dichotomy of body and mind is not in line with a holistic approach. The general practitioner who can integrate the patient's complexity of feelings in the body and experiences of various natures has the potential to meet the needs of the patient adequately (72). The patient's perception, apprehension and anticipation are indicative during the consultation. Often the patients in a PC setting may have a multitude of purposes for consulting a doctor (73). There are also gender differences concerning how symptoms and own expectations are communicated (74). A patient-centered approach is recommended to include the patients own thoughts and hopes during the consultation (75).

In Sweden a majority of persons and those increasing with age have confidence in the PC, which is also the arena for most consultations and peoples' attitudes to the health care system is regularly reported by "Vårdbarometern" (76).

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# Common diseases - focus on circulatory diseases

## Incidence and register studies focusing stroke

Frequencies of many common diseases such as cardiovascular diseases, stroke, diabetes, cancer and other chronic diseases are achieved from population studies and register studies. Cardiovascular disease and stroke are leading causes of death globally. The Framingham Heart Study started already in 1948 and the initial study recruited men and women between 30 to 62 years of age. Participants have been assessed every two years undergoing a detailed medical history, physical examination and laboratory tests. From the original cohort second and third generations are now examined. Trends in overweight and obesity were evaluated among Framingham participants from 1950 to 2000. The results showed that the incidence had increased progressively over the last 5 decades (77). Almost seven decades follow-up of epidemiology of blood pressure and atrial fibrillation and their relation to cerebrovascular disease has given important information. Already the initial Framingham publication on stroke, (1965), clearly identified elevated blood pressure, systolic no less importantly than diastolic, as the first-rank risk factor for all stroke, infarction as well as hemorrhage (78). Furthermore the importance of midlife hypertension for future stroke was reported, as well as an association with future stroke risk of atrial fibrillation (79). Secular trends regarding lifestyle factors are important to foresee future burden of diseases in a population. The Doetinchem Cohort Study follows a population-based cohort from Doetinchem, a rural part of eastern Netherlands, with the aim of studying the impact of (changes in) lifestyle factors and biological risk factors on aspects of health, incidence of chronic disease, physical and cognitive functioning and quality of life (80). Weight increase in participants in the Doetinchem-cohort 20-59 years over three consecutive 5-year intervals was associated with a number of components in the metabolic syndrome (central obesity, raised blood pressure, reduced HDL cholesterol and elevated blood glucose) particularly in the young group (81). In the same cohorts the prevalence of overweight, obesity and hypertension increased in all ages but more among the more recently born generations. Unfavorable generation shifts for diabetes were seen for men but not for women while shifts were seen for overweight/obesity in both sexes but particularly among the recently born women. The authors in this population study from the Netherlands did not show differences due to socioeconomic status. Their conclusion is that in the future more elderly will develop overweight-related disease, such as diabetes and cardiovascular disease (82).

In Ontario, Canada, the prevalence of diabetes increased during the past 10 years, particularly among younger and in some minority populations. The

increase in the latter was probably associated with immigration from regions with more susceptible populations, although the authors did not assess ethnic differences. The global rate that was predicted for 2030 was exceeded already by 2005 (83). In the US, the "Obesity Epidemic" has been a great challenge for preventive efforts as well as the "Stroke belt", with very high incidences among younger in the south- eastern states, with considerable correlations among different populations. The Centers for Disease Control and Prevention (CDC) reported that from 1980 through 2010 the number of adults in the United States aged 18-79 with newly diagnosed diabetes more than tripled. More than two-thirds of American adults are either overweight or obese and in the past 30 years, adult obesity rates have more than doubled (84).

The US obesity "epidemic" is extremely costly, and the progression is greater in women than in men and particularly among black women (85).

Since the early 1990s new cases of diabetes have increased. Also, the prevalence of pre-diabetes is increasing worldwide, which emphasizes that lifestyle modification is the corner-stone of diabetes prevention (86). In Finland the prevalence of type 2 diabetes has increased in parallel with a gradual increase in overweight and obesity (87). In the Swedish public health report from 2006, 3.3 % of women and 4.8% of men aged 18-84 reported diabetes diagnoses, and comparable figures from 1990s report were 2.6% and 3.0%. The annual report from the National Diabetes Register, Sweden, in 2012 showed increasing numbers of diabetes type 2 diagnoses, reported by medical clinics and primary health care ([www.ndr.nu](http://www.ndr.nu)). However, these increases can partly depend on increased reporting to the register.

The WHO Monica project, a register study which started in the early eighties, included 41 MONICA Collaborating Centers and used a standardized protocol to study trends in cardiovascular disease and trends in risk factors in men and women aged 25-64 years (88). Seventeen centers in 10 countries reported stroke events registered for a subgroup population. Preliminary results were presented for a 10-year period before all centers had completed their reports on events and lifestyle factors. The trend pointed at decreasing events and stroke mortality. Changing stroke rates are suggested to be related to changes in cardiovascular risk factors in the population, such as improved hypertension control. Trends in coronary-event rates and the estimation of the contribution of classic risk factors in the WHO MONICA Project populations were reported. The 38 populations from 21 countries consisted of men and women aged 35-64 years from the mid-1980s to the mid-1990s. Risk factors described were smoking, systolic blood pressure and blood cholesterol. They were analyzed as a composite score but also individually. BMI was added to the analyses. In the Framingham study, coronary risk score incorporated three factors not included in the Monica score study: HDL cholesterol, diabetes and left-ventricular hypertrophy. The decrease in CHD events and mortality was not exclusively attributed to improvement concerning the risk factors.

The conclusion was that a broader range of interventions was potentially available that might or might not be already identified. “Trends in the prevalence of obesity and the global spread of tobacco use are reasons to expect that the past will not predict the future” (89). Age standardized adult diabetes prevalence from 199 countries was 9.8% for men 2008 compared with 8.3% 1980 and for women 9.8% 2008 compared with 7.5% 1980 (90).

Since 1985 the Northern Monica study (<http://www.umu.se/phmed/medicin/monica/>) is part of the population survey that has lasted the longest in the world with a standardized methodology. One among many reports from them found improvements in cardiovascular factors between 1986 and 2009 in the population subjects in age groups 25-64 years in 1986 and 1990 and 25-74 years from 1994. The opposite was reported for obesity, where one in five was obese in 2009 which was twice as many as in 1986 (91). From Swedish and Finnish cohorts sex differences were reported concerning diabetes as a risk factor for stroke, with more increased stroke risk in men than in women (92). The Monica Risk, Genetics, Archiving and Monograph (MORGAM) Project data from the European countries' survey with 18 populations showed among results that smoking was an important risk factor for stroke across Europe (93).

The Swedish Register Study Riks-Stroke reported trends concerning 1995 – 2010 showing an increase in the number of patients who received adequate secondary prevention but also an increased case fatality rate, which the authors ascribed possibly due to shorter stay in the stroke units (94).

The Rotterdam Study is a large prospective population-based cohort study from 1990 that focused on risks and incidences for several common diseases (95). Stroke incidence trends were studied through sub cohorts from 1990 and 2000. Incidence rates decreased by a third in men but remained unchanged in women. Smoking decreased in men but not in women and blood pressure levels increased. Antithrombotic and lipid lowering medication of stroke risk factors increased in all ages and both in men and women, while antihypertensive treatment was unchanged despite considerable increase in grade 2 hypertension and both systolic and diastolic blood pressures. BMI increased in both men and women (96). A register study (1980-2010) from the Netherlands shows a remarkable decline in IS mortality after 2000, but non-fatal incidence IS events were stable or even increased. The effect on prevalence and on the heavy human and economic burden are discussed and the need for prevention of IS is stressed (97).

The Hisayama Study established annual health examinations for inhabitants aged  $\geq 40$  years. Five cohorts representing five decades from 1960-2000 were followed up for 7 years to study secular trends in cardiovascular disease.



Incidence of ischemic stroke decreased in both men and women but hemorrhages only in men. Improved management of hypertension and decrease in smoking rate were found. The decreasing trends in the incidence and mortality of ischemic stroke slowed down in recent years. It was proposed that the reason was an increase in the prevalence of metabolic risk factors, suggested to be attributable to the westernization of dietary habits and physical inactivity as a result of motorization (98). Another Japanese population study, the Okinawa study comparing health check-up data between 1987 and 2001, found an upward trend for cerebral infarctions between the two periods, even though blood pressure decreased significantly in the second period. Metabolic deterioration as indicated by increased BMI, fasting blood glucose and non-HDL cholesterol was considered to be the factor underlying this upward trend (99). Also, in the Chinese island regions the incidence of stroke increased while mortality declined 1982-2008. Accordingly, the authors stressed the importance of effective intervention and specific policy recommendations on stroke prevention (100).

The INTERHEART study showed strong associations between life style factors and coronary heart disease (101). European guidelines for prevention of cardiovascular diseases in clinical practice have pointed out that multimodal interventions should take into account emotions, psychosocial factors and harmful habits (48). The large case control multicenter INTERSTROKE study, found that five risk factors contributed to 80% of all strokes: hypertension, smoking, unhealthy diet, physical inactivity and high waist hip ratio (WHR). Additional risk factors among them were diabetes, heart disease, alcohol consumption, and stress or depressive symptoms (102).

The Göteborg BEDA cohort aged 45-54 years, three cohorts from the GOT-Monica cohort aged 45-54 years and one-third of all women born in 1953 and living in Göteborg in 2003 were randomly sampled and invited for examination. Results from cross-sectional examinations were reported from 1980 and 2003. Systolic blood pressure and prevalence of hypertension decreased. The prevalence of diabetes was stable over time and physical exercise was increased. More women had overweight, smoking was still quite high, and those who reported permanent stress had increased their stress perception (103).

The Population Study of Women in Gothenburg (PSWG) started 1968-69 and is still ongoing. A sample of women in the age strata 38, 46, 50, 54 and 60 was studied with anthropometric measures, laboratory tests and questionnaires. A 36-year follow-up study for women aged 38 and 50 years reported secular trends, and the trends were in the healthier direction, especially concerning physical activity and smoking. A social gradient was

seen for smoking. Self-reported stress had increased among 50-year old women from 28% to 75%, findings in concordance with the above mentioned report (43). The incidence in stroke in PSWG over 32 years is described in paper IV in this thesis.

## Interventional studies – examples from Nordic countries

Broad intervention studies in PC settings were pioneered in Finland where in the late 1960s coronary heart disease mortality among Finnish men in Karelia was among the highest in the world. The North Karelia Project with start 1972 carried out a risk factor survey to monitor trends.

In the first two surveys, the target population consisted of persons aged 30-59 years and thereafter the target population was increased to include persons aged 25-74 years. Comprehensive chronic disease prevention and health promotion were established. Decline in serum cholesterol levels was observed as well as decline in blood pressure levels among both men and women until 2002, but the latter levelled off among both men and women. Prevalence of smoking decreased among men but not in the same way for women. BMI showed an increasing trend for men since start, but for women, after an initial decrease an increasing trend occurred from 1982. It was reported that 80 % decline in coronary mortality mainly reflected a great reduction in risk factor levels. On the other hand, increasing obesity was observed and it was suggested that this was due to decrease in work-related physical activity although leisure time physical activity had increased (104).

The randomized Finnish Diabetes Prevention Study targeting overweight men and women with impaired glucose tolerance reported that intense lifestyle intervention with weight reduction, dietary modification and increased physical activity for 4 years resulted in sustained lifestyle modification. The intervention also resulted in long-term prevention of progression to type 2 diabetes. The control group only received general information about life style (105).

The Västerbotten Intervention Program (VIP) started in Norsjö in the County of Västerbotten, Sweden, 1985. This region had a very high mortality from myocardial infarction with 720/100 000 inhabitants/year among 16 to 74-year-olds reported. A comprehensive health survey was initiated, calling participants every 10 year at the ages 30, 40, 50 and 60 years, but from 1995 the survey of persons aged 30 years was discontinued. Since 1995 the program has been implemented in all PCCs according to the county council. The health survey includes anthropometric data, biological markers and

questionnaires. Interventions including both preventive and health promotive strategies are used and coordinated with the whole community. Evaluation has shown considerable reduction in cholesterol and blood pressure levels and a narrowing of the health gap between the socially privileged and less privileged (106). The long-term effects of this population-based program and the coordinated activities within the intervention program, consisting of many components, are very powerful (107).

In 1988 the County Council of Skaraborg decided to support a health promotion program based on both population and individually based strategies. An intervention program called "Live for Life" was initiated in Habo, with both a population strategy involving the total county and individual health examinations confined to a subgroup of men and women aged 30 and 35 years. The program resulted in less smoking, improved dietary habits, and decreased blood pressure (108-110). They also reported decreased mortality from ischemic heart disease for the period 1984-96 when comparing mortality data from other Swedish communities and all Sweden with the community of Habo (111). They also reported that the model "Live for Life" seemed to be more effective than a community health strategy alone (112).

The Skaraborg Hypertension project reported positive effects on stroke incidence trends in an intervention area compared to a control area in the same county through a structured program for blood pressure control in collaboration between the primary care units and the hospitals. Blood pressure reduction averaged 2-5 mm Hg in the intervention group (113). The same project group found in a random sample from Skaraborg of men and women aged 30-75 years that about one-third were well controlled and aware about their hypertension, which clearly shows the importance of better implementation of expert guidelines (114).

In a randomized study in Gothenburg, a comprehensive risk factor modification program in high risk hypertensive men 50-72 years of age, failed to show a significant effect on ultrasound intima-media thickness, which was their primary aim. However, significant reductions were seen on one or more of hypercholesterolemia, diabetes or smoking during 6 years of follow-up and on total mortality. The program was comprehensive with an information meeting followed by five weekly meetings and follow-ups every 6 months. The intervention included a smoking cessation program, instructions to lose weight and to lower consumption of fat and sugar. Diabetic patients were taught self-monitoring of blood sugar (115).

In the Swedish community Strömstad, it was observed that the mortality statistics during 1969-78 were significantly increased among women due to high mortality in stroke when compared with the rest of the county of Göteborg and Bohuslän. All women aged 45-64 years were therefore invited to a free health survey 1985. The survey included 927 women and all women with one or more risk factors for ischemic heart disease or stroke were invited to courses in diet and physical activity. More than half of the women had one or more risk factors according to the criteria for inclusion, and one-third of them wanted to take part in health courses. The intervention resulted in reduced risk factors for cardiovascular disease and long-standing effects on cardiovascular risk factor patterns were seen (116, 117).

A prevention program combining population and individual high risk strategy and integrated into the existing primary care organization was initiated in the PHC in Sollentuna in cooperation with Department of Internal Medicine at Karolinska Hospital in 1988. Persons under 60 years of age were offered a short questionnaire concerning already known hypertension, hyperlipidemia or diabetes, smoking, overweight, physical activity and family history of early cardiovascular disease. When the questionnaire indicated one or more risk factors, a free check-up including anthropometric data and biological risk markers was offered. After one year 2116 persons had been registered in the prevention program through questionnaires. The majority of the sample consisted of women (62%), and the median age was 45 years. Among the participants, 24% of men smoked and 27% of the women. High values of lipids were found; men had higher values than women. The presence of two of the established principal risk factors (smoking, hypercholesterolemia and/or hypertension defined as diastolic pressure  $\geq 90$  mm Hg) was found in 17% of the women and 22% of the men (118). During 4 years, 5622 persons participated in the program and the authors reported that a program for cardiovascular screening and prevention could be integrated in the PC system and that risk factors such as hypercholesterolemia, hypertriglyceridemia and high blood pressure were significantly reduced after intervention (119). The successful reduction of high cholesterol levels was associated with younger age and longer education (120).

A Danish randomized and controlled study on PC based intervention, the Ebeltoft Health Promotion Project, showed that the intervention group that received an offer of health tests and patient-centered planned health consultations showed positive effects on cardiovascular risk scores without extra need for contacts in the health care system and with a significant decline in annual hospital admission rates (121-123).

## Behavior change

Geoffrey Rose (1982) stated: “It makes little sense to expect individuals to behave differently from their peers; it is more appropriate to seek a general change in behavioral norms and in the circumstances which facilitate their adoption” ([www.who.int/whr/2002/en/](http://www.who.int/whr/2002/en/)). An examination of the theories of behavior change from the individual point of view shows that different models exist, with some common features. An acknowledged method to achieve successful behavior change dealing with an individual’s readiness to change behavior is counselling based on the Stages of Change Model. The theory behind is based on the notion that individual’s progress through different stages: pre-contemplation, contemplation, preparation, action and maintenance (124-127). The quality of motivation is important for behavioral change to occur. Motivational interviewing is used as a technique for behavioral change and is based on theories in Stages of Change (128). The aim of motivational interviewing is to help the client to build motivation for change based on the resolution of ambivalence and inconsistencies in their behaviors. The conventional advisory way to induce behavioral change can easily fail when the client does not address his own insight and motivation. On the contrary, motivational interviewing is characterized by factors such as expressing empathy, a patient-centered meeting, supporting self-efficacy, developing discrepancy and working with ambivalence (129). The promotion of autonomous decision making is fundamental when working with behavior change. Deci and Ryan developed another method, focusing on the internalization of motivation according to the self-determination theory – SDT (130, 131). They described three basic psychological needs, i.e. autonomy, competence and relatedness, and stressed the importance of autonomy support, which is a common feature in both SDT and motivational interviewing. In a report it was suggested that “self-determination theory can offer a comprehensive theoretical rationale for understanding the efficacy of motivational interviewing” (132). An intervention study was described with nurses who were educated in SDT method and implementation on diabetics type 2 patients (133), and a study protocol with an intervention based on SDT concerning physical activity for primary care patients with cardiovascular risk was presented (134).

Long-term weight loss was seen among obese individuals if facilitated by autonomy-supportive counselors (135). Encouragement, empowerment, support and a good doctor-patient relationship with empathy were important factors reported in a review of studies concerning the patient perspective with regard to counselling about living habits in the healthcare system (136).

In a long-term weight loss study it was reported that about 20% of the general population achieved success. Success indicators were: engaging in high levels of physical activity, a suitable diet, eating breakfast, self-monitoring body weight, maintaining a consistent eating pattern and catching “slips” (137). Medical triggers were also reported as facilitators of initial weight loss and long-term maintenance (138). A recent study used information, letters and e-mail for patients aged 45-80 years with cardiovascular risk factors but concluded that for empowerment was needed “more behaviorally sophisticated support to increase patient self-management, self-efficacy, and self-esteem” (139). It has been shown that a telephone call sometime after prescription increases compliance both with advice and pharmacological treatment (140).

## Promotion and prevention

The WHO Ottawa Charter conference defined 1986 health promotion as follows: “Health promotion is the process of enabling people to increase control over, and to improve their health”(141). The role of Swedish primary care for prevention was made clear during the 1970s and was further underlined the next decade (142). Based on theories about salutogenesis (4), it was pointed out that pathogenesis seeks to help people from getting worse while salutogenesis is about empowering them to achieve better health creating physical, mental and social well-being (143). One of the major theorists Geoffrey Rose, said:” It’s better to be healthy than ill or dead. That is the beginning and the end of the only real argument for preventive medicine”.

Professional health publications are often concerned with how to avoid, prevent, or treat disease but seldom consider the health aspect. Better health cannot be attained by simply avoiding, preventing, or treating problems (WHO 1986). Health efforts, therefore, should be directed toward creating physical, mental, and social well-being. To guide these efforts, salutogenesis, a theoretical framework about the origins or creation of health, is needed to complement the traditional pathogenesis framework that focuses on the origins and causes of disease. The Antonovsky theory about SOC is a foundation of this work (4) and includes the concept of empowerment (WHO Bangkok 2005). To be called “promotive”, the work shall contain empowerment strategies according to Rappaport, who defined this as “a process by which people, organizations and communities gain mastery over their affairs”(144-146). WHO in the Action Plan 2008-2013 gives examples of “Lessons learned”, which are exemplified by the following: “experience clearly shows that non-communicable diseases, NCD, are to a great extent

preventable through interventions against the major risk factors and their environmental, economic, social and behavioral determinants in the population; a comprehensive prevention strategy needs to blend synergistically an approach aimed at reducing risk factor levels in the population as a whole with one directed at high-risk individuals; even modest changes in risk factor levels will have a substantial public health benefit; more health gains in terms of prevention are achieved by influencing public policies in domains such as trade, food and pharmaceutical production, agriculture, urban development, and taxation policies than by changes in health policy alone". In a rehabilitation process an important goal is to regain function and activity but an overall goal is also to regain and strengthen health although the injury or disease may still remain in a chronic disease or as a sequel to damage. It is often fruitful to apply salutogenic perspectives, such as social support and fulfilling goals for participation in family and society contexts.

# AIM OF THE THESIS

## General aims

The thesis aims to:

- develop a promotive and preventive strategy for lifestyle intervention in the broad arena of PC, built on lifestyle questions to engage motivated individuals needing change.
- explore the association between level of leisure time physical activity and well-being in women in a 32- year perspective
- explore stroke incidence and risk factors in women in a 32-year perspective

## Specific aims

### Study I

To describe a self-administered preventive tool dealing with risk factors for cardiovascular disease and its effectiveness to engage persons in need of life style changes.

