

## Danish Centre for Evaluation and Health Technology Assessment

Preventive health screenings and health consultations in primary care  
- a health economic analysis of "Ebeltoft Health Promotion Project"  
Summary

## Summary

*Background:* Primary preventive interventions aimed at elevated blood pressure and serum cholesterol, smoking, overweight and low levels of physical activity are generally considered as effective when implemented as individual interventions. In several countries, preventive health checks are recommended for the middle aged population (1, 2). Until now, however, it has been uncertain, whether implementation of systematic preventive health screenings and health consultations in primary care in Denmark would be cost effective. The Danish population registers provide a unique opportunity for assessing the impact of offering preventive health screening in primary care, respectively, preventive health screening followed by health consultations with the general practitioner (GP) about health promotion measures. The health economic analysis reported here is based on the “Ebeltoft Health Promotion Project” (3) and constitutes a supplement to the randomized, controlled study of the impact of offering preventive health screenings and health consultations in primary care (4-6). The report has been prepared by DSI Danish Institute for Health Services Research in a close collaboration with the group of researchers behind “Ebeltoft Health Promotion Project”. The project has been funded by The Danish Centre for Evaluation and Health Technology Assessment’s grants for Health Technology Assessment.

*Objective:* To assess whether the implementation of preventive health screenings and health consultations in primary care in Denmark will be cost effective.

*Methods:* The study comprises a determination of the expenses and costs related to predefined health effect measures for three randomized groups (two intervention groups (1,006 subjects) and a control group (501 subjects)). The participants were 30 to 49 years old (as of January 1, 1991) men and women living in the municipality of Ebeltoft and registered in one of the primary care units of the municipality. Randomization of subjects into control and intervention groups was stratified by primary care unit, sex, age, body mass index (BMI), and cohabitation status. The participants were randomized between the following types of intervention:

- Group 1 (control group (in the following referred to as the questionnaire group)): completion of a questionnaire at project start and after one year and five years. The subjects were offered a general health screening and subsequent consultation at the end of the project (five years after project start).
- Group 2 (intervention group): completion of a questionnaire at project start and after one year and five years. Offered a health screening at project start and at one year and five years, each followed by a written feedback with health promotion advice and a request to make an appointment for an ordinary consultation in case the health screening had led to suspicions of disease or had indicated any increased risk factors, such as a high or very high risk of cardiovascular disease. The group was also offered health consultation at the end of the project, depending on their own appraisal of need.
- Group 3 (intervention group): completion of a questionnaire at project start and after one year and five years. The group was offered a health screening at project start and at one year and five years. The first health screening was to be followed by a planned, 45 minutes long patient centred health consultation with their GP, and the following four years the participants could each year demand a 30 minutes long health consultation depending on their own appraisal of need.

In addition to an assessment of the risk of cardiovascular disease the health screening comprised: eye test, audition test, physical fitness test, examination of pulmonary function, assessment of liver and kidney function, and examination for diabetes. Participants from group 2 and 3 received a written feedback in the same format from their own GP with an explanation of the different examinations and, on the basis of the test results, individualized advice on which health promotion actions the subject could undertake. The mailing also included informative leaflets about life style

factors from The Danish Heart Foundation. In case of suspected disease or elevated risk factors, the subjects in group 2 were also requested to consult their usual GP.

All the calculations of the present cost effectiveness analysis are based on individual level data, and the analysis has been performed as an “intention to treat” analysis.<sup>1</sup> The assessment of costs comprises a determination of the following types of costs and expenses, which are all further described and explained in the methods section of the report:

- the costs of the interventions and of implementing the project
- direct health care costs related to hospital stays or outpatient visits (somatic and psychiatric) and consultations in the primary sector
- costs due to short- and long-term illness determined absences from work (estimated with the human capital method)
- expenses on sickness benefits and social pensions

The analysis uses the following two health effect measures, which are also further described in the methods section of the report:

- life-years gained
- number of deaths

The analysis focuses on *life-years gained*, as there was not found statistically significant differences in the number of deaths after six years follow-up. It should be noted, however, that “Ebeltoft Health Promotion Project” was not powered to detect a statistically significant difference after six years in the outcome measure *number of deaths*. Individual life expectancies at baseline and at the final health screening were estimated as in a Swedish study (7). Life expectancies at baseline for the control group were set equal to sex- and age-specific average values for subjects in the intervention groups (groups 2+3).

Direct costs comprised somatic and psychiatric inpatient and outpatient hospital services as well as services from practitioners, i.e. GP's, specialists, dentists, physiotherapists, chiropractors, opticians, chiropodists, independent laboratory technicians, and psychologists. Somatic hospital services were estimated with utilization data observed from the National Patient Register and using Danish, representative DRG cost weights and costs of outpatient services and casualty ward. Cost per extra inpatient day was calculated directly when inpatient days were greater than anticipated in the DRG cost (8). Costs of psychiatric inpatient and outpatient services were estimated from the Danish Central Psychiatric Register. All hospital costs are national means excluding capital costs (8). The costs of services from practitioners, i.e. the primary sector, were estimated from utilization extracts from the National Health Insurance Registry and costed by the negotiated fee schedule. Productivity costs and expenses on sickness benefits and social pensions were estimated from extracts from the Social Pension and Absenteeism Registries at Statistics Denmark. Aggregated data on private income, frequencies of occupation and employment rates were extracted from Statistics Denmark (1991-1997).