### Study II

To evaluate the feasibility of implementing a preventive step-wise primary health care program consisting of a screening questionnaire and a self-administered health profile to engage motivated individuals in need of lifestyle changes. An additional aim was to evaluate the effects after 1 year in a well-defined, primarily urban population attending the primary healthcare.

### Study III

To explore potential effects of physical activity on well-being among women in a population based study with a 32-year perspective.

### Study IV

To study first-ever and fatal stroke in women over 32 years with focus on subdividing by stroke type, to consolidate endpoints and associations with risk factors, both classical risk and others concerning socio- economy and lifestyle.



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# Material and Methods

## Studies I-IV

### Study I Design

#### Study population

Askim is in the southern part of Gothenburg with 22 500 inhabitants at the time of the study. The population is mixed and has a higher proportion of persons with high income and university education compared with Gothenburg as a whole. The patients visiting the publicly funded Askim PCC were representative of Gothenburg, as high-income persons had a relatively higher attendance at private physicians. Participants were attendants aged 18 and 65 years, who during three autumn months had contacted doctors for both planned and acute visits between 9 and 12 morning time.

#### Screening questions

At the reception desk all applicants were given a *screening questionnaire* (appendix 1) (147) to be answered voluntarily and anonymously including eight questions on lifestyle factors, including physical activity, smoking, alcohol intake, mental stress at work and leisure time, and 2 questions concerning dietary habits. The questions were answered with “yes”, “no”, “don’t know”. One question concerning heredity for cardiovascular disease and one about motivation were included at the end of the tool. The latter was as follows: “How much can you engage yourself in changing your lifestyle now considering your life situation (family, work, leisure time hours)?” The answer was expressed in a visual analogue scale (VAS) from 0-100% where 100% expressed maximal motivation. Afterwards the patient could either refuse further participation or ask for a self-monitoring health profile.

#### Self-monitoring health profile

The *self-administered health profile* (appendix 2) has been described (147). It consists of 6 separate folders dealing with lifestyle as follows: smoking, alcohol habits, physical activity, dietary habits, stress, living conditions (one for employed and one for job seekers) and one concerning WHR and one well-being expressed as a life ladder, present and future. The latter is measured by a VAS (1-10, 10=best). The folders concerning stress and living conditions have been added upon demand by participants in an earlier pilot study (147). The results from the questionnaires were converted into a health profile comprising eight variables. Seven of these are classified as “good”, “less good” or “risk” corresponding to a green, yellow or red field,

respectively. This gives an overview of lifestyle risk factors in the form of a health profile. The folder concerning living conditions (appendix 3) consists of questions constructed from the demand-control model - DCM (148). For employed persons a total of 21 questions were used, i.e. 12 questions relating to the working situation and 9 to relations and social network. For unemployed persons a total of 22 questions were used, i.e. 14 related to unemployment situation and 8 to relations and social network. Points are counted under the headings “demand”, “lack of control” and “support”. Only the sum of points regarding “demand” load is noted in the risk group. The proportion of points concerning lack of control influences the risk. Support is a well-known modifying factor and the higher the points on support the less the risk of burden and vice versa. For mental stress there were 16 questions, i.e. five concerning experience of stress and 11 concerning stress-related physical symptoms in the body. The grading is 0-3 points and refers to how often these symptoms were experienced. In the health profile each folder ends with simple information concerning how to change to better habits. The results of the calculations are transferred to the health curve and the participant is faced with two questions: “I should like myself to change” What? How? and “This I need help with” What? How? For those in need of help, different competencies in the team at the PCC were available and also activities in collaboration with the municipality.

The participants were informed that they would be contacted by phone after six months and followed up after one year with a new health profile. The screening questions and the self-monitoring health profile were instruments used for both intervention and assessment

## **Study II Design**

An intervention study was conducted in a naturalistic context using a screening questionnaire offered to consecutive patients, followed by a self-administered health profile and a health dialogue.

### **Study population**

Hisingen, the fourth largest island in Sweden, had 130 033 inhabitants at the start of the study and is located in Gothenburg, the second largest city in Sweden. The demographics of Hisingen are representative of Gothenburg as a whole, with both high-income and low-income populations and high morbidity in some areas. The study population included men and women between 18 and 79 years of age, who visited the eight publicly funded PCC:s during a period of eight months with a break in June, July, August and one month around Christmas. The goal was to reach all patients attending the PCCs including contact for acute disorders or for planned visits to GPs and

other staff. The study was carried out with an extra-resource consisting of one health educator at each PHC and a process leader (the respondent)

### **Screening questions**

The *screening questionnaire* was modified from that used in paper I. One question was added concerning consumption of sweet products. The answers to the question on readiness to change were converted to five response alternatives ranging between “not at all” to “very much”. A final question was added: “Are you interested in a self-administered health profile, followed by a health dialogue, a blood pressure and a blood sugar check-up?” The questionnaire was distributed at the reception desk to all individuals aged 18-79 years attending the PCCs.

### **Self-administered health profile**

The *self-administered health profile* was the same as that described in paper I. The self-administered health profile was used to introduce a pedagogic component of reflection and motivational thoughts. The participants own reflections are facilitated by immediate feedback when possibilities for lifestyle changes can be presented and contact for further health dialogues can be offered.

When using the instrument for assessment of baseline data and follow-up we used the dichotomized variable “good” versus “not so good/risk”

### **Survey questions**

*Survey questions* from the Gothenburg population studies were used. Leisure time physical activity groups were classified: “low”, “intermediate”, “high”, and “very high” (149, 150). The general well-being question was: “How do you feel about your health situation (well-being)?” (15, 151). The variable well-being was dichotomized, 1-3 corresponded to “good” and 4-7 to “poor”. Mental stress was assessed with a single-item questionnaire (152, 153) where the six answer alternatives were dichotomized and “no stress” corresponded to “never felt stress” and “one period but not during the last 5 years” and “period of stress” corresponded to “one period during the last 5 years”, “several periods during the last 5 years”, “persistent stress during the last year” and “persistent stress during the last 5 years”.

### **Biological variables**

*Biological variables* were measured as follows: systolic and diastolic pressure, capillary p-glucose, weight, BMI, WHR and waist circumference.

### **Health dialogue**

*Health dialogue* was based on the individual’s responses to the health profile. The dialogue lasted for 20 minutes to 1 hour depending and at the end the patient if necessary had the opportunity to choose among different

programs designed to promote lifestyle change. The participant decided in conjunction with the health educator a way of lifestyle change and was offered relevant components in a broad health promoting program. The common goal was to strengthen the individual's own health-promoting activities and also participation in municipal and cultural facilities.

## Study III Design

A longitudinal, prospective population based study of women was started at 1968-69 (154). The sample of participants was obtained from the Revenue Office Register. The sampling method was based on date of birth (women born on day 6,12,18,24 or 30 of each month were invited). During September 1968 to August 1969 1462 women participated in the first examination (participation rate 90,1%) in age strata 38,46,50,54 and 60 years(i.e. born in 1930, 1922, 1918, 1914 and 1908). Follow-up examinations took place in 1974-75, 1980-81, 1992-93, 2000-01 and 2005-06.

### Physical activity indicator and well-being indicator

The physical activity questionnaire was developed for use in population studies in Gothenburg in order to facilitate the description of physical activity at work and leisure time (155). We restricted the analysis to leisure time activity. Four activity groups were classified as follows: low, intermediate, high and very high physical activity. The questionnaire has been found to discriminate activity levels adequately, as compared with maximal oxygen uptake (149). We categorized physical activity into three levels: high including those with very high physical activity, intermediate and low. The well-being indicator was a multi-item questionnaire, the Gothenburg Quality of Life Instrument (GQL instrument) (15, 151) . The instrument was used in the present study during 1980-81 and in the follow-up studies during 1992-93 and 2000-01(151). The instrument was constructed for the assessment of the participant's own perceptions of general well-being and some specified health problems. The question about general well-being was: "How do you experience your health situation (well-being)?" The answers were rated on a Likert-type scale ranging from 1 to 7 with "excellent, couldn't be better" (=1) to "very poor" (=7). The instrument has been evaluated and been proved to have high reliability and validity (151). Degree of well-being was dichotomized as good (scores 1-3) and poor (scores 4-7)

## Study IV Design

A longitudinal, prospective population based study over 32-years with women recruited from the Revenue Office Register in five age strata. The design and population is the same as in paper III.

### Classification of stroke

Stroke was defined using WHO criteria (156). Since 1978 all hospital admissions are registered in the National Patient Register (NPR) and classification is based on the International Classification of Diseases (ICD 8 until 1986; ICD 9 until 1996, ICD 10 since 1997). Principle discharge diagnoses from the NPR were used. Endpoints were defined as fatal (157) or non-fatal ischemic (IS), hemorrhagic (HS), and non-specified (NS) stroke. IS was defined as ICD codes 434 and I63, HS was defined as 431 and I61 and NS was defined as stroke not possible to subtype into IS or HS. Subarachnoid hemorrhage (SA) was excluded. For all cases with unspecified or uncertain NPR stroke diagnoses (432, I62 and 436, I64) medical records including reports from rehabilitation staff, nurses, and CT and MR scans were scrutinized to validate the stroke and specify endpoints (IS, HS, NS). Records were also scrutinized from participants who had 433, 437, 438 and I67, I69 codes. Classifications were made by the first author and a secondary examination by the second author (CB), an experienced stroke neurologist. Specified NPR IS and HS codes were accepted, but ten patient journals chosen at random were examined and none contained diagnostic errors. Transient ischemic attacks (TIA) with ICD codes 435 and G45 were also scrutinized to reveal possible IS among these, and further analyses were made among 433, 434 and I65, I66 to yield possible IS or TIA cases there. Remaining TIA cases were not included in the analyses. Fatal stroke (FS) was defined as death within one month after the stroke without other primary cause of death (157). Death certificates, NPR diagnoses and complementary information from records provided support to ascertain fatal stroke and type when possible.

### Potential risk factors for stroke

The PSWG included medical examinations, questionnaires, anthropometric data (body mass index (BMI) and waist- hip ratio (WHR), blood tests (total cholesterol, s-triglycerides and fasting b-glucose), and blood pressure measures as earlier described in detail (154). Hypertension was defined as  $\geq 160/ \geq 95$  mmHg (each or both) and/or antihypertensive treatment. For comparison with modern guidelines (158), we further subdivided into four blood pressure (mmHg) groups: a reference group ( $<140/ <90$ ), grade 1 (140-159 and/or 90-99), grade 2 (160-179 and/or 100-109) and grade 3 ( $\geq 180$  and/or  $\geq 110$ ). Smoking habits were classified as smokers, ex-smokers and non-smokers. Socioeconomic status was based on women's reported own (or

husband's) occupation. Education was divided into eight levels from elementary school (1) to secondary education (8). Self-perceived mental stress was evaluated on a scale from 0-5: 0=no stress and 5=continuous stress the last five years. In the analyses self-perceived stress was dichotomized such that >3 represented permanent stress during the last year. Leisure time physical activity was classified as "low" (1)," intermediate" (2)," high" (3) and "very high"(4). In the analyses, leisure time physical activity was dichotomized using a cut-off point between 1 and 2, to study effect of inactivity.

## Statistical analysis, Papers I-IV

In Paper I and II for comparison of differences between presumptive participants and non-participants in answering screening questions (affirmative, uncertain or negative), Pearson's  $X^2$  test was used. In Paper I Wilcoxon's signed ranks test was applied when comparing changes between the results of the first health profile at baseline and the second health profile after one year. In Paper II at the 1-year follow-up we recorded improvement, deterioration and no change, compared to baseline. The paired samples t test was used for change in continuous variables, and the Wilcoxon matched-pair signed ranks test was used for change in categorical variables. Pearson  $X^2$  test was used for testing differences between men and women. Logistic regression analysis test resulted in ORs and 95% CI for men and women and for each variable. The OR for improvement was set at one for men, relative to which that for women was expressed.

In Paper III physical activity level was categorized into three levels: high including those with very high level, intermediate and low. Degree of wellbeing was dichotomized into good (scores 1-3) and poor (scores 4-7). A logistic regression multivariate model was used to analyze the associations between physical activity level and well-being. The category with high level was used as a reference group. The following covariates were included in the model: age, BMI, educational level and smoking at baseline. For changes in well-being in relation to changes in physical activity level, logistic regression analysis was used controlling for the same covariates. For each participant, the change in physical activity level and well-being was calculated by subtracting the measurements in 1980-81 and 1992-93 from those in 2000-01, and those in 1980-81 from those in 1992-93. The variables were dichotomized into positive changes (reduced scores  $\geq 1$  step) and negative changes (reduced scores  $\leq 1$  step) and those with positive changes were used as a reference group. Those with no changes (score change=0) were not included in the analysis.

In Paper IV association with stroke incidence risk was estimated by Hazard Ratios (HRs) and 95% confidence intervals (CIs) from Cox regression analyses in multivariate model including as covariates age and baseline data concerning hypertension, blood pressure, BMI, smoking, physical inactivity, cholesterol, triglycerides, mental stress and low education. HRs were calculated for total stroke, IS, HS and FS. Significance was considered at  $p < 0.05$ . Survival time free from stroke was calculated for diabetes, myocardial infarction (MI), atrial fibrillation and hypertension. Incidence was calculated crude and age-standardized per 100000 person-years of first-ever stroke for women in PSWG between 1968 and 2001, using the Gothenburg female population in 2000 as reference. Incidence rates were also calculated for age groups 38-54 and from 55 with 5 year steps from (55-59), up to (85-89) by dividing the number of strokes by the total amount of person years in each age category. Incidence rates were given with 95%CI. To illustrate the non-linear effect of blood pressure level on stroke risk a model-predicted risk of total stroke from a third degree polynomial function of systolic and diastolic pressure with age as covariate was plotted.

## RESULTS

### Low-budget method for lifestyle improvement in primary care (Paper I)

In total 949 screening questionnaires were distributed from the desk and 511 patients returned filled-in questionnaires. Among these 373 (73%) wanted the health profile, 209 (56%) returned the filled-in Health profile and 164 (78%) returned a 1-year follow-up health profile (Figure 1).

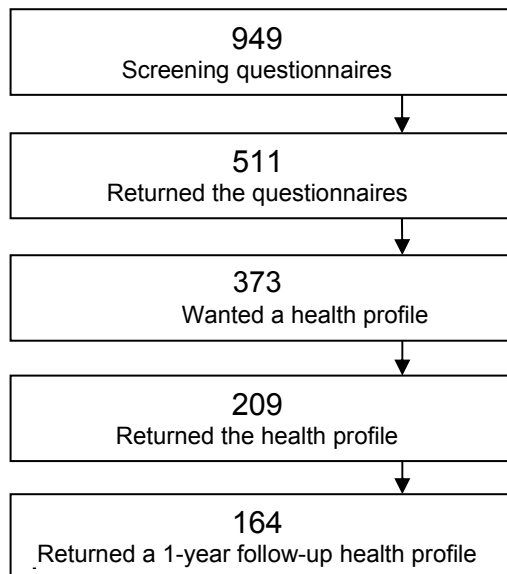


Figure 1. Flowchart of the study participants.

The answers to the screening questionnaires from participants and from those who did not want to participate were compared. Comparisons showed an overrepresentation of subjects who reported a less favorable lifestyle in the participation group. Comparing answers to the screening questions with those in the health profile showed good correlation between them. The results in health profile at 1-year follow up showed improvement in dietary habits, perceived mental stress and level of physical activity.



## Implementation of a low-budget, lifestyle-improvement method in an ordinary primary healthcare setting: a stepwise intervention study (Paper II)

Seventy per cent of the visitors to the PCCs (22 554 patients) were reached by *the waiting room screening questionnaires*, which is the start of the intervention initiating contemplation. Among these, 11 571 returned screening leaflets and among them 67% consented to participate. Among them 3 691 (47%) attended the first health dialogue and 2 120 (57%) returned at the 1-year follow up (Figure 2).

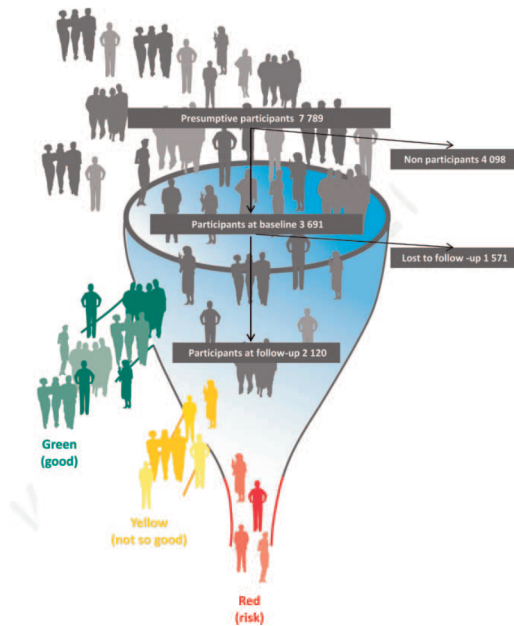


Figure 2. The funnel illustrates the selection process, based on the health profile, with gradually decreasing outflow for green (good), yellow (not so good) and red (risk). It also illustrates the dynamic process whereby the participants, following their own insight mediated through screening leaflets, are identified and offered a health dialogue.

As in study I, we compared the answers from those who chose to participate and those who did not. As in Study I we found statistically significant

differences between presumptive participants and presumptive non-participants in affirmative/uncertain/negative responses to all screening questions except for smoking, with indications of worse lifestyle in presumptive participants. Readiness to initiate lifestyle change was also higher in this group ( $p < 0.001$ ) (Figure 3).

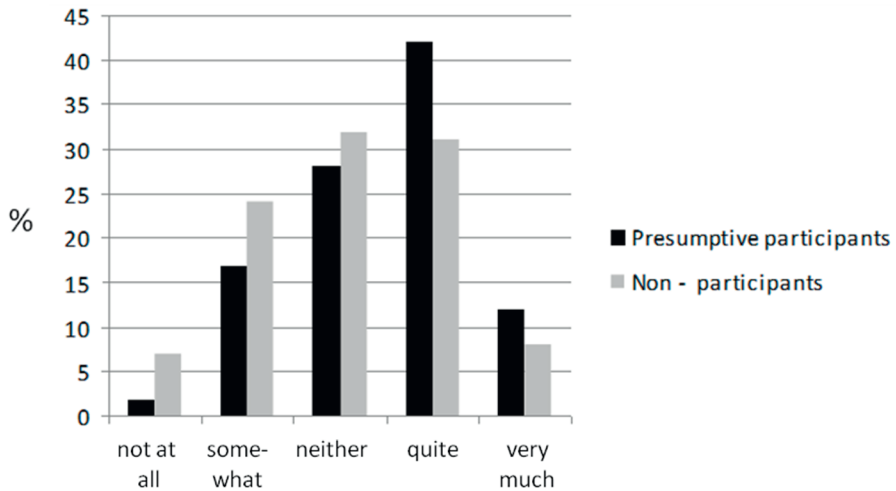


Figure 3. Differences between presumptive participants and presumptive non-participants concerning readiness to undertake lifestyle change. The responses, given in percent, are to the screening question ‘How ready are you to change your lifestyle right now based on your life situation?’. The participants exhibited more readiness to initiate lifestyle change,  $p < 0.001$  (Pearson’s  $\chi^2$  test).

The prevalence of risk defined as one or more self-reported risk factor in screening questionnaire was 96% and only 1% of those wanting to participate reported no risk factor at all.

*Biological* baseline mean values were available from 3 691 participants (1 283 men and 2 404 women) for six age decades. Some results will be mentioned here. Mean waist circumference was  $>100$  cm for men in all age cohorts over 30 years and  $>90$  cm for women over 40 years. For both genders in all age cohorts over 40 years, the mean BMI was  $>27$  kg/m<sup>2</sup>. More than one-third of men in the three youngest age cohorts were smokers and almost one-fourth of women in the same cohorts. Low physical activity was seen in the younger

age cohorts, especially among women. Poor well-being was expressed by more than 50% among women between 18 and 69 years of age and also reported by more than 40% among men.

*Change from baseline at 1-year follow-up* (Table 1) was examined among 2 120 participants. Women had significantly improved all biological variables after 1 year and men improved weight when being obese at baseline, systolic and diastolic blood pressure and p-glucose the latter in cases exceeding 7 mmol/l at baseline. View of current life situation showed improvement in almost 40% among men and women, with improvement in view of life future in one third of men and more than one third in women. Logistic regression analyses revealed a gender difference concerning WHR and physical activity, with women showing more pronounced improvement than men (Table 2).



Table 1 Change in health variables at one-year follow-up compared to baseline (n=2 120). Continuous variables (weight, BMI, waist circumference, waist-hip ratio (WHR), blood pressure and p-glucose) are shown as reduction in mean and SD. The categorical variables: six from the health profile (Hp), three from the survey questions (sq) on well-being, physical activity and stress and two on view of life (Hp) are shown as number improved n (%). Response rate varies due to missing values

Continuous variables	Total (n=2120)	p-value	Men (n=730)	p-value	Women (n=1 390)	p-value
	Mean(SD) reduction		Mean(SD) reduction		Mean(SD) reduction	
Weight (kg)(n=2104)	0.34(4.0)	<0.001	0.28(4.08)	0.069	0.38(3.9)	<0.001
BMI (kg/m <sup>2</sup> )( n=2082)	0.08(1.6)	0.015	0.007(1.69)	0.913	0.12(1.5)	0.002
BMI <sub>≥</sub> 25 (kg/m <sup>2</sup> ) (n=1420)	0.2(1.8)	<0.001	0.065(1.88)	0.425	0.287(1.71)	<0.001
BMI <sub>≥</sub> 30 (kg/m <sup>2</sup> ) (n=533)	0.49(2.0)	<0.001	0.378(1.78)	0.006	0.548(2.07)	<0.001
Waist circumference (cm) (n=1064)	0.78(5.0)	<0.001	0.47 (5.11)	0.070	0.961(4.88)	<0.001
WHR (n=2034)	0.004(0.05)	<0.001	0.002(0.046)	0.245	0.006(0.045)	<0.001
Syst blood pressure (mmHg) (n=2090)	1.03(15.0)	0.002	1.24(14.6)	0.023	0.918(15.19)	0.026
Syst blood pressure (mmHg) ≥140 (n=648)	9.4(16.8)	<0.001	8.33(15.53)	<0.001	10.018(17.55)	<0.001
Diastolic blood pressure (mmHg) (n=2087)	0.93(9.9)	<0.001	1.16(8.8)	<0.001	0.809(10.41)	0.004
Diastolic blood pressure (mmHg) ≥90 (n=366)	8.7(11.0)	<0.001	6.8(8.09)	<0.001	10.12(12.60)	<0.001
Cap.p-glucose (mmol/l) (n= 1986)	0.13(1.5)	<0.001	0.107(1.78)	0.119	0.139(1.38)	<0.001
Cap.p-glucose (mmol/l) ≥7 (n=454)	1.2(2.1)	<0.001	1.09(2.42)	<0.001	1.323(1.75)	<0.001

<b>Categorical variables</b>	<b>n(%)</b>	<b>p-value</b>	<b>n(%)</b>	<b>p-value</b>	<b>n(%)</b>	<b>p-value</b>
Smoking (Hp) (n=2106)	90(4)	<0.001	42(6)	<0.001	48(4)	<0.001
Alcohol (Hp)(n=2104)	120(6)	<0.001	64(9)	<0.001	56(4)	<0.001
Diet (Hp)(n=2098)	480(23)	<0.001	164(23)	<0.001	316 (23)	<0.001
Physical activity (Hp)(n=2091)	364(17)	<0.001	97(14)	0.004	267(19)	<0.001
Living conditions(Hp) (n=1786)	247(14)	<0.001	65(11)	0.020	182(16)	<0.001
Stress (Hp) (n=2103)	234(11)	<0.001	54(7)	0.004	180(13)	<0.001
Well-being (sq) (n=2062)	382(19)	<0.001	115(16)	0.003	267(20)	<0.001
Physical activity(sq) (n=2060)	219(11)	<0.001	72(10)	<0.001	147(11)	<0.001
Period of stress(sq) (n=2066)	544(26)	<0.001	181(26)	0.040	363(27)	<0.001
View of life present(Hp) (n=2047)	791 (39)	<0.001	264(38)	0.002	527(39)	<0.001
View of life future(Hp) (n=2010)	661(33)	0.001	212(31)	0.340	449(34)	0.002

Table 2 The change is shown as improvement or deterioration from baseline to one year follow-up (n=2120) with respect to the following variables: body mass index (BMI), waist hip ratio (WHR), waist circumference, p- glucose, systolic and diastolic blood pressure, smoking and alcohol habits, physical activity and stress. Pearson Chi-square P-values for differences between men and women are shown. The OR shows differences between men and women with age adjustment with men as reference (OR=1).

Variables	Change Men			Change Women			Women	
	Improvement n (%)	Deterioration n (%)	Improvement n (%)	Deterioration n (%)	P	OR	95% CI	
<b>BMI (n=1801)</b>	315 (51)	304 (49)	630 (53)	552 (47)	0,331	0,88	0,72-1,07	
<b>WHR (n=1699)</b>	311 (53)	277 (47)	650 (58,5)	461 (41,5)	0,026	0,80	0,66-0,98	
<b>Waist circumference (n=910)</b>	180 (55)	149 (45)	339 (58)	242 (42)	0,287	0,85	0,65-1,12	
<b>Cap p-glucose (n=1917)</b>	360 (55)	292 (45)	703 (56)	562 (44)	0,881	0,98	0,81-1,18	
<b>Syst blood pressure (n=1717)</b>	327 (55)	269 (45)	584 (52)	537 (48)	0,274	1,11	0,91-1,36	
<b>Diast blood pressure (n=1619)</b>	327 (57)	243 (43)	574 (55)	475 (45)	0,305	1,11	0,90-1,36	
<b>Smoking (Hp) (n=126)</b>	42 (76)	13 (24)	51 (72)	20 (28)	0,566	1,31	0,58-2,96	
<b>Alcohol (Hp) (n=194)</b>	79 (71)	32 (29)	65 (78)	18 (22)	0,260	0,71	0,36-1,39	
<b>Physical activity (Hp) (n=757)</b>	148 (63,5)	85 (36,5)	385 (73,5)	139 (26,5)	0,006	0,64	0,46-0,89	
<b>Stress (Hp) (n=361)</b>	57 (64)	32 (36)	190 (70)	82 (30,1)	0,306	0,77	0,46-1,27	

## **Effects of leisure time physical activity on well being among women: a 32-year perspective (Paper III)**

The distribution of women with different self-reported physical activity levels and level of well-being is shown in table 3. The percentage of women with low physical activity at baseline was almost unchanged at 32-year follow-up; the group with intermediate physical activity decreased during the same period while the group with high physical activity increased.

The three cross-sectional analyses (Table 4), showed association between low physical activity and reported low degree of well-being. The odds ratio (OR) for experiencing poor well-being in the group with low physical activity compared with physically active women was (1980-81) 3.94 (95% CI 2.70-5.74) and similar results were seen in the following cross-sectional analysis. The same trend was seen in the group with intermediate physical activity.

Low physical activity reported at baseline (Table 5) was associated with an increased risk of poor well-being at the follow up 1980-81 and 1992-93, an association that was not seen 2000-01. There was significant association between changes in physical activity and simultaneous changes in well-being during the study periods 1980-01 and 1992-93 and 1980-81 and 2000-01 except for the period 1992-93 and 2000-01. Those with negative change in physical activity showed increased risk of negative change in well-being



Table 3. Distribution of woman with different self-reported physical activity levels as reported for the last 12 months during the years 1968-69 to 2000-2001. Well-being levels from 1980-81 to 2000-01 (data on well-being not available for 1968-69).

	1968-69		1980-81		1992-93		2000-01	
	n	%	n	%	n	%	n	%
Level of physical activity								
Low physical activity	265	18.1	337	29.3	194	23.3	79	15.8
Intermediate physical activity	1029	70.4	585	50.7	407	48.8	290	57.9
High physical activity	164	11.2	226	19.5	231	27.7	129	25.7
Very high physical activity	3	0.2	5	0.4	0	0.0	3	0.6
Total	1461	100	1153	100	832	100	501	100
Level of well-being (scale 1-7)								
7 (very poor)	-	-	10	1	5	1	6	1
6	-	-	37	3	33	4	29	5
5	-	-	221	19	182	22	134	23
4	-	-	209	18	163	20	103	18
3	-	-	410	36	308	38	215	38
2	-	-	165	14	91	11	72	13
1 (Excellent, could not be better)	-	-	90	8	34	4	9	2
Total	-	-	1142	100	816	100	568	100

Table 4. Risk of poor well-being (Likert scores 4-7) in relation to physical activity (women with low or intermediate physical activity as compared with women with high physical activity); cross-sectional observations in 1980-81, 1992-93 and 2000-01 (multivariate logistic regression model including the potential influence of age, educational level, smoking and body mass index).

Level of activity	1980-81		1992-93		2000-01	
	OR	95% CI	OR	95% CI	OR	95% CI
Low	3.94	2.70-5.74	4.01	2.61-6.17	7.17	3.56-14.44
Intermediate	1.83	1.29-2.59	1.45	1.03-2.05	2.34	1.48-3.72
High	1		1		1	

OR, odds ratio; CI, confidence interval. Low and intermediate physical activity is associated with reporting poor well-being.

Table 5. Risk of poor well-being (Likert scores 4-7) in the follow-up analyses based on physical activity as reported in the baseline study in 1968-69 (multivariate logistic regression model including the potential influence of age, educational level, smoking and body mass index).

Level of activity	1980-81		1992-93		2000-01	
	OR	95% CI	OR	95% CI	OR	95% CI
Low	2.09	1.31-3.34	2.74	1.56-4.83	1.49	0.77-2.88
Intermediate	1.31	0.88-1.95	1.54	0.97-2.46	1.05	0.63-1.73
High	1		1		1	

OR, odds ratio; CI, confidence interval. Low physical activity was associated with reporting poor well-being 12 and 24 years later.

## Stroke incidence and association with risk factors in women (Paper IV)

### Stroke incidence

Of the 1460 women, 184 (12.6%) had a first-ever stroke during the 32 years of follow-up in this study: 138 (9.5%) IS, 25 (1.7%) HS, 21 (1.4%) NS. Table 6 shows age cohort incidence. Out of 19 TIA cases according to the NPR, five were changed to IS through the validation process. Age standardized incidence rate was 4.48 per 1 000 person years. Incidence rate increased with age as seen in Table 7, and in the group 80-84 years the incidence rate was 7-fold higher than in the group 60-64 years. Fatal first-ever strokes constituted 33 cases, with a total stroke mortality of 48 cases: 18% of the incident strokes were fatal (9 % of IS, 52% of HS and 33% of NS). Using death certificates and NPR, 74 cases were scrutinized, whereby 16 could initially be dismissed as stroke diagnoses, and 10 cases had another more probable diagnosis (1 MI, 4 dementia, 1 status epilepticus, 1 diabetes, 3 heart failure).

### Validation of unspecified or uncertain diagnoses

Unspecified diagnoses constituted 68 strokes i.e. 37% of total strokes. The validation process specified these as 42 IS, 1 HS, 3 SA, and 1 as Parkinson's disease. Due to lack of medical confirmation, 21(11%) strokes remained classified as NS. Table 8 shows the changed diagnose codes for the period 1992-93 – 2000-01.

### Potential risk factors

Age-adjusted HRs of potential risk factors for stroke and fatal stroke are shown in Table 9. All variables except cholesterol and mental stress showed significant association with either ischemic stroke, total stroke or both. The smaller HS group showed significant association only with physical inactivity. Blood pressure, WHR, smoking and physical inactivity had significant associations with fatal stroke. Multivariate Cox regression analysis (Table 10) found significant associations between IS and BMI, smoking and low educational level. Hypertension was significantly associated with total stroke, but the association between IS and hypertension did not reach significance (HR 1.50, CI 0.99-2.27). The association between HS and physical inactivity remained significant. Smoking, BMI and physical inactivity significantly increased fatal stroke HR.

Analysis of association between risk of stroke and blood pressure levels showed association with blood pressure levels. Systolic hypertension, 140-159 mm Hg, corresponding to grade 1 was not significantly associated with increased risk of stroke, whereas systolic hypertension, 160-179 mmHg, corresponding to grade 2 showed a small non-significant increase (HR1.35, CI 0.81-2.27). In contrast, systolic hypertension  $\geq$ 180 mmHg corresponding to grade 3 showed a significantly higher risk of stroke compared to

the reference group (HR 2.73, CI 1.62-4.60). Diastolic hypertension 90-99 mmHg, corresponding to grade 1, was significantly associated with increased risk of stroke (HR1.41, CI 1.00-1.97) as was grade 2 hypertension 100-109 mm Hg (HR 1.65, CI 1.02-2.67) and grade 3 hypertension  $\geq 110$  mm Hg (HR 2.02, CI 1.05-3.89). The reference group was normotensive, i.e.  $<140/<90$  mmHg. Analysis between stroke risk and continuous blood pressure level showed a significant linear association with diastolic pressure, but a deviation from linearity was seen for low and high systolic pressure (Figure 4). When comparing the risk of having one of the blood pressure levels increased with both systolic and diastolic pressure levels increased the analysis showed significantly increased risk when both pressures were increased: grade 1 hypertension (HR1.62, CI 1.17-2.25) and grade 2 hypertension (HR 1.85, CI 1.19-2.88).

The prevalence of medication for hypertension at any time during the follow-up period was 30% higher in the group with grade 1 hypertension at baseline compared with the reference group  $<140/<90$  mmHg at baseline.

32-year survival analyses show significantly increased time free from stroke in individuals without concurrent diabetes ( $p<0.001$ ), atrial fibrillation (AF) ( $p<0.001$ ), and baseline hypertension ( $p=0.001$ ) but not for myocardial infarction (Figure 5).

Table 6. Incidence of non-fatal and fatal stroke during a 32-year follow-up of women aged 38 to 60 at baseline 1968-69.

Year of birth	Age at baseline	Type of stroke	First- ever stroke						Total mortality from stroke	
			Non-fatal		Fatal		Total		n	%
			n	%	n	%	n	%		
1930 n=372	38	IS	7	1.9	0	0.0	7	1.9	0	0.0
	38	HS	1	0.3	0	0.0	1	0.3	0	0.0
	38	NS	1	0.3	0	0.0	1	0.3	0	0.0
	38	Total	9	2.5	0	0.0	9	2.4	0	0.0
1922 n=431	46	IS	46	10.7	4	0.9	50	11.6	7	1.6
	46	HS	3	0.7	4	0.9	7	1.6	6	1.4
	46	NS	2	0.5	1	0.2	3	0.7	2	0.5
	46	Total	51	11.9	9	2.1	60	13.9	15	3.5
1918 n = 398	50	IS	45	11.3	5	1.3	50	12.6	8	2.0
	50	HS	4	1.0	4	1.0	8	2.0	4	1.0
	50	NS	3	0.8	1	0.3	4	1.0	3	0.8
	50	Total	52	13.1	10	2.5	62	15.6	15	3.8
1914 n = 180	54	IS	21	11.7	3	1.7	24	13.3	3	1.7
	54	HS	3	1.7	1	0.6	4	2.2	2	1.1
	54	NS	2	1.1	5	2.8	7	3.9	8	4.4
	54	Total	26	14.4	9	5.0	35	19.4	13	7.2
1908 n = 79	60	IS	6	7.6	1	1.3	7	8.9	1	1.3
	60	HS	1	1.3	4	5.1	5	6.3	4	5.1
	60	NS	6	7.6	0	0.0	6	7.6	0	0.0
	60	Total	13	16.5	5	6.3	18	22.8	5	6.3
Total n = 1460	38-60	IS	125	8.6	13	0.9	138	9.5	19	1.3
	38-60	HS	12	0.8	13	0.9	25	1.7	16	1.1
	38-60	NS	14	1.0	7	0.5	21	1.4	13	0.9
	38-60	Total	151	10.3	33	2.3	184	12.6	48	3.3

Table 7. Stroke incidence calculated for age groups from 38-54 over five year intervals to 85-89 years. Incidence rate per 1.000 risk years with 95% Poisson confidence interval.

Age interval	Incidence rate	Confidence interval
38-54	0.41	0.13 - 0.95
55-59	0.15	0.004 - 0.84
60-64	2.35	1.34 - 3.81
65-69	4.04	2.64 - 5.92
70-74	10.84	8.07 - 14.25
75-79	15.75	11.83 - 20.55
80-84	17.48	11.08 - 26.22
85-89	33.61	14.51 - 66.23
Total	4.40	3.79 - 5.08

Table 8. The validation process changed the diagnose codes for the period 1992-93 – 2000-01 as shown below. 14 codes out of 56 remained NS.

Unspecified codes	434 IS	I63 IS	431 HS	I61 HS	430 SA	Stroke NS	332 Parkinson	Total
433	2					1		3
436	16				1	8	1	26
I62						1		1
I64		5				2		7
I67		2			1			3
437	4					1		5
438	4		1		1	1		7
I69	1	3						4
Total	27	10	1		3	14	1	56

Table 9. Cox regression analysis including potential risk factors for stroke at baseline. Hazard ratio (HR) with 95% confidence interval for stroke compared with women who had no stroke during the 32 year follow-up period, with age as background variable

Variable studied	Fatal and non-fatal stroke						Fatal stroke	
	Ischemic		Hemorrhagic		Total		HR	95% CI
	HR	95% CI	HR	95% CI	HR	95% CI		
<i>Baseline data</i>								
Systolic BP	<b>1.01</b>	1.00-1.02	<b>1.01</b>	1.01-1.03	<b>1.01</b>	1.00-1.02	<b>1.02</b>	1.00-1.03
Diastolic BP	<b>1.02</b>	1.00-1.03	1.02	0.99-1.06	<b>1.02</b>	1.01-1.03	<b>1.03</b>	1.01-1.06
BMI	<b>1.08</b>	1.03-1.12	1.02	0.92-1.13	<b>1.06</b>	1.02-1.10	1.06	0.97-1.16
WHR	<b>1.41</b>	1.02-1.94	1.16	0.54-2.49	<b>1.39</b>	1.06-1.83	<b>2.30</b>	1.31-4.03
Smoking	<b>1.64</b>	1.16-2.31	2.05	0.91-4.57	<b>1.75</b>	1.30-2.36	<b>4.92</b>	2.33-10.40
Hypertension	<b>1.86</b>	1.27-2.74	1.14	0.44-2.94	<b>1.73</b>	1.24-2.41	1.75	0.82-3.73
Phys inactivity	1.35	0.99-1.85	<b>2.15</b>	1.04-4.43	<b>1.49</b>	1.14-1.96	<b>2.41</b>	1.28-4.54
Cholesterol	1.06	0.94-1.19	0.70	0.46-1.05	1.01	0.89-1.14	1.04	0.79-1.37
Triglycerides	<b>1.30</b>	1.08-1.56	0.82	0.35-1.94	<b>1.28</b>	1.08-1.52	1.30	0.86-1.98
Mental stress	0.69	0.30-1.56	1.18	0.28-5.04	0.68	0.33-1.38	1.40	0.43-4.61
Low education	<b>1.24</b>	1.07-1.43	0.97	0.77-1.21	<b>1.15</b>	1.03-1.28	1.11	0.86-1.42

Table 10. Multivariate Cox regression analysis including potential risk factors for stroke at baseline. Hazard ratio (HR) with 95% confidence interval for stroke compared with women who had no stroke during the 32 year follow-up period

Variable studied	Fatal and non-fatal stroke						Fatal stroke	
	Ischemic		Hemorrhagic		Total		HR	95% CI
	HR	95% CI	HR	95% CI	HR	95% CI		
<i>Baseline data</i>								
Age	<b>1.11</b>	1.08-1.15	<b>1.19</b>	1.10-1.29	<b>1.14</b>	1.10-1.17	<b>1.21</b>	1.13-1.30
Hypertension	1.50	0.99-2.27	0.90	0.31-2.62	<b>1.45</b>	1.02-2.08	1.43	0.63-3.23
BMI	<b>1.07</b>	1.02-1.12	1.06	0.95-1.19	<b>1.05</b>	1.01-1.09	<b>1.11</b>	1.00-1.22
Smoking	<b>1.78</b>	1.23-2.57	2.06	0.86-4.89	<b>1.86</b>	1.35-2.56	<b>5.68</b>	2.54-12.71
Phys inactivity	1.22	0.88-1.70	<b>2.18</b>	1.04-4.58	<b>1.38</b>	1.04-1.83	<b>2.23</b>	1.16-4.26
Cholesterol	0.92	0.78-1.08	0.71	0.46-1.10	0.88	0.76-1.03	1.02	0.72-1.46
Triglycerides	1.29	0.92-1.81	0.81	0.29-2.23	1.30	0.97-1.75	0.86	0.39-1.91
Mental stress	0.73	0.32-1.65	1.11	0.26-4.74	0.69	0.34-1.40	1.29	0.39-4.29
Low education	<b>1.17</b>	1.01-1.35	0.95	0.76-1.20	1.10	0.98-1.23	1.04	0.81-1.34

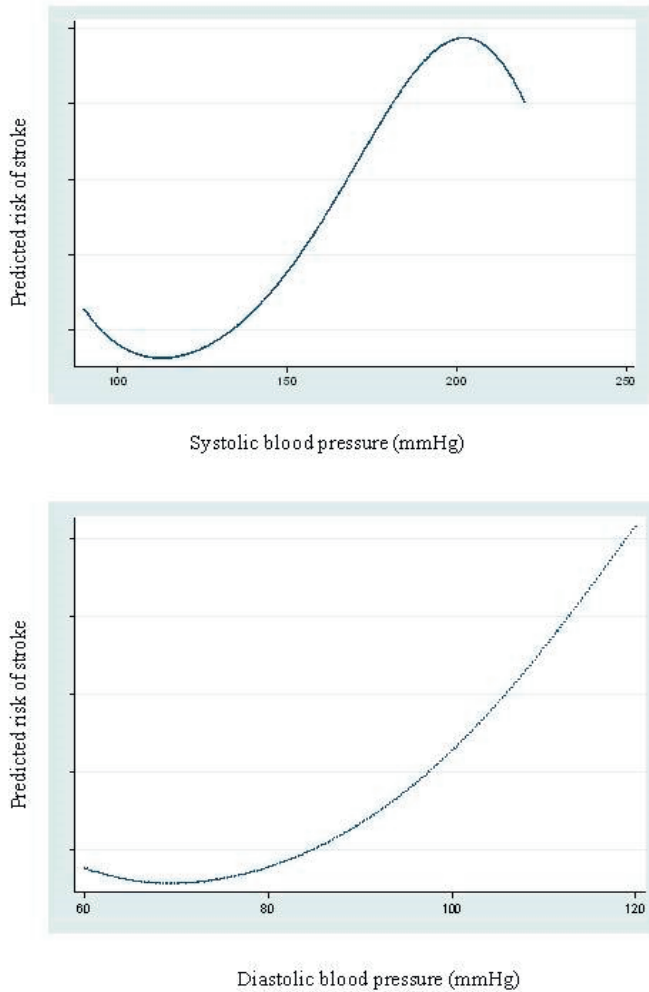


Figure 4. Plots for the model-predicted risk of total stroke from a third degree polynomial function of systolic and diastolic blood pressure with age as covariate.