The comparisons of costs and effects and the statistical tests of the differences, using bootstrapping on mean values, have been focused on comparing the following groups:

- the health screening group versus the questionnaire group (group 2 vs. group 1)
- the health screening plus health consultation group versus the questionnaire group (group 3 vs. group 1)

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<sup>1</sup> This means that the estimated costs have been determined for all the subjects in each of the respective groups, and the average costs per subject in a given group have been calculated based on the number of subjects in the group. The changes in effects have been assessed on the basis of the persons participating in the health screenings both in 1991/1992 and in 1996/1997.

- the intervention groups combined (health screening+health screening plus health consultation) versus the questionnaire group (groups 2+3 vs. group 1)
- the health screening plus health consultation group versus the health screening alone group (group 3 vs. group 2)

The questionnaire group is the one most similar to the current patient management pattern in primary care, where systematic health screenings and health consultations are not performed. The level of significance chosen for the statistical tests is 5%.

*Results:* All costs and expenses are presented as average costs or expenses per randomized subject over a 6-year period. They have been calculated using 1997-prices and discounted at 3% per year. The outcome measure life years gained is determined as the average change in number of life-years gained per participant with health screening data available, assessed over a 5-year period and discounted at 3% per year.

For men and women combined, both interventions (health screening plus health consultation (group 3) and health screening alone (group 2)) are economically dominant compared to the questionnaire group (group 1). This implication follows from the finding that the health effect for both the health screening plus health consultation (group 3) and the health screening alone (group 2) is statistically significantly better than the health effect for the questionnaire group (group 1), while no significant differences in costs are found, regardless of which measure of costs is considered, direct health care costs, total expenses or total costs.<sup>2</sup> The health effects of health screening plus health consultation (group 3) is also significantly better than the health effect of health screening alone (group 2) without any significant differences in expenses or costs.

Subjects that are offered health screenings and health consultations (group 3) gain on average 0,30 years of life versus 0,16 years for the subjects in the questionnaire group (group 1) and 0,24 years for those who are only offered health screenings. Average direct health care costs<sup>3</sup> amount to 21,200 DKK per person for subjects offered health screenings and health consultations, 24,100 DKK for subjects only offered health screenings versus 27,300 DKK per person for the participants in the questionnaire group. The differences in costs are not statistically significant.

When the assessment is made for each gender separately, it appears that for men the health effect of both health screenings plus health consultations (group 3) and health screenings alone (group 2) is significantly better than the health effect for the subjects in the questionnaire group (group 1), while there are no significant differences in costs, regardless of the cost measure examined (direct health care costs, total expenses, or total costs). For women, the health effect is significantly better for the subjects offered health screenings and health consultations (group 3) than for the subjects in the questionnaire group (group 1), again without significant differences in any of the cost measures examined.

Sensitivity analyses have been performed examining the impact of 1) changes in outcome, in terms of number of life years gained; calculating life expectancies at baseline for subjects in the control group on the basis of average values for *all* who participated in the health screenings at baseline 2) assumptions concerning sickness benefits and costs of illness determined absences from work in 1991 and 1992; i.e. assuming the rates of absenteeism in 1991 and 1992 were approximately the same as in 1993 and 3) applying discount rates of either 0% or 5% per year. In general, these sensitivity analyses show that the results are not very sensitive, as the examined changes only have a limited quantitative but not a qualitative impact (in the sense of changing the direction of the

2 Costs were determined as either the direct costs in the health care sector, total expenses (direct health care costs+expenses on sickness benefits and social pensions) or as total costs (direct health care costs+costs due to short- and long-term sickness leaves).

3 To the direct health care costs should be added that part of the implementation and intervention costs which are not already included in the fees agreed with The National Health Insurance Service (use of office space, disposables, cleaning, etc.). These costs have been estimated to amount to 630 DKK and 310 DKK per person for group 3 and group 2, respectively.

results). After changing the assumptions used for estimating the number of life years gained, offering health screenings plus health consultations is still not significantly more costly than the offer given to the questionnaire group. Including assumptions about sickness leaves during the period November 17, 1991, to December 31, 1992, leads to a diminution of the estimated reductions in total costs and expenses. Changing the discount factor only changes the order of magnitude of expenses and costs but has no impact on the main results. Not discounting leads to the largest expenses and costs, while the smallest expenses and costs are found when using a discount factor of 5%.

Offering the middle aged population systematic preventive health screenings and health consultations must therefore be considered to be cost neutral compared to the current practice. For comparison, it may be noted that, for example, the least costly screening programmes for cervical cancer (9) and colon cancer (10, 11) cost about 21,000 DKK and 17,000 DKK, respectively, per life year gained when assessed over a 36-year period and discounted by 5% per year, but these costs include only the direct costs of running the screening programme.

*Conclusions:* Offering systematic, primary care based preventive health screenings and health consultations to 30 to 49 years old men and women is economically dominant compared to what is offered to the questionnaire group. This is implied by the finding that the health effect in terms of life years gained assessed over a 5-year period, is significantly better in the intervention group offered health screenings and health consultations than in the questionnaire group (control), while the costs for the intervention group, assessed over six years, were not higher than for the control group. This results must, however, be qualified by the proviso that the assessment of the health effect in terms of life years gained is based on an assumption of a life-long impact of the intervention, which probably is an overestimation of the effect. On the other hand, costs have only been determined over a 6-year period, whereby the expected reduction in future consumption of health care for the intervention group has not been taken into consideration.

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