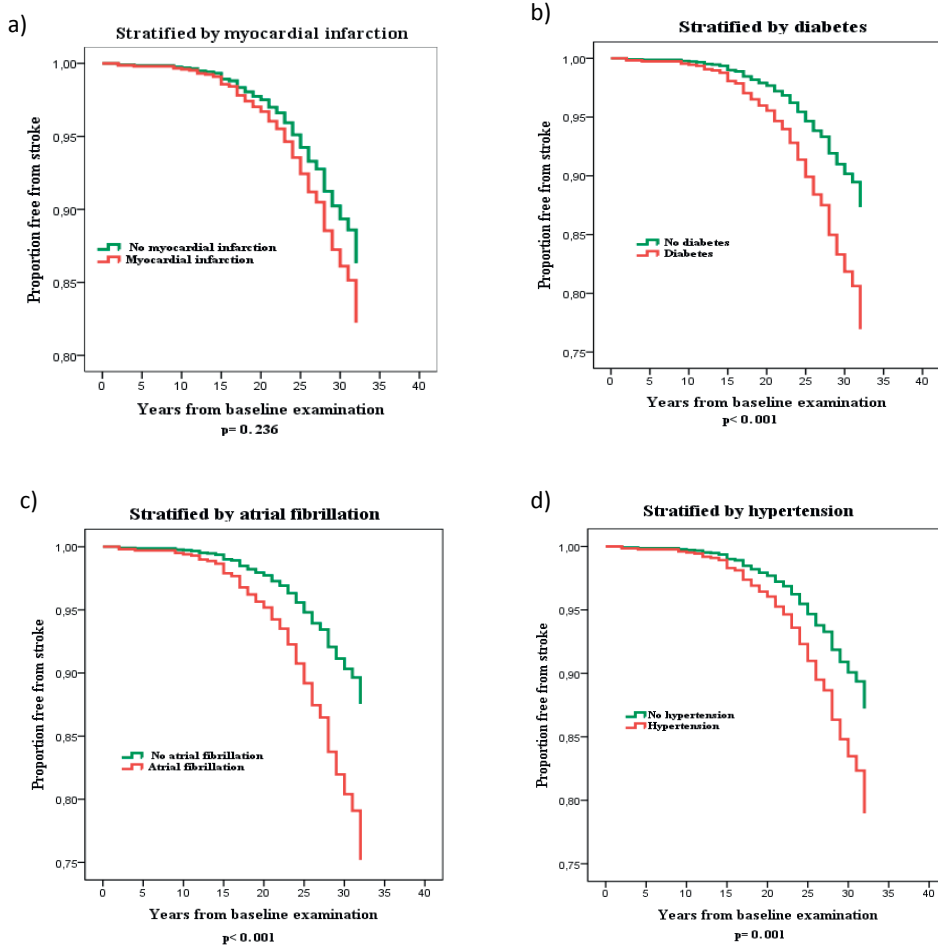


Figure 5. 32-year survival curves, based on Cox regression analysis of stroke with and without myocardial infarction, diabetes, atrial fibrillation and baseline hypertension respectively.

## DISCUSSION

### Main findings

In study I and II we saw that it was feasible to use an instrument that can reach motivated individuals in the need of lifestyle change. A simple screening method was possible to develop. The one year follow-up after intervention showed positive changes concerning biological markers as well as for lifestyle factors. Uncontrolled blood pressure and blood sugar levels were detected. The method gave structure to the promotive and preventive work at the PCCs. It also stimulated the participant's own activity and coordinated the interaction with special resources in the PCC and the community. The applicants at the PCC wished to be consulted about their health. Most of the participants started lifestyle changes with or without coaching and only 4% were referred to their GPs. Implementation of the method was feasible and did not require much extra resources.

In study III data from the PSWG, a prospective longitudinal study of women reported association between level of physical activity at baseline and perceived health over three decades. A shift towards increased physical activity resulted in better perceived health.

In study IV, using data from the PSWG, it was concluded that it was possible to improve diagnostics in subtypes of stroke. A high and increasing incidence of stroke was seen with ageing. Furthermore an association was seen with hypertension over time but no association was seen with systolic hypertension grade 1- 2 and stroke, while diastolic pressures grade 1-3 showed associations and particularly when combined with systolic hypertension. BMI and smoking were significantly associated with stroke. Survival analysis showed that atrial fibrillation, diabetes and baseline hypertension had a strong influence on time free from stroke, which was not seen for myocardial infarction. The incidence of stroke over 32-years among women was comparable with other studies.

### Methods for lifestyle intervention (study I and II)

***What is new:** The two studies explore feasibility and implementation of a promotive and preventive strategy in an ordinary primary care setting. It is built on the theories of "stages of change", respecting the individuals' present situation. A stepwise program is based on behavior change, own reflection, own responsibility and concern for further participation in parts of the program and uses few extra resources and no extensive laboratory screening.*

PC is an appropriate arena for promotive/preventive strategies (67). A method based on the theoretical framework from "Stages of Change" (125-127) was tested as the pilot project "Göteborg Health Profile Project" at Askim's PCC (Study I) and in a broader approach in Hisingen, "Hälsolyftet", at eight PCCs (Study II). Study II confirmed the

findings shown in the pilot study; i.e. that it was possible to reach motivated individuals with unhealthy lifestyle with a swift screening questionnaire, named “lifestyle questions”, when presented to the patients. This is the first part of the intervention, offering participation in a health-promotion program. Thus, it is not aimed at screening for risk factors, but rather at opening the patient’s own mind concerning health improvement. The name “screening questions” might be misleading and is never used in patient work or in education about the instrument. Baseline data from study II showed that negative life style factors were common not least in younger age groups. The strength of the study was the setting in an ordinary primary care context with a large number of participants. The stepwise design was to facilitate the individual’s own thinking in a context in which more extensive health dialogue could be offered. The target group was unselected and not limited to research criteria. Furthermore the feasibility in a regular primary care context and the design allowed for knowledge transfer about structure and performance monitoring the staff, which was the aim of the study

The “Göteborg Health Profile Project”, i.e. the pilot methodological study (study I), was developed in collaboration with the Askim municipal district, PC Gothenburg, Social Insurance Agency and university. Primary care psychology and competencies in multifactorial psychosomatic work were developed in collaboration with Professor em. Sven Carlsson, Department of Psychology, Gothenburg University. When our method was implemented at Hisingen under the name of “Hälsolyftet” [www.allmanmedicin.gu.se/halsolyftet](http://www.allmanmedicin.gu.se/halsolyftet), an important consideration was that politicians, PCC leaders, community facilities and university were tightly involved and supportive. Further a well-organized network for health promotive work was established there.

Large and well-designed studies in Sweden targeting cardiovascular risk factors in the population via a PC perspective have shown that intervention can be successful. The large Västerbotten Intervention Programme (VIP) is integrated in ordinary PC structures and has long follow-up over two decades. VIP is supported from county politicians and health care providers. Furthermore it is designed to involve multidisciplinary collaborations and coupling to the University of Umeå and the manual has been updated regularly according to international and national guidelines (106, 107, 159). Also, the Live for Life health promotion program in the former County of Skaraborg was integrated into an ordinary PC setting and showed beneficial effects on cardiovascular risk factors and mortality (108, 111, 160). Furthermore it was reported that an individual health dialogue supported by a global health and risk assessment pedagogic tool seems to be more effective than a community health strategy only (112).

A systematic review of randomized and controlled trials of various lifestyle interventions showed overall positive effects both regarding secondary prevention of morbidity and mortality and regarding the primary prevention of risk factors, especially when the intervention was multifactorial. The authors emphasized a need for standardized ways of describing interventions and outcomes to facilitate effect-size evaluations (161). A randomized and controlled study of PC multi-professional teams for intervention in adults with existing cardiovascular disease or multiple risk factors showed decreased risk levels

in both the intervention and the control groups. The intervention group had a non-significantly better effect concerning risk factors and the authors stressed that long-term follow-up studies are needed (162).

We used the primary care arena for all applicants to initiate behavior change and assumed that our screening questions would make people prepared for changes (127). This assumption is supported by our results in study I and II showing that those patients who reported most negative lifestyle and/or heredity for vascular disease chose to participate. It should be mentioned that self-report on population level in order to select individuals at risk for cardiovascular disease can be questioned when awareness of a medical problem is low, as for hyperlipidemia and in this study also for hypertension in women. Overweight was the variable where self-report yielded the most accurate selection (163). Low awareness about hypertension and its treatment was also reported from the Skaraborg Hypertension project (114). Our method with the introductory lifestyle questions were chosen to obtain a patient-centered approach, thereby awakening the person's own thoughts about lifestyle and not about medical diagnoses. It is within this context of interest to note that the question about heredity seemed to play an important role for the patient's decision to participate.

Our instruments are intended to initiate the individual's reflection and to stimulate thoughts about own lifestyle factors and not primarily to measure different life style components. The screening questions were constructed as negative statements in order to stimulate an immediate short reflection. They were deliberately constructed to initiate thoughts concerning lifestyle and also concerning the sometimes hidden worry regarding heredity, which is my strong empiric impression from clinical work in PC. In a primary prevention study conducted in midwestern USA, a web based self-administered tool, "Family Healthware", was used to assess family history-based risk for coronary heart disease, stroke, diabetes and some cancer forms in order to personalize a prevention plan. The study underlined that family history is a risk factor for many common chronic diseases, yet it remains underutilized in primary care practice (164). The same group used the tool to provide personalized risk-tailored messages compared to a control group where the patients received an age- and sex-specific health message related to lifestyle and screening. The authors concluded that messages tailored to an individual's familial risk for 6 common diseases modestly increased self-reported physical activity and fruit and vegetable intake but reduced the likelihood of receiving cholesterol screening (165). Participants' ratings of their risk for developing common diseases, before feedback on familial risk, parallels but is often lower than their calculated risk based on family history. Having a family history of a common disease did not change the perceived ability to prevent the disease (166).

Perceived risk and worry was influenced by family history for diabetes, heart disease and stroke separately and particularly in combination. The authors stressed the need for tailored lifestyle interventions for these groups (167). Further, a goal was to ask the

patient about readiness for change in the same short instrument in order to reach motivated persons and to facilitate the motivational process. For this reason the motivation question is formulated to give the patient the opportunity to reflect about readiness for change in relation to current life circumstances. Under stressful life-situations a straightforward advice concerning risk for future disease the advice can be rejected. A qualitative study of participants with elevated cardiovascular risk score in a PC health screening project showed that the consequences and health advice from the doctor are not always interpreted as intended by the medical culture (168). We saw a significant association between answers to screening questions and calculations in the health profile.

The next step for patients who chose to participate was to accept the offer to continue to the self-administered health profile and health dialogue. The health profile is a pedagogic tool with immediate feedback and can stimulate to actively fulfill a health dialogue with an expert, health educators or district nurses. The filtering process as illustrated by the “funnel” for selection shows referral to adequate therapeutic level such as self-care, advice, team-based interventions or further medical examinations. In the initial phase many colleagues were worried that the procedure might generate more low-priority consultations. This did not occur and only 4% was referred to their GP because of earlier unknown hypertension or diabetes or uncontrolled hypertension. The reasons were checked through personal communication. Regular meetings were held between me as process leader and the staffs at the PCCs as well as frequent sessions with the health educators and involved district nurses. The weighting of the calculations in the health profile corresponds to knowledge concerning risk regarding smoking, alcohol consumption, level of physical activity, and WHR. The components of the health profiles were initially derived from the Live for Life program started in Habo (169) and modified to include just three levels instead of four, which was difficult for patients to judge according to our experience when testing the instruments (147). Concerning stress and “living conditions” the weighting was based on clinical and scientific experience. Although the weightings are arbitrarily set they were decided after thorough discussions within the project group to get the quantification reasonable. Stress in this context means self-perceived stress with a list of common stress experiences and a list of common somatic stress symptoms. The patients reported whether they had these different symptoms every day, sometimes a week, sometimes a month or just very seldom. Test-retest of our instruments is not yet systematically studied. The patients were regularly asked to tell if the questions had a good fit with their own judgment of stress perception which they indeed had. Thus the test appears to have good face validity and construct validity but content validity and predictive validity should be studied further.

Self-reported smoking status and alcohol consumptions were reported to show good agreement (170), although this is controversial. Our method is intended to have a holistic approach and psychosocial aspects were integrated (appendix 3 “Levnadsförhållanden”) based on theories of Karasek- Theorell Demand-Control Model (148). This instrument is

also available for jobseekers. It is well known that individuals outside working life are vulnerable due to various social, psychological and medical aspects.

As a consequence of the low budget clinical method we did not use a screening of different biological and anthropometric markers for cardiovascular disease except for WHR in the pilot study I and blood sugar, blood pressure, BMI, waist circumference and WHR in study II. Further, in study II the three new survey questions – well-being, physical activity and perceived stress were added, validated instruments for comparison between baseline and one-year follow-up results and also to compare with epidemiological large studies. We deliberately chose not to include more than very simple biological variables that are valid and cheap to measure. In the Sollentuna prevention program a more extensive screening of biological markers was added particularly concerning blood lipids (118). A later report from this project showed that there is a high level of unawareness of this risk factor as judged from the self-reports (163).

Our filtering process in a stepwise procedure illustrated by the funnel, makes possible to use the first steps in a broad population attending the PCC and in further steps to implement measures for interventions at a deeper level for persons at high risk and motivation for change. In our study we have not made a population search as in the VIP (159) and Live for Life (108, 109) projects among persons not seeking PC. Such a combination is in accordance with the recommendations of Geoffrey Rose, major theorist of prevention. He advocated combined “high risk” and “population-based” strategies (171).

Education is a background factor underlying compliance with treatment programs, both concerning pharmacological treatments and life style interventions. Educational level is also associated with socioeconomic level, occupation and different aspects of life that can play a role for health-related behaviors. Education influences possibilities to get information, to influence and to keep autonomy and self-control (60). Follow-up from the “Hälsolyftet” project is ongoing to study vulnerability based on socioeconomic variables including education (172).

We found that women were more successful than men when it came to change in WHR and physical activity. Sex differences have been reported such as males often being underrepresented in lifestyle interventions (173). Sex differences for overweight and diabetes in generational shifts were seen in the Doetinchem Cohort Study (82). In the large lifestyle intervention program in Skaraborg County several sex differences were described. Women, compared with men, had better dietary habits and lower alcohol consumption but smoked more and experienced greater mental stress and psychosocial strain (169). In the PSWG women showed a trend for increased physical activity, less smoking but a considerably increased self-reported stress in a 36 year perspective (43).

Formal inter- and intra-reliability tests were not performed in the “Hälsolyftet” project. To increase the trustworthiness of the procedure we performed several steps for data catching and managing. Accordingly monthly meetings with the heads of the PCCs and their leader provided the possibility to increase the acceptance and steering of the process. Furthermore regular meetings every fortnight with the health educators/district nurses, responsible for the research logbook were performed to increase the uniformity of the procedure. The project statistician was engaged from the start to secure proper data management and also to continuously check data quality. The input of data was double checked to minimize possible errors and also checked against the primary involved health educators/district nurses. In order to guarantee anonymity for the participant the individual was given a code number unknown to the care units and solely for the research data files at the University unit. All participants received written information about the project’s design and participation was voluntary. The project was approved by the Regional Ethical Review Board (Regionala etikprövningsnämnden i Göteborg, dnr. 007-07).

Lack of time is often expressed as a limiting factor in discussions about systematic work concerning lifestyle issues. The experiences from Göteborg Health Profile Project (I) and “Hälsolyftet” (II) showed instead that the involved personnel felt that making use of different competencies and teamwork was rewarding. Further, the burden upon the doctors did not increase but rather their competence was utilized when participants were shown to have medical problems such as insufficient control of hypertension and/or diabetes. Similarly, the Ebeltoft Health Promotion Project showed that an offer of health tests and patient-centered health consultations to the middle-aged population can be cost-effective (123). Utilization of secondary healthcare did not increase in response to a general health promotion offer. During the observation period a significant decline in annual hospital admission rates was seen (121).

Earlier education of physicians has been dominated by an organ and a disease perspective, while the last decade a more patient-centered and holistic aspect is also included. Engels classic article in Science 1977 proposed a new paradigm with a biopsychosocial model which represents a cornerstone in this field (174). Further, in clinical work more emphasis has been put on care processes and team organizations, such as in care for stroke, dementia, heart failure, cancer and other chronic diseases. Such a shift has also been obvious in many large intervention programs where more focus is put on lifestyle factors and not as earlier dominated by traditional medical risk factors (104, 106, 108, 119). The focus of the present thesis is on reaching and stimulating the patient’s motivation for change and to evaluate a construct for a more person-centered intervention that makes the patient the active part and not as in former time a passive listener to good advice concerning lifestyle factors.

## Physical activity and perceived well-being (III)

*What is new: Exploring long-term effects over 32 years of physical activity level at baseline on perceived well-being, and effects of changed physical activity level on future perceived well-being.*

This study is drawn from data in the PSWG cohorts. It contains both a cross sectional analysis of the relation between low physical activity and reported degree of well-being at the follow-ups (1980-81, 1992-93 and 2000-01) and a prospective comparison between physical activity level at baseline and reported well-being at the above-mentioned follow-ups. The instruments for physical activity and well-being were the same as those used in the survey questions in paper II. Thus, physical activity was rated in terms of four levels, and the instrument is the same as that used in the different population studies in Gothenburg from the sixties validated by Saltin and Grimby (149) and therefore named the Saltin-Grimby Physical Activity Level Scale (SGPALS). The scale has been modernized as regards modern life style particularly concerning computer use (175). In this study relation to cardiovascular risk factor profile was reported. Self-reported physical inactivity (SGPALS level 1) showed higher risk factor profile including self-reported stress (175). The question about well-being was included in the PSWG from 1980-81. It was derived from the questionnaire GQL comprising components of physical and mental well-being and has been reported to be reliable (151).

The initial participants were representative for the Gothenburg female population, also after a long follow-up period concerning mortality, while the less than 10% initial non-participants had lower long-term survival (176, 177). At twelve year follow-up, low leisure time physical activity seemed to be an independent risk factor for stroke, and low physical activity at work was an independent risk factor for overall mortality (178). This is in accordance with a review of evidence concerning physical activity and mortality in women (179). In an investigation of 20 year survival, an initial low level of physical activity as well as a decrease in physical activity between baseline and 6 years follow-ups were predictive for mortality (180). Fitness was a significant mortality predictor in older adults independent of overall or abdominal adiposity (181). Poor fitness in young adults was associated with cardiovascular risk factors but could be modified by improved fitness (182). A Canadian review described strong evidence of the effectiveness of regular physical activity in the primary and secondary prevention of several chronic diseases and premature death. The authors reported that the relation between physical activity and health status appeared to be linear (183).

In a review of prospective epidemiological studies, a dose-response relationship was demonstrated between physical activity and coronary heart disease (CHD), both in men and women and in middle-aged and older persons. Physical activity also appeared to be associated with reduced risk of stroke. The authors concluded that the benefit of continued



regular moderate physical activity such as walking or gardening does not need to be vigorous or sports-related (184).

In study III a strong association was found between level of leisure time physical activity and reported degree of well-being. The results were consistent both regarding cross sectional data and regarding baseline data in comparison with data at 12, 24 and 32 years follow-up. A change in physical activity level was associated with change in well-being over the first two study periods as a further confirmation of the extent of the association. The reason for an association solely over the first two periods could be an increased morbidity and mortality in the low physical activity group, and fewer participants. Increased mortality has been reported in women with a sedentary life style (180, 185). A review found evidence for an association between physical activity and reduced risk of CVD among women in a dose-response fashion. The authors conclude that inactive women would benefit by even a slight increase in physical activity (186). In a review of randomized controlled trials, a similar view was expressed that also low- intensity physical activity when substituted for sedentary behaviors as watching television was beneficial (187). In an Australian study participants wore an accelerometer during seven days to measure interruptions during sedentary time, considered to reflect breaks. Independent of total sedentary time, increased breaks were beneficially associated with some metabolic risk factors and the researchers recommended advice to break up sedentary life (188).

The strong associations seen in study III both in cross-sectional analysis and in the prospective analysis might indicate a causal relationship. This might also be supported by the result that change in physical activity resulted in a change in perceived well-being. However, further studies are needed to elucidate causality. A study from the Netherlands using SF-36 data showed cross-sectional and longitudinal associations, during a five year period, between leisure time physical activity and health-related quality of life. Change in leisure time physical activity was associated with change in social functioning in men and women (189). Although instruments chosen were not the same as in study III, the results were in the same directions, underlining a positive effect of physical activity on health dimensions. Also, the Copenhagen City Heart Study reported a dose-response effect between physical activity and psychosocial well-being, the most pronounced effect being between the low and moderate physical activity groups (190).

A Finnish cross-sectional population-based study showed a relationship between enhanced psychological well-being and regular physical exercise in accordance with our study (191).

The extensive body of evidence that has been accumulated regarding several positive effects of physical activity has resulted in statements concerning knowledge and recommendations. The Centers for Disease Control and Prevention in the USA have gathered information about effects and about levels of physical activities <http://www.cdc.gov/physicalactivity/>. A Canadian report concludes with recommendations

for exercise, including intensity, type, time and frequency and prescriptions of exercise(192).

The Swedish National Institute of Public Health (Folkhälsoinstitutet) published FYSS (Fysisk aktivitet i sjukdomsprevention och sjukdomsbehandling) 2008, Sweden, and an English version in 2010

(Swedish National Institute of Public Health 2010:14). The book FYSS presents the scientific evidence underlying the recommendations for different health conditions and diseases.

## Stroke: subtypes and associated risk factors (IV)

***What is new:** Data about stroke in women in a long perspective - 32 years with high participation rate. Validation of hospital register stroke diagnoses and death certificates to reduce unspecified register diagnoses. Long perspective of risk analysis in prehypertension and relations between systolic and diastolic blood pressure levels and stroke risk in middle aged and older women. Education level data in women from 1968-69 in relation to long term risk for stroke.*

PSWG is a unique longitudinal population study of women in five age strata and here we report data from 32 years of follow-up. A validation process increased subtype diagnoses considerably such that total incidence of stroke was 184 cases (12.6%) and 33(18%) were fatal. Baseline BMI, smoking and low educational level were associated with IS, while smoking was associated with FS. Concurrent diabetes and AF were negatively associated with time free from stroke. Hypertension at baseline was associated with total stroke, but not significantly with subtypes. Stroke risk increased with increasing blood pressure levels when viewed from a perspective of 32 years of follow-up time. Grade 1 systolic hypertension according to modern guidelines did not significantly increase the risk for stroke, grade 2 showed a tendency, while grade 3 showed a strong association with stroke risk. Diastolic hypertension grade 1-3 showed significant and increasing association with stroke risk and particularly combined with systolic hypertension.

### Endpoint analysis

Specification of stroke main types is important since they differ concerning trends, risk factor associations and gender differences. Thus a problem in longitudinal investigation over decades can be that diagnostic methods, criteria for ICD-diagnoses and physicians' awareness of stroke subtyping at hospital discharge from general medicine wards or specialized stroke units vary over time as well as TIA vs. minor stroke diagnoses. Bejot et al showed differences between two large population studies on stroke incidence, the OXVASC and the Dijon studies, which showed that reliance on routine clinical coding

underestimates the incidence of minor stroke. The OXVASC study showed that 56.8% of the incident stroke cases were minor, and 232 out of 375 cases had been ascertained in a TIA clinic (193). Lack of sensitivity in hospital discharge database to identify acute IS was also seen in French hospitals, and therefore the use of hospital diagnoses alone may be problematic. Due to considerable change in diagnostic precision over time, we made considerable effort to revise the NPR diagnoses through validation against clinical data from records and CT images. To avoid investigator biases the diagnoses were set before subtype endpoints were included in the dataset. The validation resulted in a 26% increase of specified stroke cases. A similar validation process was used to define fatal strokes, given low autopsy rate and often vaguely described death certificates. Clinical diagnoses in death certificates are often uncertain (194) particularly for patients dying outside hospitals. Accordingly, information was included from nursing homes, primary care and recent hospital admissions. In Sweden only few acute first-ever stroke cases have received care outside the hospitals even during the late decades in the 20th century.

In the Rotterdam study (195) stroke main subtype was subtyped as HS or IS if CT and MRI showed signs of that, and if no abnormality on CT or MRI, the stroke was classified as infarction. Stroke without neuroimaging was in the Rotterdam study classified as possible hemorrhage or infarction based on symptoms. A possible hemorrhagic stroke was based on sudden hemiplegia or other focal signs with permanent unconsciousness or death within hours, and possible infarction was based on the presence of limited impairment, complete improvement within 72 hours or documented at time of the stroke onset. Despite these definitions they had as much as 37% unspecified strokes compared to our lower figure of 11% after validation. One explanation for this could be that almost all patients in our study had an acute CT and only very few first-ever stroke patients were cared for outside hospital. In a few fatal cases autopsy was basis for subtyping. In the Rotterdam study hemorrhages constituted 9%, infarctions 54% and unspecified stroke 37%. They found incidence rates higher in men than in women over the entire age range and a fatality rate of 32.5% for all strokes, 33.3% for HS and 12.4% for IS (195). In Rotterdam between 1990 and 2008 stroke incidence rates decreased in men but not in women (96).

Our result by validation of TIA and stroke diagnoses are in line with such uncertainties regarding the hospital diagnoses, particularly before stroke patients in Europe were treated in comprehensive stroke units. Furthermore the use of magnetic resonance imaging indicates that young adults with ischemic stroke show a high frequency of preexisting and clinically silent infarcts probably attributable to vascular risk factors (196). In an elderly population white matter disease is common and investigation can reveal neurological symptoms reflecting probable lacunar infarcts (197). Better awareness of the disease and treatment options have probably led to increased referral to hospitals (198).

When validating fatal stroke, we often found vaguely described death certificates, a phenomenon which has been reported earlier (194). The Auckland Regional Community Stroke Studies IV (199) following stroke incidence and trends over

four decades, stress the importance of methodology and outcome descriptions in future population-based studies. Our study reflects four decades backwards and is a population-based study with high participation rate. Our validation process has made it possible to increase specified main types of stroke. It was started before the era of CT and MR as well as long before stroke unit care and diagnostics were current. This has increased possibilities to investigate trends during a period with very large changes in social structure, medical possibilities and attitudes to stroke treatment. Furthermore it increases possibilities to compare with modern prospective studies. The Auckland region has large advantages in terms of limited area and population and well defined population. This important condition is also fulfilled in our study. Furthermore, the Swedish national registers and personal code numbers are advantages as well as the extremely high hospital admission rate for stroke patients and only in public hospitals.

Routine hospital discharge diagnoses have limitations as a sole basis for estimating stroke incident rates. The proportion of “false-positive” stroke diagnoses at discharge may be as high as one-third of all diagnoses of stroke (200). Our validation of diagnoses partly resolved such risks.

### **Stroke incidence and risk factors**

Reported incidence rates vary and comparing rates can be difficult due to different populations, age distribution, hospital settings and end-points (201). Gold standards for studying stroke incidence have been suggested (202). Incidence of IS and stroke mortality have decreased in the elderly people in Sweden but vary in different age strata and by gender and particularly an increasing trend is seen among younger people (203) as in an earlier register report (201). A review of 56 population-based studies between 1970 and 2008 reports differences in secular trends in different countries (204).

In our study we reported an incidence rate of 480 per 100 000 person-years comparable with another study from southern Sweden (205). By calculating incidence for different ages we also found comparable rates with the Rotterdam study (195). As expected, the incidence increased with age and was somewhat higher in the higher age groups compared to rates for women in the Rotterdam Study (195), although the broad confidence intervals in both studies do not allow any conclusions to be drawn regarding true differences between the rates.

Stroke incidence in young people seems to increase (198, 203), and more intense life style intervention is recommended (206). Gender differences and increasing incidence in Sweden between 1989 and 2000 among persons aged 30 to 65 years were shown with data from the Swedish Hospital Discharge Register(201).

Stroke incidence increased by 100% in low to middle income countries but decreased by 42% in high income countries (207). Large population studies show decreased stroke incidence during the last decades (208), but smaller decreases in women (96) and also more severe stroke in women (209). Differences in incidence rates have also been seen between different regions in Sweden (210, 211).

Hypertension is a strong risk factor for stroke (102) and about 28% of incident stroke is attributable to untreated hypertension (212). The results of the multivariate analyses in study IV showed a significant association between hypertension at baseline and total stroke. Seventy-nine percent of participants with hypertension diagnosis were on medication at some point during the 32-year follow-up, and 35% of the total cohort population in the PSWG were at some point on anti-hypertensive medication. Atrial fibrillation was also a strong risk factor for stroke, and increased focus is warranted particularly since women with AF who are not on warfarin treatment may have higher thromboembolic risk than men (213).

The significant association between BMI and IS and total stroke conforms to other studies (214-216), but increased risk for all stroke associated with WHR and, not BMI, has previously been reported (102). Similarly, abdominal obesity was associated with higher stroke risk in both sexes but less pronounced in women (217). WHR measurement in women has been questioned (218) and is controversial. Both BMI and WHR in our study was associated with IS and total stroke and WHR also with fatal stroke. After multivariate analysis BMI was associated with IS, total stroke and fatal stroke. Physical inactivity was associated with HS, total stroke and fatal stroke.

It is of interest that low educational level showed an independent association with IS, despite the lower proportion of well-educated women during 1968-69. Kuper et al showed a gradient by years of education in women; low educational level was associated with smoking and alcohol (219). Earlier studies combining different aspects of socioeconomic status reported associations with stroke (212, 220). In women the relationship was stronger than in men (212). Smoking was associated with total stroke, IS and fatal stroke in accordance with other studies (102).

In a Malmo study geographical differences were found in stroke incidence related to socioeconomic factors. High rate areas were characterized by a higher prevalence of smoking, hypertension, diabetes, and being overweight and by inferior socioeconomic circumstances (221).

Despite limited sample size we could show that smoking, overweight and low educational level could influence future stroke risk beside hypertension. Higher stroke risk was seen for increasing systolic and diastolic blood pressure levels in a long-term perspective. The low risk of grade 1 systolic hypertension (158) in this study is compatible with present guidelines indicating that life style intervention is a number one priority if no other risks are present. Our results strengthen the notion that early evidence-based lifestyle

interventions should take into account women's socio-economic background and educational differences beside classic risk factors.

Middle-aged women from the Australian Longitudinal Study on Women's Health were surveyed every three years. Educational level was associated with increased stroke risk, partially through known lifestyle and biological risk factors (222). The South London Stroke Register shows total stroke incidence decrease over 16 years related to risk factors before stroke. This was however not seen in the younger age groups and black groups. The authors conclude that advances in risk factor reductions failed to be transmitted to younger ages (223).

In the Northern Manhattan study several life style factors have been shown to have strong associations with stroke, such as low physical activity (224) increased blood glucose levels (225), social isolation (226), metabolic syndrome, and sex differences were observed (227).

We found that concurrent diabetes, atrial fibrillation and baseline hypertension were negatively associated with time free from stroke. Lifestyle intervention aimed to improve physical activity level, reduce overweight and risk of diabetes and to support vulnerable individuals can be supposed to reduce risk for stroke. In PC it is of great importance to identify hypertension and atrial fibrillation being strong risk factors for stroke. In prehypertension corresponding to high normal and grade 1 blood pressure levels, it is important to include lifestyle intervention and a follow-up to identify eventual future need for pharmacological treatment.

## Ethical considerations

Ethical approvals for the studies were granted by the regional Ethic Review Board in Gothenburg, Sweden, for study II (Dnr 007-07) and for study III and IV PSWG (Dnr 179-92, S377-99, T453-04, Ö402-99). The women who participated in the Prospective Population Study of Women in Gothenburg were invited to a free health examination by post. Prior to all examinations, the local Ethic Review Board in Gothenburg approved the invitation and information process. The participants were informed that participation was voluntary, could be terminated any time and that confidentiality was guaranteed. The participants were informed by letter about individual results of all examinations. If the participants wished letter with information was sent to the responsible doctor at the PC.

The patients in study I and II who answered the screening questionnaire were all anonymous. In the pilot study the participants were asked if the questionnaires had raised concerns and almost everyone denied this, and just very few indicated concerns although they experienced this as "a positive concern". In study II all patients who chose to participate received written information about the background of the study, the aim and procedures. The patients were also informed that they could withdraw from the study at any time without consequences concerning care. All participants were informed that information concerning them would be handled confidentially. Each patient was coded

with a number and the link between the number and personal data was only known by the coordinator at each PC who received thorough information about absolute confidentiality.

## Strengths and limitations in general

This thesis concerns PC and its role in public health work. Strategies to promote health and prevent illness represent tasks that PC is suitable for performing in cooperation with other societal authorities. WHO addressed similar issues in 2008 : “Primary Care Now More than Ever”(67). A strength is that the program fits well with such ideas. A further strength is that the tested program is based on knowledge concerning positive effects of lifestyle interventions and on the well-known difficulty in applying health promotional methods in the daily clinical routine. Furthermore, the method has a theoretical framework derived from knowledge within the psychology with regard to how to bring about behavioral change and maintain such change. The program is based on the theory “Stages of Change” as well as the health promotion concepts of empowerment, participation and personal responsibility. The individuals who have participated in the program have expressed their positive thoughts concerning the way in which problems related to lifestyle changes are addressed, which is also characterized by autonomy, i.e. the patient’s own decision. Moreover, staff members working with the instruments and the health dialogue have expressed almost without exception the perceived benefits, and also that the method was in fact overall time-saving rather than time-consuming. Another strength is that individuals in need of life style intervention and with motivation to engage in life style change chose to participate in a higher degree compared to the group who did not want to participate. A weakness is that in order to guarantee anonymity we have no information regarding persons who chose not to participate in the initial lifestyle questionnaire. Thus, we cannot rule out that persons in need of lifestyle change can have been excluded. We can also have missed persons with, for example, language barriers. An indication of a positive effect of the patient’s thoughts and efforts concerning lifestyle beyond that of merely choosing to participate was the positive effects upon biological markers, anthropometry and lifestyle from baseline to one-year follow-up. Ninety-eight percent of the participants reported that they valued to have been addressed concerning life style in this way. Generally this is known from other experiences and 80% according to “Vårdbarometern” are positive to discussing lifestyle when visiting health care facilities ([www.vardbarometern.se](http://www.vardbarometern.se)). A weakness is that we can not present data from a planned qualitative analysis of the participants’ and the personnel’s attitudes to the program.

In study I, the pilot study, the study group was drawn from a population with a somewhat higher proportion of persons with high income and university education compared to the population of Gothenburg. However, the aim in this work was to test the feasibility of a program for lifestyle intervention in a small pilot study. In study II the population was larger and representative for Hisingen and more generalizable to a city with mixed population concerning socioeconomic and ethnic background. A strength of the study is that the participants were drawn from a PCC as regards possibilities to adopt a simple program for further application within the PCC arena. However, a weakness in

comparison with a population-based program can also be that it cannot be ruled out that those individuals with other patterns of health care attendance, for example acute visits to hospital, were underrepresented. Results of trials of complex interventions are more generalizable if they are performed in the setting in which they are most likely to be implemented (228). This is an additional strength of our study, which was aimed at examining a method for use in an ordinary PC setting.

A limitation was that this naturalistic study was performed without a parallel control group. Limitations of randomized controlled studies have been discussed in relation to population-based interventions (229). Several difficulties have been raised with regard to psychological interventions (230) and concerning complex interventions (231). Comparison with another primary care area in Gothenburg would have generated confounders such as differences in population and case mix, probably more than in rural areas and smaller cities and municipalities. In Gothenburg the degree of segregations is greater as well as resettlements. Furthermore, inhabitants in larger cities have access to a broader range of care options, sometimes also with multiple medical contacts and less organized teams for prevention and rehabilitation in PC. A dilution effect in complex interventions is also a problem such as population mobility bias (232) which is common within a city.

In paper III a major strength is that the study group from PSWG is representative of the female population in Gothenburg over a 32 year follow-up, and the level of physical activity at baseline was correlated to the reported perceived health at follow up examinations. A change to higher levels of physical activity was also associated with increase in well-being. A major strength is that the PSWG gives an excellent opportunity to study such an association in women at different ages since criteria for inclusion and follow-up at predetermined occasions are rigorously followed to yield both cross sectional data and longitudinal data.

One of the strengths in this work was a uniquely long follow-up period for this type of study and also the high participation rate, i.e. 90%, at baseline. Furthermore, the random sampling of five age cohorts secured representativity of the female population and the birth cohorts were within satisfactory age ranges. Further the drop-out rate is relatively low and after 24 years the participating women were shown to be representative of the entire population (176). However, non-participants, being more unhealthy (177) can have influenced slightly and drop-out due to death can also have led to an underestimation of the association between physical activity level and well-being. A strength is that simple and validated instruments have been used and they did not change over time. It may be a weakness that just one item was used from the GQL instrument although this question has a high internal reliability and consistency with the entire instrument (151).

Concerning study IV the same strengths and limitations are present as in study III concerning the population in the PSWG study. A weakness concerning stroke end points is that diagnostic procedures and precision in subtyping have changed considerably over time. To overcome this weakness a considerable work-up has been performed from all available case notes, i.e. not restricted to the physician's reports but also scrutinizing complete data including information obtained from nurses, rehabilitation personnel and CT examinations, and the research notes from the PSWG. This resulted in a uniquely low level part of unspecified stroke diagnoses. Furthermore, weaknesses always inherent in



diagnoses from death certificates have been minimized through scrutiny of all available notes from hospitals, nursing homes and PCCs. For TIA diagnoses particular re-evaluations showed that a considerable part were, despite the ICD codes from NPR, ischemic strokes and others were transient non-ischemic attacks, such as syncope, vertigo. The trustworthiness of TIA diagnoses was too low to merit inclusion in the study. A strength is the comprehensive battery of investigations of the participants at defined time points during follow-up, which enabled association analysis of hazard rates of stroke in relation to different classical and other risk factors. The analysis of different blood pressure levels enabled a long-term analysis of stroke risk at different stages of blood pressure increase.

## CONCLUSION

- A stepwise program for lifestyle intervention based on a short lifestyle questionnaire, a health profile and a health dialogue was feasible to implement in an ordinary primary care setting. The program captured individuals motivated for and in need of lifestyle changes and was feasible to handle. Improvement at 1-year follow-up was observed among several lifestyle factors and simple biological markers. The results are promising but long-term effects must be interpreted with caution as no parallel control group was studied. The method is feasible for clinical use and for further studies regarding long-term effects.
- Well-being among women in a 32-year perspective was associated with level of physical activity at baseline. Changes in physical activity were also associated with changes in well-being. Increased physical activity in sedentary individuals can promote their well-being
- Validation of hospital discharge diagnoses could reduce the number of questionable diagnoses and non-specified stroke diagnoses in a prospective population study of women in a 32-year follow up. The incidence rates increased considerably with age and were in line with other European studies. Smoking, overweight and low education at baseline influenced future stroke risk. Blood pressure levels corresponding to what is now defined as hypertension grade I were not significantly associated with stroke, but with increasing levels of systolic and diastolic blood pressure, each or in combination, the association increased in strength. Among participants with blood pressure levels at baseline corresponding to grade I with modern terminology, 30% were subsequently during the long-term follow-up treated with antihypertensive medication. The results are in accordance with present guidelines recommending that lifestyle intervention and blood pressure follow-up should be the first option. Early evidence-based lifestyle interventions should target classical risk factors as well as take into account socio-economic factors, educational levels and gender differences

## FUTURE PERSPECTIVES

- to evaluate the program in a larger group and compare with a control group treated according to current experiences and guidelines. Compare results longitudinally combined with cross-sectional analyses, for example, every second year to study the effectiveness of the method. Simple outcome measures should be used such as in this study but could be extended with biological markers, for example, HbA1c for persons with pre-diabetes.
- to study which barriers exist to utilize the potential of teamwork in PC.
- to study whether the method is equally useful for patients born outside of Scandinavia born as for those born in Scandinavia.
- to study drop outs with maintained anonymity. Are there special groups concerning age, gender, and social factors?
- to use qualitative methods to explore participants' narratives concerning how the stages of change for lifestyle intervention came about and what initiated it and which obstacles they experienced
- to use qualitative methods to investigate staff personnel's experiences concerning the health promotive work and if these are associated with age, gender, profession, or the duration of professional experience.
- to study how those who have participated in education concerning health- promotive methodology can apply their knowledge in practical work.
- to compare a group of stroke patients who receive health promotive therapy, for example, tailored physical activity and/or stress management and availability to social activities with a group who receives customary treatment.
- to study further the relations between stroke risk and social and educational factors and to further elucidate risk of grade 1 hypertension in relation to lifestyle factors in a long-term perspective
- to find possibilities to maintain health after retirement concerning sedentary behavior , activity and participation

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# APPENDIX

## FRÅGOR OM DIN LIVSTIL

Appendix 1

### Frågor om din livsstil

Ringa in ditt svar

Är du för lite fysiskt aktiv ..... ja ..... nej ..... vet ej

Röker/snugar du ..... ja ..... nej

Upplever du flera gånger/vecka stress i arbetet ..... ja ..... nej ..... vet ej

Upplever du flera gånger/vecka stress på fritiden ..... ja ..... nej ..... vet ej

Har du känt att du borde skära ner din alkoholkonsumtion ..... ja ..... nej ..... vet ej

Har du problem med sömnen ..... ja ..... nej ..... vet ej

Tror du att du är överviktig ..... ja ..... nej ..... vet ej

Äter du för mycket fett ..... ja ..... nej ..... vet ej

Äter du för litet fibrer ..... ja ..... nej ..... vet ej

Äter/dricker du för mycket söta produkter ..... ja ..... nej ..... vet ej

Finns det hos dina föräldrar och/eller syskon någon

som har sockersjuka, högt blodtryck, eller haft hjärtinfarkt,

slaganfall, kärlkramp i benen ..... ja ..... nej ..... vet ej

Hur mycket kan du engagera dig i förändring av din livsstil just nu med tanke på din livssituation (familj, arbete, fritid osv.) Kryssa i ditt svarsalternativ nedan:

Inte alls

Ganska litet

Varken mycket  
eller litet

Ganska mycket

Mycket



### MIN HÄLSOPROFIL

Inte helt Bra
Bra
Risk

●
●
●
●
●
●
●
●

1. Tobak .....
2. Alkohol .....
3. Kort .....
4. Fysisk aktivitet .....
5. Lärnadsförhållanden .....
6. Stress .....
7. Mjölja-stress mätt .....
8. Livsyn

Neid
Ang
Ang

Framid
Ang
Ang

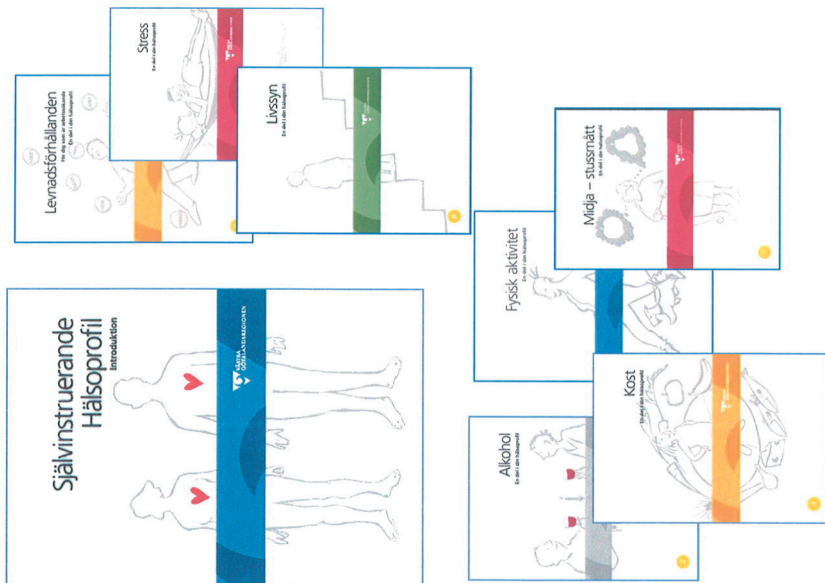
När din Hälsocheck är klar är det dags att fundera på om det är något som du skulle vilja ändra på. Tänk gärna ut här: "vad kan jag göra bättre på" och vad "behöver jag hjälp med".

Detta skulle jag vilja vilja ändra på	Vad?
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

Detta behöver jag hjälp med

Vad?
.....
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.....

När patienten har gjort sin Hälsoprofil hemma överförs resultatet till "Min Hälsoprofil". Patienten får en överblick över sin hälsokurva.



# Levnadsförhållanden

En del i din hälsoprofil



## GÖR DIN EGEN HÄLSOPROFIL DEL 5 – LEVNADSFÖRHÅLLANDEN

## Hur har du det på arbetet och hemma?

Börja svara på frågorna 1–21. Under varje fråga finns olika svarspoäng (p). Dessa poäng för du ut i respektive ruta  under antingen belastning, brist på kontroll eller stöd.

När du besvarat alla frågorna summerar du ihop poängen.

Frågor om ditt arbete:	Belastning	Brist på Kontroll	Stöd
1. Hur många timmar arbetar du per vecka? (alla timmar ska räknas med, även extraknäck) 0–49 tim = 0 p, 50–65 tim = 1 p, Mera än 65 tim = 2 p	<input type="checkbox"/>		
2. Brukar du känna dig jäktad i arbetet? Mycket sällan = 0 p, Några ggr i veckan = 2 p, Nästan alltid = 3 p	<input type="checkbox"/>		
3. Hur tycker du arbetstakten vanligtvis är? Lagom = 0 p, För låg = 1 p, För hög = 2 p	<input type="checkbox"/>		
4. Har du någon möjlighet att själv bestämma arbetstakten? I mycket hög grad = 0 p, Delvis = 1 p, Inte alls = 2 p		<input type="checkbox"/>	
5. Kräver ditt arbete hög koncentration långa stunder i taget? Sällan = 0 p, Ofta = 1 p, Mycket ofta = 2 p	<input type="checkbox"/>		
6. Är dina arbetsuppgifter enformiga? Inte alls = 0 p, I viss mån = 1 p, I mycket hög grad = 2 p		<input type="checkbox"/>	
7. Är dina arbetsuppgifter intressanta och stimulerande? I mycket hög grad = 0 p, Delvis = 1 p, Inte alls = 2 p	<input type="checkbox"/>		
8. Har du möjlighet att påverka din arbetssituation? I mycket hög grad = 0 p, Delvis = 1 p, Inte alls = 3 p		<input type="checkbox"/>	
9. Hur är kontakten och samarbetet med dina närmaste arbetskamrater? Bra = 3 p, I viss mån bra = 1 p, Dålig = 0 p			<input type="checkbox"/>
10. Trivs du bra i din arbetsgrupp? Ja = 3 p, I viss mån = 1 p, Nej = 0 p			<input type="checkbox"/>
11. Finns det olösta konflikter på din arbetsplats? Nej = 0 p, I viss mån = 2 p, Ja = 3 p	<input type="checkbox"/>		
12. Räknar du med att bli arbetslös det närmaste året? Nej = 0 p, Vet ej = 1 p, Ja = 3 p		<input type="checkbox"/>	

## GÖR DIN EGEN HÄLSOPROFIL DEL 5 – LEVNADSFÖRHÅLLANDEN

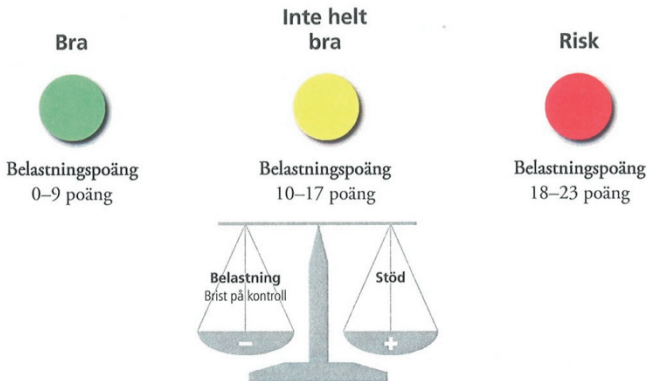
Frågor om dina relationer / kontaktnät:		Belastning	Brist på Kontroll	Stöd
13.	Finns det någon/några du kan anförtra dig åt? Ja = 3 p, Delvis = 2 p, Nej = 0 p			<input type="checkbox"/>
14.	Hur ofta träffar du släkt eller vänner? Flera ggr per vecka = 2 p, Några ggr per vecka = 1 p, Mera sällan = 0 p			<input type="checkbox"/>
15.	Hur stort utbyte har du av att träffa din släkt eller dina vänner? Mycket stort = 2 p, ganska stort = 1 p, inget utbyte = 0p			<input type="checkbox"/>
16.	Kan du styra ditt liv som du själv vill? Ja, ofta = 0 p, I viss mån = 2 p, Inte alls = 3 p		<input type="checkbox"/>	
17.	Deltager du regelbundet i fritidsaktiviteter? Ja, i hög grad = 2 p, I viss mån = 1 p, Nej = 0 p			<input type="checkbox"/>
18.	Är någon som står dig nära allvarligt sjuk? Nej = 0 p, Delvis = 2 p, Ja = 3p	<input type="checkbox"/>		
19.	Har du det senaste året haft anledning att oroa dig för någon annan av dina närmaste p.g.a hög ålder, handikapp som krävt behov eller tillsyn, eller p.g.a. sociala problem som missbruk eller liknande (OBS: gäller ej samma person som i fråga 18)? Nej = 0 p, Delvis = 2 p, Ja = 3 p	<input type="checkbox"/>		
20.	Finns det svårigheter i umgänget mellan dig och någon närstående? Nej = 0 p, Delvis = 2 p, Ja = 3 p	<input type="checkbox"/>		
21.	Utgör ekonomin ett problem för dig? Nej = 0 p, Delvis = 2 p, Ja = 3 p		<input type="checkbox"/>	
<b>SUMMA POÄNG på frågorna 1–21</b>		<input type="text"/>	<input type="text"/>	<input type="text"/>
		<b>(0–23)</b>	<b>(0–16)</b>	<b>(0–15)</b>

Förs över till rätt cirkel på baksidan

## GÖR DIN EGEN HÄLSOPROFIL DEL 5 – LEVNADSFÖRHÅLLANDEN

## Resultat

För att kryssa i rätt cirkel nedan är det endast *belastningspoängen* från första kolumnen du ska utgå ifrån. Resultatet för du över till blanketten "Min HälsoProfil" under rubrik "5 LEVNADSFÖRHÅLLANDEN".



Frågorna du besvarat var uppdelade i tre områden: belastning, brist på kontroll och stöd. Ju högre poäng på belastning och brist på kontroll desto större negativ påverkan på din hälsa. Ju högre poäng på stöd desto större positiv påverkan.

Om din belastningspoäng och brist på kontroll är hög, blir frågan vad kan du göra för att minska belastningen och öka kontrollen? Gå gärna tillbaka och titta på frågorna. Enkla råd och tips följer nedan:

## Tips och råd

- Upplever du ofta problem på arbetet är det bra om du kan tala med dina arbetskamrater eller din närmaste chef, om hur du upplever det. Kanske kan det finnas något som går att påverka, ibland kan det ju vara små saker det gäller.
- Man kan förbättra samvaro/ samhörighetskänslan med arbetskamrater genom enkla saker. Försök att möta blicken, hälsa god morgon, le mot omgivningen, byta några vardagliga fraser. Testa om du märker någon skillnad om du gör så.
- Känner du dig trygg med någon arbetskamrat eller vän, dela gärna dina tankar. Att dela det man känner med någon annan kan vara till stor hjälp. Vi bär alla på upplevelser och erfarenheter. Att tala och att lyssna kan stärka ens psykiska välbefinnande.
- Mår man psykiskt dåligt kanske man skall kontakta sin doktor.
- Är du nedstämd över att du förlorat någon som t.ex. en nära anhörig/vän, eller över något som du kunnat göra tidigare men ej kan nu p.g.a sjukdom eller annan orsak? Efter den första chockfasen är det då till god hjälp att få samtala om det som hänt och hur man känner det. Att få visa de känslor man känner som t.ex. att gråta är läkande.
- Att ha ekonomiska problem är svårt och kan synas helt olösligt. Ett sätt att minska oro kan vara att få hjälp med att se över den ekonomiska situationen av någon som är kunnig på det. På kommunkontoret finns sådana personer. Den egna kontrollen över situationen kan på så vis öka och därmed minskas oron.

## REFERENCES

1. Damasio AR. *Descartes' Error. Emotions, Reasons and the Human Brain*. New York: Avon Books; 1994.
2. Bircher J. Towards a dynamic definition of health and disease. *Med Health Care Philos*. 2005;8(3):335-41.
3. Antonovsky A. The structure and properties of the sense of coherence scale. *Soc Sci Med*. 1993;36(6):725-33.
4. Antonovsky A. *Hälsans mysterium: Natur och Kultur*; 2005.
5. Wikman A, Marklund S, Alexanderson K. Illness, disease, and sickness absence: an empirical test of differences between concepts of ill health. *J Epidemiol Community Health*. 2005;59(6):450-4.
6. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav*. 1997;38(1):21-37.
7. Burstrom B, Fredlund P. Self rated health: Is it as good a predictor of subsequent mortality among adults in lower as well as in higher social classes? *J Epidemiol Community Health*. 2001;55(11):836-40.
8. Garcia P, McCarthy M. *Measuring Health. A Step in the Development of City Health Profiles*. WHO Regional Office for Europe Copenhagen; 2002.
9. EuroQol G. EuroQol--a new facility for the measurement of health-related quality of life. *Health Policy*. 1990;16(3):199-208.
10. Rabin R, de Charro F. EQ-5D: a measure of health status from the EuroQol Group. *Ann Med*. 2001;33(5):337-43.
11. Ware JE, Jr., Keller SD, Gandek B, Brazier JE, Sullivan M. Evaluating translations of health status questionnaires. Methods from the IQOLA project. *International Quality of Life Assessment. Int J Technol Assess Health Care*. 1995;11(3):525-51.
12. Ware JE, Jr., Gandek B, Kosinski M, Aaronson NK, Apolone G, Brazier J, et al. The equivalence of SF-36 summary health scores estimated using standard and country-specific algorithms in 10 countries: results from the IQOLA Project. *International Quality of Life Assessment. J Clin Epidemiol*. 1998;51(11):1167-70.
13. Sullivan M, Karlsson J. The Swedish SF-36 Health Survey III. Evaluation of criterion-based validity: results from normative population. *J Clin Epidemiol*. 1998;51(11):1105-13.
14. Sullivan M, Karlsson J, Ware JE, Jr. The Swedish SF-36 Health Survey--I. Evaluation of data quality, scaling assumptions, reliability and construct validity across general populations in Sweden. *Soc Sci Med*. 1995;41(10):1349-58.
15. Tibblin G, Tibblin B, Peciva S, Kullman S, Svardsudd K. "The Goteborg quality of life instrument"--an assessment of well-being

- and symptoms among men born 1913 and 1923. *Methods and validity*. Scand J Prim Health Care Suppl. 1990;1:33-8.
16. Cantril H. *The Pattern of human concerns*. New Brunswick, NJ: Rutgers University Press. 1965.
  17. Luttik ML, Lesman-Leegte I, Jaarsma T. Quality of life and depressive symptoms in heart failure patients and their partners: the impact of role and gender. *J Card Fail*. 2009;15(7):580-5.
  18. Berry JD, Willis B, Gupta S, Barlow CE, Lakoski SG, Khera A, et al. Lifetime risks for cardiovascular disease mortality by cardiorespiratory fitness levels measured at ages 45, 55, and 65 years in men. The Cooper Center Longitudinal Study. *J Am Coll Cardiol*. 2011;57(15):1604-10.
  19. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346(6):393-403.
  20. Ekblom-Bak E, Hellenius ML, Ekblom O, Engstrom LM, Ekblom B. Fitness and abdominal obesity are independently associated with cardiovascular risk. *J Intern Med*. 2009;266(6):547-57.
  21. Rovio S, Kareholt I, Helkala EL, Viitanen M, Winblad B, Tuomilehto J, et al. Leisure-time physical activity at midlife and the risk of dementia and Alzheimer's disease. *Lancet Neurol*. 2005;4(11):705-11.
  22. Sofi F, Valecchi D, Bacci D, Abbate R, Gensini GF, Casini A, et al. Physical activity and risk of cognitive decline: a meta-analysis of prospective studies. *J Intern Med*. 2011;269(1):107-17.
  23. Kallings LV, Sierra Johnson J, Fisher RM, Faire U, Stahle A, Hemmingsson E, et al. Beneficial effects of individualized physical activity on prescription on body composition and cardiometabolic risk factors: results from a randomized controlled trial. *Eur J Cardiovasc Prev Rehabil*. 2009;16(1):80-4.
  24. *Folkhälsan i Sverige : årsrapport 2013*. Stockholm: Socialstyrelsen; 2013.
  25. Andreasson S, Danielsson AK, Hallgren M. Severity of alcohol dependence in the Swedish adult population: association with consumption and social factors. *Alcohol*. 2013;47(1):21-5.
  26. Socialstyrelsen. *National Guidelines for Methods of Preventing Disease – summary 2013* [cited 2014 -02-03]. Available from: <http://www.socialstyrelsen.se/nationalguidelines>.
  27. De Backer G, Ambrosioni E, Borch-Johnsen K, Brotons C, Cifkova R, Dallongeville J, et al. European guidelines on cardiovascular disease prevention in clinical practice. Third Joint Task Force of European and Other Societies on Cardiovascular Disease Prevention in Clinical Practice. *Eur Heart J*. 2003;24(17):1601-10.

28. Blair SN. Physical inactivity: the biggest public health problem of the 21st century. *Br J Sports Med.* 2009;43(1):1-2.
29. Healy GN, Matthews CE, Dunstan DW, Winkler EA, Owen N. Sedentary time and cardio-metabolic biomarkers in US adults: NHANES 2003-06. *Eur Heart J.* 2011;32(5):590-7.
30. Halldin M, Rosell M, de Faire U, Hellenius ML. The metabolic syndrome: prevalence and association to leisure-time and work-related physical activity in 60-year-old men and women. *Nutr Metab Cardiovasc Dis.* 2007;17(5):349-57.
31. Erickson KI, Weinstein AM, Lopez OL. Physical activity, brain plasticity, and Alzheimer's disease. *Arch Med Res.* 2012;43(8):615-21.
32. Weuve J, Kang JH, Manson JE, Breteler MM, Ware JH, Grodstein F. Physical activity, including walking, and cognitive function in older women. *JAMA.* 2004;292(12):1454-61.
33. Dunstan DW, Barr EL, Healy GN, Salmon J, Shaw JE, Balkau B, et al. Television viewing time and mortality: the Australian Diabetes, Obesity and Lifestyle Study (AusDiab). *Circulation.* 2010;121(3):384-91.
34. Benedict C, Brooks SJ, Kullberg J, Nordenskjold R, Burgos J, Le Greves M, et al. Association between physical activity and brain health in older adults. *Neurobiol Aging.* 2013;34(1):83-90.
35. Geda YE, Roberts RO, Knopman DS, Christianson TJ, Pankratz VS, Ivnik RJ, et al. Physical exercise, aging, and mild cognitive impairment: a population-based study. *Arch Neurol.* 2010;67(1):80-6.
36. Reimers CD, Knapp G, Reimers AK. Does physical activity increase life expectancy? A review of the literature. *J Aging Res.* 2012;2012:243958.
37. Wendel-Vos GC, Schuit AJ, Feskens EJ, Boshuizen HC, Verschuren WM, Saris WH, et al. Physical activity and stroke. A meta-analysis of observational data. *Int J Epidemiol.* 2004;33(4):787-98.
38. Wei M, Kampert JB, Barlow CE, Nichaman MZ, Gibbons LW, Paffenbarger RS, Jr., et al. Relationship between low cardiorespiratory fitness and mortality in normal-weight, overweight, and obese men. *JAMA.* 1999;282(16):1547-53.
39. Hu FB, Willett WC, Li T, Stampfer MJ, Colditz GA, Manson JE. Adiposity as compared with physical activity in predicting mortality among women. *N Engl J Med.* 2004;351(26):2694-703.
40. Jarrett J, Woodcock J, Griffiths UK, Chalabi Z, Edwards P, Roberts I, et al. Effect of increasing active travel in urban England and Wales on costs to the National Health Service. *Lancet.* 2012;379(9832):2198-205.
41. Korniloff K, Vanhala M, Kautiainen H, Koponen H, Peltonen M, Mantyselka P, et al. Lifetime leisure-time physical activity and the



- risk of depressive symptoms at the ages of 65-74 years: the FIN-D2D survey. *Prev Med.* 2012;54(5):313-5.
42. Finucane MM, Stevens GA, Cowan MJ, Danaei G, Lin JK, Paciorek CJ, et al. National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. *Lancet.* 2011;377(9765):557-67.
  43. Bjorkelund C, Andersson-Hange D, Andersson K, Bengtsson C, Blomstrand A, Bondyr-Carlsson D, et al. Secular trends in cardiovascular risk factors with a 36-year perspective: observations from 38- and 50-year-olds in the Population Study of Women in Gothenburg. *Scand J Prim Health Care.* 2008;26(3):140-6.
  44. Wilhelmsson L, Welin L, Svardsudd K, Wedel H, Eriksson H, Hansson PO, et al. Secular changes in cardiovascular risk factors and attack rate of myocardial infarction among men aged 50 in Gothenburg, Sweden. Accurate prediction using risk models. *J Intern Med.* 2008;263(6):636-43.
  45. Akesson A, Weismayer C, Newby PK, Wolk A. Combined effect of low-risk dietary and lifestyle behaviors in primary prevention of myocardial infarction in women. *Arch Intern Med.* 2007;167(19):2122-7.
  46. Pirie K, Peto R, Reeves GK, Green J, Beral V. The 21st century hazards of smoking and benefits of stopping: a prospective study of one million women in the UK. *Lancet.* 2013;381(9861):133-41.
  47. Thun MJ, Carter BD, Feskanich D, Freedman ND, Prentice R, Lopez AD, et al. 50-year trends in smoking-related mortality in the United States. *N Engl J Med.* 2013;368(4):351-64.
  48. Orth-Gomer K, Albus C, Bages N, DeBacker G, Deter HC, Herrmann-Lingen C, et al. Psychosocial considerations in the European guidelines for prevention of cardiovascular diseases in clinical practice: Third Joint Task Force. *Int J Behav Med.* 2005;12(3):132-41.
  49. Rosengren A, Hawken S, Ounpuu S, Sliwa K, Zubaid M, Almahmeed WA, et al. Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries (the INTERHEART study): case-control study. *Lancet.* 2004;364(9438):953-62.
  50. Stringhini S, Sabia S, Shipley M, Brunner E, Nabi H, Kivimaki M, et al. Association of socioeconomic position with health behaviors and mortality. *JAMA.* 2010;303(12):1159-66.
  51. Laaksonen M, Talala K, Martelin T, Rahkonen O, Roos E, Helakorpi S, et al. Health behaviours as explanations for educational level differences in cardiovascular and all-cause mortality: a follow-up of 60 000 men and women over 23 years. *Eur J Public Health.* 2008;18(1):38-43.

52. Bolin K, Lindgren B, Rossner S. The significance of overweight and obesity for individual health behaviour: an economic analysis based on the Swedish surveys of living conditions 1980-81, 1988-89, and 1996-97. *Scandinavian journal of public health*. 2006;34(4):422-31.
53. van Oostrom SH, Smit HA, Wendel-Vos GC, Visser M, Verschuren WM, Picavet HS. Adopting an active lifestyle during adulthood and health-related quality of life: the Doetinchem Cohort Study. *Am J Public Health*. 2012;102(11):e62-8.
54. Marmot M, Friel S, Bell R, Houweling TA, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet*. 2008;372(9650):1661-9.
55. Starfield B. *Primary Care: balancing the health needs, services and technology*. New York: Oxford University Press; 1998.
56. Cabrera C, Helgesson O, Wedel H, Bjorkelund C, Bengtsson C, Lissner L. Socioeconomic status and mortality in Swedish women: opposing trends for cardiovascular disease and cancer. *Epidemiology*. 2001;12(5):532-6.
57. Bartley M, Martikainen P, Shipley M, Marmot M. Gender differences in the relationship of partner's social class to behavioural risk factors and social support in the Whitehall II study. *Soc Sci Med*. 2004;59(9):1925-36.
58. Dunn JR, Walker JD, Graham J, Weiss CB. Gender differences in the relationship between housing, socioeconomic status, and self-reported health status. *Rev Environ Health*. 2004;19(3-4):177-95.
59. Artazcoz L, Borrell C, Benach J. Gender inequalities in health among workers: the relation with family demands. *J Epidemiol Community Health*. 2001;55(9):639-47.
60. Wamala SP, Mittleman MA, Schenck-Gustafsson K, Orth-Gomer K. Potential explanations for the educational gradient in coronary heart disease: a population-based case-control study of Swedish women. *Am J Public Health*. 1999;89(3):315-21.
61. Rostila M, Toivanen Sr. *Den orättvisa Hälsan*. Stockholm: Liber; 2012.
62. Islam MK, Gerdtham UG, Clarke P, Burstrom K. Does income-related health inequality change as the population ages? Evidence from Swedish panel data. *Health Econ*. 2010;19(3):334-49.
63. Fritzell J, Neramo M, Lundberg O. The impact of income: assessing the relationship between income and health in Sweden. *Scandinavian journal of public health*. 2004;32(1):6-16.
64. Fritzell J, Kangas O, Bacchus Hertzman J, Blomgren J, Hiilamo H. Cross-temporal and cross-national poverty and mortality rates among developed countries. *J Environ Public Health*. 2013;2013:915490.
65. Bhatia M, Rifkin SB. Primary health care, now and forever? A case study of a paradigm change. *Int J Health Serv*. 2013;43(3):459-71.

66. Commission for a Socially Sustainable Malmö. Malmö's path towards a sustainable future. Health, welfare and justice 2013 [cited 2014 -02-03]. Available from: <http://www.instituteofhealthequity.org/projects/malmo-path-towards-a-sustainable-future-health-welfare-and-justice>.
67. WHO. The World Health Report 2008 Primary Health Care Now More Than Ever [cited 2014 -02-03]. Available from: <http://www.who.int/whr/2008/en/>.
68. Starfield B, Shi L. Policy relevant determinants of health: an international perspective. *Health Policy*. 2002;60(3):201-18.
69. Fries JF, Koop CE, Beadle CE, Cooper PP, England MJ, Greaves RF, et al. Reducing health care costs by reducing the need and demand for medical services. The Health Project Consortium. *N Engl J Med*. 1993;329(5):321-5.
70. WHO. The world health report 2002 - Reducing Risks, Promoting Healthy Life 2002. Available from: <http://www.who.int/whr/2002/en/>.
71. Sarafino EP. *Health Psychology Biopsychosocial Interactions*. USA: John Wiley & sons, Inc.; 1994.
72. Mattsson B, Mattsson M. The concept of "psychosomatic" in general practice. Reflections on body language and a tentative model for understanding. *Scand J Prim Health Care*. 2002;20(3):135-8.
73. Malterud K, Hollnagel H, Witt K. Gendered health resources and coping--a study from general practice. *Scandinavian journal of public health*. 2001;29(3):183-8.
74. Malterud K. Illness and disease in female patients. II. A study of consultation techniques designed to improve the exploration of illness in general practice. *Scand J Prim Health Care*. 1987;5(4):211-6.
75. Malterud K, Hollnagel H. Positive self-assessed general health in patients with medical problems. A qualitative study from general practice. *Scand J Prim Health Care*. 2004;22(1):11-5.
76. SKL. Vårdbarometern - Befolkningens attityder till, kunskaper om och förväntningar på hälso- och sjukvården. 2013 [cited 2014 -01-24]. Available from: <http://webbutik.skl.se/sv/artiklar/halso-och-sjukvard/vardbarometern-befolkningens-attityder-till-kunskaper-om-och-forvantningar-pa-halso-och-sjukvarden.html>.
77. Parikh NI, Pencina MJ, Wang TJ, Lanier KJ, Fox CS, D'Agostino RB, et al. Increasing trends in incidence of overweight and obesity over 5 decades. *Am J Med*. 2007;120(3):242-50.
78. Wolf PA. Contributions of the Framingham Heart Study to stroke and dementia epidemiologic research at 60 years. *Arch Neurol*. 2012;69(5):567-71.
79. Romero JR, Wolf PA. Epidemiology of Stroke: Legacy of the Framingham Heart Study. *Global heart*. 2013;8(1):67-75.

80. Verschuren WM, Blokstra A, Picavet HS, Smit HA. Cohort profile: the Doetinchem Cohort Study. *Int J Epidemiol.* 2008;37(6):1236-41.
81. Bot M, Spijkerman AM, Twisk JW, Verschuren WM. Weight change over five-year periods and number of components of the metabolic syndrome in a Dutch cohort. *Eur J Epidemiol.* 2010;25(2):125-33.
82. Hulsegge G, Picavet HS, Blokstra A, Nooyens AC, Spijkerman AM, van der Schouw YT, et al. Today's adult generations are less healthy than their predecessors: generation shifts in metabolic risk factors: the Doetinchem Cohort Study. *European journal of preventive cardiology.* 2013.
83. Lipscombe LL, Hux JE. Trends in diabetes prevalence, incidence, and mortality in Ontario, Canada 1995-2005: a population-based study. *Lancet.* 2007;369(9563):750-6.
84. Fryar CD, Carroll MD, Ogden CL. Prevalence of Overweight, Obesity, and Extreme Obesity Among Adults: United States, Trends 1960–1962 Through 2009–2010 2012 [cited 2014 -01-25]. Available from: [http://www.cdc.gov/nchs/data/hestat/obesity\\_adult\\_09\\_10/obesity\\_adult\\_09\\_10.htm](http://www.cdc.gov/nchs/data/hestat/obesity_adult_09_10/obesity_adult_09_10.htm).
85. Wang Y, Beydoun MA, Liang L, Caballero B, Kumanyika SK. Will all Americans become overweight or obese? estimating the progression and cost of the US obesity epidemic. *Obesity.* 2008;16(10):2323-30.
86. Tabak AG, Herder C, Rathmann W, Brunner EJ, Kivimaki M. Prediabetes: a high-risk state for diabetes development. *Lancet.* 2012;379(9833):2279-90.
87. Lindstrom J, Absetz P, Hemio K, Peltomaki P, Peltonen M. Reducing the risk of type 2 diabetes with nutrition and physical activity - efficacy and implementation of lifestyle interventions in Finland. *Public Health Nutr.* 2010;13(6A):993-9.
88. The World Health Organization MONICA Project (monitoring trends and determinants in cardiovascular disease): a major international collaboration. WHO MONICA Project Principal Investigators. *J Clin Epidemiol.* 1988;41(2):105-14.
89. Kuulasmaa K, Tunstall-Pedoe H, Dobson A, Fortmann S, Sans S, Tolonen H, et al. Estimation of contribution of changes in classic risk factors to trends in coronary-event rates across the WHO MONICA Project populations. *Lancet.* 2000;355(9205):675-87.
90. Danaei G, Finucane MM, Lu Y, Singh GM, Cowan MJ, Paciorek CJ, et al. National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2.7 million participants. *Lancet.* 2011;378(9785):31-40.
91. Eriksson M, Holmgren L, Janlert U, Jansson JH, Lundblad D, Stegmayr B, et al. Large improvements in major cardiovascular risk

- factors in the population of northern Sweden: the MONICA study 1986-2009. *J Intern Med.* 2011;269(2):219-31.
92. Hyvarinen M, Tuomilehto J, Laatikainen T, Soderberg S, Eliasson M, Nilsson P, et al. The impact of diabetes on coronary heart disease differs from that on ischaemic stroke with regard to the gender. *Cardiovasc Diabetol.* 2009;8:17.
  93. Asplund K. Stroke in the uninsured. *Stroke.* 2009;40(6):1950-1.
  94. Appelros P, Jonsson F, Asberg S, Asplund K, Glader EL, Asberg KH, et al. Trends in Stroke Treatment and Outcome between 1995 and 2010: Observations from Riks-Stroke, the Swedish Stroke Register. *Cerebrovasc Dis.* 2013;37(1):22-9.
  95. Hofman A, van Duijn CM, Franco OH, Ikram MA, Janssen HL, Klaver CC, et al. The Rotterdam Study: 2012 objectives and design update. *Eur J Epidemiol.* 2011;26(8):657-86.
  96. Wieberdink RG, Ikram MA, Hofman A, Koudstaal PJ, Breteler MM. Trends in stroke incidence rates and stroke risk factors in Rotterdam, the Netherlands from 1990 to 2008. *Eur J Epidemiol.* 2012;27(4):287-95.
  97. Vaartjes I, O'Flaherty M, Capewell S, Kappelle J, Bots M. Remarkable decline in ischemic stroke mortality is not matched by changes in incidence. *Stroke.* 2013;44(3):591-7.
  98. Hata J, Ninomiya T, Hirakawa Y, Nagata M, Mukai N, Gotoh S, et al. Secular trends in cardiovascular disease and its risk factors in Japanese: half-century data from the Hisayama Study (1961-2009). *Circulation.* 2013;128(11):1198-205.
  99. Sugama C, Isa K, Okumura K, Iseki K, Kinjo K, Ohya Y. Trends in the incidence of stroke and cardiovascular risk factors on the isolated island of Okinawa: the Miyakojima study. *J Stroke Cerebrovasc Dis.* 2013;22(7):e118-23.
  100. Wu X, Zhu B, Fu L, Wang H, Zhou B, Zou S, et al. Prevalence, incidence, and mortality of stroke in the chinese island populations: a systematic review. *PLoS One.* 2013;8(11):e78629.
  101. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet.* 2004;364(9438):937-52.
  102. O'Donnell MJ, Xavier D, Liu L, Zhang H, Chin SL, Rao-Melacini P, et al. Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study. *Lancet.* 2010;376(9735):112-23.
  103. Johansson S, Wilhelmsen L, Welin C, Eriksson H, Welin L, Rosengren A. Obesity, smoking and secular trends in cardiovascular risk factors in middle-aged women: data from population studies in Goteborg from 1980 to 2003. *J Intern Med.* 2010;268(6):594-603.

104. Vartiainen E, Laatikainen T, Peltonen M, Juolevi A, Mannisto S, Sundvall J, et al. Thirty-five-year trends in cardiovascular risk factors in Finland. *Int J Epidemiol.* 2010;39(2):504-18.
105. Lindstrom J, Peltonen M, Eriksson JG, Ilanne-Parikka P, Aunola S, Keinanen-Kiukaanniemi S, et al. Improved lifestyle and decreased diabetes risk over 13 years: long-term follow-up of the randomised Finnish Diabetes Prevention Study (DPS). *Diabetologia.* 2013;56(2):284-93.
106. Weinehall L, Hellsten G, Boman K, Hallmans G, Asplund K, Wall S. Can a sustainable community intervention reduce the health gap?-- 10-year evaluation of a Swedish community intervention program for the prevention of cardiovascular disease. *Scandinavian journal of public health Supplement.* 2001;56:59-68.
107. Norberg M, Wall S, Boman K, Weinehall L. The Vasterbotten Intervention Programme: background, design and implications. *Global health action.* 2010;3.
108. Lingfors H, Lindstrom K, Persson LG, Bengtsson C, Lissner L. Evaluation of "Live for Life", a health promotion programme in the County of Skaraborg, Sweden. *J Epidemiol Community Health.* 2001;55(4):277-82.
109. Persson LG, Lindstrom K, Lingfors H, Bengtsson C. A study of men aged 33-42 in Habo, Sweden with special reference to cardiovascular risk factors. Design, health profile and characteristics of participants and non-participants. *Scand J Soc Med.* 1994;22(4):264-72.
110. Persson LG, Lindstrom K, Lingfors H, Bengtsson C. Results from an intervention programme dealing with cardiovascular risk factors. Experiences from a study of men aged 33-42 in Habo, Sweden. *Scand J Prim Health Care.* 1996;14(3):184-92.
111. Lingfors H, Persson LG, Lindstrom K, Ljungquist B, Bengtsson C. Time for a "vision zero" concerning premature death from ischaemic heart disease? *Scand J Prim Health Care.* 2002;20(1):28-32.
112. Lingfors H, Persson LG, Lindstrom K, Bengtsson C, Lissner L. Effects of a global health and risk assessment tool for prevention of ischemic heart disease in an individual health dialogue compared with a community health strategy only results from the Live for Life health promotion programme. *Prev Med.* 2009;48(1):20-4.
113. Lindblad U, Rastam L, Ryden L, Ranstam J, Berglund G, Isacson SO. Reduced stroke incidence with structured hypertension care: the Skaraborg Hypertension Project. *J Hypertens.* 1990;8(12):1147-53.
114. Lindblad U, Ek J, Eckner J, Larsson CA, Shan G, Rastam L. Prevalence, awareness, treatment, and control of hypertension: rule of thirds in the Skaraborg project. *Scand J Prim Health Care.* 2012;30(2):88-94.
115. Agewall S, Fagerberg B, Berglund G, Schmidt C, Wendelhag I, Wikstrand J, et al. Multiple risk intervention trial in high risk

- hypertensive men: comparison of ultrasound intima-media thickness and clinical outcome during 6 years of follow-up. *J Intern Med.* 2001;249(4):305-14.
116. Bjorkelund C, Bengtsson C. Feasibility of a primary health care programme aiming at reducing cardiovascular and cerebrovascular risk factors among women in a Swedish community, Stromstad. *Scand J Prim Health Care.* 1991;9(2):89-95.
117. Bjorkelund C, Lissner L, Devine C, Lindroos AK, Palm L, Westerstahl A. Long-term effects of a primary health care intervention program for women: lower blood pressure and stable weight. *Fam Med.* 2000;32(4):246-51.
118. Hellenius ML, de Faire U, Krakau I, Berglund B. Prevention of cardiovascular disease within the primary health care system--feasibility of a prevention programme within the Sollentuna primary health care catchment area. *Scand J Prim Health Care.* 1993;11(1):68-73.
119. Hellenius ML, Johansson J, de Faire U, Elofsson S, Krakau I. Four years experience of a cardiovascular opportunistic screening and prevention programme in the primary health care in Sollentuna, Sweden. *Scand J Prim Health Care.* 1999;17(2):111-5.
120. Hellenius ML, Nilsson P, Elofsson S, Johansson J, Krakau I. Reduction of high cholesterol levels associated with younger age and longer education in a primary health care programme for cardiovascular prevention. *Scand J Prim Health Care.* 2005;23(2):75-81.
121. Thomsen JL, Karlsmose B, Parner ET, Thulstrup AM, Lauritzen T, Engberg M. Secondary healthcare contacts after multiphasic preventive health screening: a randomized trial. *Scandinavian journal of public health.* 2006;34(3):254-61.
122. Thomsen JL, Parner ET, Karlsmose B, Thulstrup AM, Lauritzen T, Engberg M. Effect of preventive health screening on long-term primary health care utilization. A randomized controlled trial. *Fam Pract.* 2005;22(3):242-8.
123. Lauritzen T, Jensen MS, Thomsen JL, Christensen B, Engberg M. Health tests and health consultations reduced cardiovascular risk without psychological strain, increased healthcare utilization or increased costs. An overview of the results from a 5-year randomized trial in primary care. The Ebeltoft Health Promotion Project (EHPP). *Scandinavian journal of public health.* 2008;36(6):650-61.
124. Ashenden R, Silagy C, Weller D. A systematic review of the effectiveness of promoting lifestyle change in general practice. *Fam Pract.* 1997;14(2):160-76.
125. Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol.* 1983;51(3):390-5.

126. Prochaska JO, DiClemente CC. Self change processes, self efficacy and decisional balance across five stages of smoking cessation. *Prog Clin Biol Res.* 1984;156:131-40.
127. Prochaska JO, DiClemente CC, Norcross JC. In search of how people change. Applications to addictive behaviors. *Am Psychol.* 1992;47(9):1102-14.
128. Rollnick S, Butler CC, Kinnersley P, Gregory J, Mash B. Motivational interviewing. *BMJ.* 2010;340:c1900.
129. Rollnick S MP, Butler C. *Health Behavior Change. A guide for Practitioners.* London: Churchill Livingstone; 1999. 225 p.
130. Ryan R PH, Deci E, Williams G. Facilitating health behaviour change and its maintenance: Interventions based on Self-Determination Theory *The European Health Psychologist.* 2008;10:2-5.
131. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol.* 2000;55(1):68-78.
132. Markland D RR, Tobin VJ, Rollnick S. Motivational interviewing and self-determination theory. *J Soc Clin Psychol.* 2005;24:811-31.
133. Juul L, Maindal HT, Zoffmann V, Frydenberg M, Sandbaek A. A cluster randomised pragmatic trial applying Self-determination theory to type 2 diabetes care in general practice. *BMC Fam Pract.* 2011;12:130.
134. Stenman E, Leijon ME, Calling S, Bergmark C, Arvidsson D, Gerdtham UG, et al. Study protocol: a multi-professional team intervention of physical activity referrals in primary care patients with cardiovascular risk factors--the Dalby lifestyle intervention cohort (DALICO) study. *BMC Health Serv Res.* 2012;12:173.
135. Williams GC, Grow VM, Freedman ZR, Ryan RM, Deci EL. Motivational predictors of weight loss and weight-loss maintenance. *J Pers Soc Psychol.* 1996;70(1):115-26.
136. Coulter A, Ellins J. *Patient-focused interventions A review of the evidence.* London: 2006.
137. Wing RR, Phelan S. Long-term weight loss maintenance. *Am J Clin Nutr.* 2005;82(1 Suppl):222S-5S.
138. Gorin AA, Phelan S, Hill JO, Wing RR. Medical triggers are associated with better short- and long-term weight loss outcomes. *Prev Med.* 2004;39(3):612-6.
139. Senesael E, Borgermans L, Van De Vijver E, Devroey D. Effectiveness of a quality improvement intervention targeting cardiovascular risk factors: are patients responsive to information and encouragement by mail or post? *Vascular health and risk management.* 2013;9:13-20.
140. Hagstrom B, Mattsson B, Rost IM, Gunnarsson RK. What happened to the prescriptions? A single, short, standardized telephone call may increase compliance. *Fam Pract.* 2004;21(1):46-50.



141. World, Health, Organization. Ottawa Charter. 1st International Conference on Health Promotion 21 november 1986.; Ottawa, Canada 1986.
142. Primärvårdens uppgifter i det förebyggande arbetet. Huvudbilaga, Hälsouppllysning Stockholm: Liber/Allmänna förl.; 1984. Available from: <http://urn.kb.se/resolve?urn=urn:nbn:se:kb:sou-452409>
143. Becker CM, Rhynders P. It's time to make the profession of health about health. *Scandinavian journal of public health*. 2013;41(1):1-3.
144. Rappaport J. Terms of empowerment/exemplars of prevention: toward a theory for community psychology. *Am J Community Psychol*. 1987;15(2):121-48.
145. Jerdén L. Health-promoting health services: Personal health documents and empowerment. Umeå: Umeå University; 2007.
146. Medin J, Alexanderson K. Hälsa och hälsofrämjande-en litteraturstudie. Lund: Studentlitteratur Primärvårdens uppgifter i det förebyggande arbetet (responsibilities(51)The role of primary health care in prevention). 2001.
147. Blomstrand A, Pedersen N, Bengtsson C. [Primary care can inspire patients to preventive self care: "Health profile" helps a patient analyze his or hers own risk factors]. *Lakartidningen*. 2002;99(41):4051-4.
148. Karasek RT, T. Health work: Stress, productivity and reconstruction of working life. New York: Basic Books. 1990.
149. Saltin B, Grimby G. Physiological analysis of middle-aged and old former athletes. Comparison with still active athletes of the same ages. *Circulation*. 1968;38(6):1104-15.
150. Bengtsson C. Physical activity in a population sample of women and in women with ischaemic heart disease. *Acta Med Scand Suppl*. 1973;549:93-6.
151. Sullivan M, Karlsson J, Bengtsson C, Furunes B, Lapidus L, Lissner L. "The Goteborg Quality of Life Instrument"--a psychometric evaluation of assessments of symptoms and well-being among women in a general population. *Scand J Prim Health Care*. 1993;11(4):267-75.
152. Harmsen P, Rosengren A, Tsipogianni A, Wilhelmsen L. Risk factors for stroke in middle-aged men in Goteborg, Sweden. *Stroke*. 1990;21(2):223-9.
153. Rosengren A, Tibblin G, Wilhelmsen L. Self-perceived psychological stress and incidence of coronary artery disease in middle-aged men. *Am J Cardiol*. 1991;68(11):1171-5.
154. Bengtsson C. Ischaemic heart disease in women. A study based on a randomized population sample of women and women with myocardial infarction in Goteborg, Sweden. *Acta Med Scand Suppl*. 1973;549:1-128.

155. Bengtsson C, Blohme G, Hallberg L, Hallstrom T, Isaksson B, Korsan-Bengtzen K, et al. The study of women in Gothenburg 1968-1969--a population study. General design, purpose and sampling results. *Acta Med Scand.* 1973;193(4):311-8.
156. Aho K, Harmsen P, Hatano S, Marquardsen J, Smirnov VE, Strasser T. Cerebrovascular disease in the community: results of a WHO collaborative study. *Bull World Health Organ.* 1980;58(1):113-30.
157. WHO. Report on Pan European consensus meeting on stroke management Copenhagen 1996
158. Mancia G, Fagard R, Narkiewicz K, Redon J, Zanchetti A, Bohm M, et al. 2013 ESH/ESC Guidelines for the management of arterial hypertension: the Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *J Hypertens.* 2013;31(7):1281-357.
159. Weinehall L, Hellsten G, Boman K, Hallmans G. Prevention of cardiovascular disease in Sweden: the Norsjo community intervention programme--motives, methods and intervention components. *Scandinavian journal of public health Supplement.* 2001;56:13-20.
160. Lingfors H, Lindstrom K, Persson LG, Bengtsson C, Lissner L. Lifestyle changes after a health dialogue. Results from the Live for Life health promotion programme. *Scand J Prim Health Care.* 2003;21(4):248-52.
161. Ketola E, Sipila R, Makela M. Effectiveness of individual lifestyle interventions in reducing cardiovascular disease and risk factors. *Ann Med.* 2000;32(4):239-51.
162. Ketola E, Makela M, Klockars M. Individualised multifactorial lifestyle intervention trial for high-risk cardiovascular patients in primary care. *Br J Gen Pract.* 2001;51(465):291-4.
163. Johansson J, Hellenius ML, Elofsson S, Krakau I. Self-report as a selection instrument in screening for cardiovascular disease risk. *Am J Prev Med.* 1999;16(4):322-4.
164. O'Neill SM, Rubinstein WS, Wang C, Yoon PW, Acheson LS, Rothrock N, et al. Familial risk for common diseases in primary care: the Family Healthware Impact Trial. *Am J Prev Med.* 2009;36(6):506-14.
165. Ruffin MTt, Nease DE, Jr., Sen A, Pace WD, Wang C, Acheson LS, et al. Effect of preventive messages tailored to family history on health behaviors: the Family Healthware Impact Trial. *Ann Fam Med.* 2011;9(1):3-11.
166. Acheson LS, Wang C, Zyzanski SJ, Lynn A, Ruffin MTt, Gramling R, et al. Family history and perceptions about risk and prevention for

- chronic diseases in primary care: a report from the family healthware impact trial. *Genet Med.* 2010;12(4):212-8.
167. Dorman JS, Valdez R, Liu T, Wang C, Rubinstein WS, O'Neill SM, et al. Health beliefs among individuals at increased familial risk for type 2 diabetes: implications for prevention. *Diabetes Res Clin Pract.* 2012;96(2):156-62.
168. Bach Nielsen KD, Dyhr L, Lauritzen T, Malterud K. Long-term impact of elevated cardiovascular risk detected by screening. A qualitative interview study. *Scand J Prim Health Care.* 2005;23(4):233-8.
169. Persson LG, Lindstrom K, Lingfors H, Bengtsson C, Lissner L. Cardiovascular risk during early adult life. Risk markers among participants in "Live for Life" health promotion programme in Sweden. *J Epidemiol Community Health.* 1998;52(7):425-32.
170. Dal Grande E, Fullerton S, Taylor AW. Reliability of self-reported health risk factors and chronic conditions questions collected using the telephone in South Australia, Australia. *BMC Med Res Methodol.* 2012;12:108.
171. Rose GA, Khaw K-T. *Rose's Strategy of Preventive Medicine*: Oxford University press; 2008.
172. Waller M, Blomstrand A, Högberg T, Ariai N, Thorn J, Björkelund C. Lifestyle intervention in primary care – what is the impact on different socioeconomic groups? . 18th Nordic Congress of General Practice , 21 - 24 August 2013; Tampere, Finland2013.
173. Pagoto SL, Schneider KL, Oleski JL, Luciani JM, Bodenlos JS, Whited MC. Male inclusion in randomized controlled trials of lifestyle weight loss interventions. *Obesity.* 2012;20(6):1234-9.
174. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science.* 1977;196(4286):129-36.
175. Rodjer L, Jonsdottir IH, Rosengren A, Bjorck L, Grimby G, Thelle DS, et al. Self-reported leisure time physical activity: a useful assessment tool in everyday health care. *BMC Public Health.* 2012;12:693.
176. Bengtsson C, Ahlqwist M, Andersson K, Bjorkelund C, Lissner L, Soderstrom M. The Prospective Population Study of Women in Gothenburg, Sweden, 1968-69 to 1992-93. A 24-year follow-up study with special reference to participation, representativeness, and mortality. *Scand J Prim Health Care.* 1997;15(4):214-9.
177. Bengtsson C, Gredmark T, Hallberg L, Hallstrom T, Isaksson B, Lapidus L, et al. The population study of women in Gothenburg 1980-81--the third phase of a longitudinal study. Comparison between participants and non-participants. *Scand J Soc Med.* 1989;17(2):141-5.
178. Lapidus L, Bengtsson C. Socioeconomic factors and physical activity in relation to cardiovascular disease and death. A 12 year follow up

- of participants in a population study of women in Gothenburg, Sweden. *Br Heart J*. 1986;55(3):295-301.
179. Oguma Y, Sesso HD, Paffenbarger RS, Jr., Lee IM. Physical activity and all cause mortality in women: a review of the evidence. *Br J Sports Med*. 2002;36(3):162-72.
  180. Lissner L, Bengtsson C, Bjorkelund C, Wedel H. Physical activity levels and changes in relation to longevity. A prospective study of Swedish women. *Am J Epidemiol*. 1996;143(1):54-62.
  181. Sui X, LaMonte MJ, Laditka JN, Hardin JW, Chase N, Hooker SP, et al. Cardiorespiratory fitness and adiposity as mortality predictors in older adults. *JAMA*. 2007;298(21):2507-16.
  182. Carnethon MR, Gidding SS, Nehgme R, Sidney S, Jacobs DR, Jr., Liu K. Cardiorespiratory fitness in young adulthood and the development of cardiovascular disease risk factors. *JAMA*. 2003;290(23):3092-100.
  183. Warburton DE, Nicol CW, Bredin SS. Health benefits of physical activity: the evidence. *CMAJ*. 2006;174(6):801-9.
  184. Wannamethee SG, Shaper AG. Physical activity and cardiovascular disease. *Semin Vasc Med*. 2002;2(3):257-66.
  185. Carlsson S, Andersson T, Wolk A, Ahlbom A. Low physical activity and mortality in women: baseline lifestyle and health as alternative explanations. *Scandinavian journal of public health*. 2006;34(5):480-7.
  186. Oguma Y, Shinoda-Tagawa T. Physical activity decreases cardiovascular disease risk in women: review and meta-analysis. *Am J Prev Med*. 2004;26(5):407-18.
  187. Lakka TA, Laaksonen DE. Physical activity in prevention and treatment of the metabolic syndrome. *Applied physiology, nutrition, and metabolism = Physiologie appliquee, nutrition et metabolisme*. 2007;32(1):76-88.
  188. Healy GN, Dunstan DW, Salmon J, Cerin E, Shaw JE, Zimmet PZ, et al. Breaks in sedentary time: beneficial associations with metabolic risk. *Diabetes Care*. 2008;31(4):661-6.
  189. Wendel-Vos GC, Schuit AJ, Tijhuis MA, Kromhout D. Leisure time physical activity and health-related quality of life: cross-sectional and longitudinal associations. *Qual Life Res*. 2004;13(3):667-77.
  190. Schnohr P, Kristensen TS, Prescott E, Scharling H. Stress and life dissatisfaction are inversely associated with jogging and other types of physical activity in leisure time--The Copenhagen City Heart Study. *Scand J Med Sci Sports*. 2005;15(2):107-12.
  191. Hassmen P, Koivula N, Uutela A. Physical exercise and psychological well-being: a population study in Finland. *Prev Med*. 2000;30(1):17-25.
  192. Warburton DE, Nicol CW, Bredin SS. Prescribing exercise as preventive therapy. *CMAJ*. 2006;174(7):961-74.

193. Bejot Y, Mehta Z, Giroud M, Rothwell PM. Impact of completeness of ascertainment of minor stroke on stroke incidence: implications for ideal study methods. *Stroke*. 2013;44(7):1796-802.
194. Appelros P, Terent A. Validation of the Swedish inpatient and cause-of-death registers in the context of stroke. *Acta Neurol Scand*. 2011;123(4):289-93.
195. Hollander M, Koudstaal PJ, Bots ML, Grobbee DE, Hofman A, Breteler MM. Incidence, risk, and case fatality of first ever stroke in the elderly population. The Rotterdam Study. *J Neurol Neurosurg Psychiatry*. 2003;74(3):317-21.
196. Fazekas F, Enzinger C, Schmidt R, Dichgans M, Gaertner B, Jungehulsing GJ, et al. MRI in acute cerebral ischemia of the young: The Stroke in Young Fabry Patients (sifap1) Study. *Neurology*. 2013;81(22):1914-21.
197. Poggesi A, Gouw A, van der Flier W, Pracucci G, Chabriat H, Erkinjuntti T, et al. Cerebral white matter changes are associated with abnormalities on neurological examination in non-disabled elderly: the LADIS study. *J Neurol*. 2013;260(4):1014-21.
198. Bejot Y, Daubail B, Jacquin A, Durier J, Osseby GV, Rouaud O, et al. Trends in the incidence of ischaemic stroke in young adults between 1985 and 2011: the Dijon Stroke Registry. *J Neurol Neurosurg Psychiatry*. 2013.
199. Krishnamurthi R, Witt E, Barker-Collo S, McPherson K, Davis-Martin K, Bennett D, et al. Reducing recurrent stroke: Methodology of the motivational interviewing in stroke (MIST) randomized clinical trial. *Int J Stroke*. 2013.
200. Asplund K, Bonita R, Kuulasmaa K, Rajakangas AM, Schaedlich H, Suzuki K, et al. Multinational comparisons of stroke epidemiology. Evaluation of case ascertainment in the WHO MONICA Stroke Study. *World Health Organization Monitoring Trends and Determinants in Cardiovascular Disease*. *Stroke*. 1995;26(3):355-60.
201. Medin J, Nordlund A, Ekberg K. Increasing stroke incidence in Sweden between 1989 and 2000 among persons aged 30 to 65 years: evidence from the Swedish Hospital Discharge Register. *Stroke*. 2004;35(5):1047-51.
202. Feigin V, Hoorn SV. How to study stroke incidence. *Lancet*. 2004;363(9425):1920.
203. Rosengren A, Giang KW, Lappas G, Jern C, Toren K, Bjorck L. Twenty-Four-Year Trends in the Incidence of Ischemic Stroke in Sweden From 1987 to 2010. *Stroke*. 2013.
204. Feigin VL, Lawes CM, Bennett DA, Barker-Collo SL, Parag V. Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. *Lancet Neurol*. 2009;8(4):355-69.

205. Pessah-Rasmussen H, Engstrom G, Jerntorp I, Janzon L. Increasing stroke incidence and decreasing case fatality, 1989-1998: a study from the stroke register in Malmo, Sweden. *Stroke*. 2003;34(4):913-8.
206. von Sarnowski B, Putaala J, Grittner U, Gaertner B, Schminke U, Curtze S, et al. Lifestyle risk factors for ischemic stroke and transient ischemic attack in young adults in the Stroke in Young Fabry Patients study. *Stroke*. 2013;44(1):119-25.
207. Norrving B, Kissela B. The global burden of stroke and need for a continuum of care. *Neurology*. 2013;80(3 Suppl 2):S5-S12.
208. Carandang R, Seshadri S, Beiser A, Kelly-Hayes M, Kase CS, Kannel WB, et al. Trends in incidence, lifetime risk, severity, and 30-day mortality of stroke over the past 50 years. *JAMA*. 2006;296(24):2939-46.
209. Appelros P, Stegmayr B, Terent A. Sex differences in stroke epidemiology: a systematic review. *Stroke*. 2009;40(4):1082-90.
210. Hallstrom B, Jonsson AC, Nerbrand C, Norrving B, Lindgren A. Stroke incidence and survival in the beginning of the 21st century in southern Sweden: comparisons with the late 20th century and projections into the future. *Stroke*. 2008;39(1):10-5.
211. Harmsen P, Wilhelmsen L, Jacobsson A. Stroke incidence and mortality rates 1987 to 2006 related to secular trends of cardiovascular risk factors in Gothenburg, Sweden. *Stroke*. 2009;40(8):2691-7.
212. Li C, Hedblad B, Rosvall M, Buchwald F, Khan FA, Engstrom G. Stroke incidence, recurrence, and case-fatality in relation to socioeconomic position: a population-based study of middle-aged Swedish men and women. *Stroke*. 2008;39(8):2191-6.
213. Fang MC, Singer DE, Chang Y, Hylek EM, Henault LE, Jensvold NG, et al. Gender differences in the risk of ischemic stroke and peripheral embolism in atrial fibrillation: the AnTicoagulation and Risk factors In Atrial fibrillation (ATRIA) study. *Circulation*. 2005;112(12):1687-91.
214. Rexrode KM, Hennekens CH, Willett WC, Colditz GA, Stampfer MJ, Rich-Edwards JW, et al. A prospective study of body mass index, weight change, and risk of stroke in women. *JAMA*. 1997;277(19):1539-45.
215. Hu G, Tuomilehto J, Silventoinen K, Sarti C, Mannisto S, Jousilahti P. Body mass index, waist circumference, and waist-hip ratio on the risk of total and type-specific stroke. *Arch Intern Med*. 2007;167(13):1420-7.
216. Jood K, Jern C, Wilhelmsen L, Rosengren A. Body mass index in mid-life is associated with a first stroke in men: a prospective population study over 28 years. *Stroke*. 2004;35(12):2764-9.

217. Bodenant M, Kuulasmaa K, Wagner A, Kee F, Palmieri L, Ferrario MM, et al. Measures of abdominal adiposity and the risk of stroke: the MONica Risk, Genetics, Archiving and Monograph (MORGAM) study. *Stroke*. 2011;42(10):2872-7.
218. Rankinen T, Kim SY, Perusse L, Despres JP, Bouchard C. The prediction of abdominal visceral fat level from body composition and anthropometry: ROC analysis. *Int J Obes Relat Metab Disord*. 1999;23(8):801-9.
219. Kuper H, Adami HO, Theorell T, Weiderpass E. The socioeconomic gradient in the incidence of stroke: a prospective study in middle-aged women in Sweden. *Stroke*. 2007;38(1):27-33.
220. Peltonen M, Rosen M, Lundberg V, Asplund K. Social patterning of myocardial infarction and stroke in Sweden: incidence and survival. *Am J Epidemiol*. 2000;151(3):283-92.
221. Engstrom G, Jerntorp I, Pessah-Rasmussen H, Hedblad B, Berglund G, Janzon L. Geographic distribution of stroke incidence within an urban population: relations to socioeconomic circumstances and prevalence of cardiovascular risk factors. *Stroke*. 2001;32(5):1098-103.
222. Jackson CA, Jones M, Mishra GD. Educational and homeownership inequalities in stroke incidence: a population-based longitudinal study of mid-aged women. *Eur J Public Health*. 2013.
223. Wang Y, Rudd AG, Wolfe CD. Age and ethnic disparities in incidence of stroke over time: the South London Stroke Register. *Stroke*. 2013;44(12):3298-304.
224. Willey JZ, Moon YP, Paik MC, Boden-Albala B, Sacco RL, Elkind MS. Physical activity and risk of ischemic stroke in the Northern Manhattan Study. *Neurology*. 2009;73(21):1774-9.
225. Boden-Albala B, Cammack S, Chong J, Wang C, Wright C, Rundek T, et al. Diabetes, fasting glucose levels, and risk of ischemic stroke and vascular events: findings from the Northern Manhattan Study (NOMAS). *Diabetes Care*. 2008;31(6):1132-7.
226. Boden-Albala B, Litwak E, Elkind MS, Rundek T, Sacco RL. Social isolation and outcomes post stroke. *Neurology*. 2005;64(11):1888-92.
227. Boden-Albala B, Sacco RL, Lee HS, Grahame-Clarke C, Rundek T, Elkind MV, et al. Metabolic syndrome and ischemic stroke risk: Northern Manhattan Study. *Stroke*. 2008;39(1):30-5.
228. Campbell M, Fitzpatrick R, Haines A, Kinmonth AL, Sandercock P, Spiegelhalter D, et al. Framework for design and evaluation of complex interventions to improve health. *BMJ*. 2000;321(7262):694-6.
229. Sanson-Fisher RW, Bonevski B, Green LW, D'Este C. Limitations of the randomized controlled trial in evaluating population-based health interventions. *Am J Prev Med*. 2007;33(2):155-61.

230. Slade M, Priebe S. Are randomised controlled trials the only gold that glitters? *Br J Psychiatry*. 2001;179:286-7.
231. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M, et al. Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ*. 2008;337:a1655.
232. Lindholm L, Rosen M. What is the "golden standard" for assessing population-based interventions?--problems of dilution bias. *J Epidemiol Community Health*. 2000;54(8):617-22.



