Active detection of chronic obstructive pulmonary disease and asthma in the general population: results and economic consequences of the DIMCA program

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The health technology evaluated was a two-stage protocol consisting of screening followed by monitoring for 6 months, 12 months and 2 years to detect cases of asthma and chronic obstructive pulmonary disease (COPD). The comparisons reported for the economic evaluation were:

- screening plus 6 month monitoring versus no screening;
- screening plus 12 month monitoring versus screening plus 6 month monitoring; and
- screening plus 24 month monitoring versus screening plus 12 month monitoring.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population was the general population registered in 10 general practices in the eastern Netherlands. All patients with diagnosed asthma or COPD, congestive heart failure or other lung disease, serious morbidity with a life expectancy of less than 4 years, severe physical or mental handicap, or corticosteroid dependency were excluded.

Setting
The study setting was primary care in the eastern Netherlands.

Dates to which data relate
The DIMCA study was established in 1991. Effectiveness and resource data were collected from this date. Prices were obtained from 1996 data.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same population from which effectiveness data were collected.
Study sample
The authors did not report any calculations to estimate the power of the sample size to detect statistically significant differences. The study sample was a random sample of people registered in 10 general practices in the eastern Netherlands. The authors reported that virtually all Dutch people are automatically registered at a general practice and therefore, the sample group could be regarded as a random sample of the general population. The inclusion criteria for the initial study sample used for the screening stage of the study meant that people likely to be in contact with health services for asthma, COPD or other serious conditions were excluded. The study sample was randomised into the DIMCA group (n=1,988) or the control group (n=535). The people in the control group were not aware of the study. It should be noted that this paper does not report any baseline data or results for the control group.

The experimental group was invited to participate in the screening stage of the study. Of the initial 1,988 people randomised to DIMCA, 239 (12%) did not satisfy the inclusion criteria (29 had a confirmed diagnosis of COPD or asthma) and 1,155 (66%) agreed to participate. Of these, 604 people had symptoms or signs of COPD or asthma and were invited to participate in the second 2-year monitoring stage of the study, and 384 (64%) people agreed to participate. The remaining 220 (36%) subjects either refused or were not able to participate for logistical reasons.

Study design
The DIMCA was a multi-centred, randomised, controlled trial. The method of randomisation was not reported. This paper only reported data for the experimental group, so that the evaluation reported is effectively an observational cohort study. The first stage of the evaluation, for the experimental group was screening followed by a 2-year monitoring period. During the monitoring period, 54 people (14%) withdrew from the study.

Analysis of effectiveness
The analysis of effectiveness was based on intention to treat. The primary outcome was cases of COPD or asthma detected by screening plus 6 month, 12 month or 24 month monitoring.

Effectiveness results
The initial screen plus 6 month monitoring identified a total of 54 (7.7%) cases of asthma or COPD (DIMCA1), a further 79 (12.5%) cases were detected after 12 months of monitoring (DIMCA2), and a further 119 (19.4%) cases were detected after 24 months of monitoring.

Clinical conclusions
A large proportion of the general undiagnosed population showed symptoms and objective signs of COPD and asthma. The detection of asthma or COPD at an early stage was feasible.

Measure of benefits used in the economic analysis
Cases of COPD or asthma detected were the measure of benefit used in the economic analysis. The cases detected were measured at 6 months, 12 months and 24 months.

Direct costs
Resource quantities and costs were reported separately. The study reported average costs for the year 1996. Discounting was not relevant as costs were incurred over a period of time less than 2 years. The direct costs included in the study were:

Costs of spirometry and assessment of forced expiratory volume in one second (FEV1) and bronchial hyper reactivity (BHR), estimated from 1996 reimbursement fees.

Costs of administration and organisation including the costs involved in summoning all subjects, sending reminders and scheduling appointments. These were assumed to be equal to the reimbursement fees for administration and
organisation in a mass screening programme for cervical cancer in the Netherlands.

Time costs to all participants including travelling time, valued by the net hourly wages of the working participants.

Transportation costs, which were valued in accordance with guidelines for economic analyses in the Netherlands.

**Statistical analysis of costs**
The authors did not report a statistical analysis of costs.

**Indirect Costs**
Indirect costs due to morbidity or mortality were not included as they were not relevant to the perspective of the study.

**Currency**
Dutch guilders (Dfl). Costs were converted to US dollars ($) ($1 = Dfl 2.08).

**Sensitivity analysis**
In a univariate (one-way) sensitivity analysis, key parameters (% of patients detected, unit cost of spirometry, unit cost of reversibility test, unit cost of histamine provocation test, unit cost of patient time) were varied by 10% to assess the impact of variation on the average cost per case detected. A multivariate, semistochastic, sensitivity analysis was used to estimate the average cost per case detected for optimistic (high rate of detection and unit costs reduced by 25%) or pessimistic (low rate of detection and unit costs increased by 25%) scenarios.

**Estimated benefits used in the economic analysis**
The incremental number of cases of asthma or COPD detected was:

54 (7.7%) cases after 6 months of monitoring;

79 (12.5%) cases after 12 months of monitoring (DIMCA2); and

119 (19.4%) cases after 24 months of monitoring.

**Cost results**
The total costs were:

screening plus 6 months of monitoring $51,452;

screening plus 12 months of monitoring $75,091; and

screening plus 24 months of monitoring $118,217.

**Synthesis of costs and benefits**
The costs and benefits were combined to estimate the incremental cost per case detected.

The incremental cost per detected case for screening plus 6 months of monitoring was $953 versus no screening (based on a hypothetical group and assumption of no cases detected without screening).

The incremental cost per detected case for screening plus 12 months of monitoring was $318 versus screening plus 6 months of monitoring.
The incremental cost per detected case for screening plus 24 months of monitoring was $363 versus screening plus 12 months of monitoring.

The authors reported that the results were not particularly sensitive to changes in any of the cost parameters tested in the univariate analysis. The average costs per case detected ranged from -4.5% to +3.3%. The multivariate analysis indicated that simultaneous variation of cost and outcome parameters resulted in a 35-37% reduction (optimistic assumptions) or 48-53% increase in the (pessimistic assumptions) of the average costs per detected case.

**Authors’ conclusions**
Detection of COPD or asthma at an early stage by means of a two-stage protocol was feasible at relatively little expense compared with other mass screening programmes.

**CRD COMMENTARY - Selection of comparators**
Screening plus 6 months of monitoring was compared to no screening. The study also evaluated the incremental cost per case detected of screening plus 12 or 24 month monitoring programmes. The authors reported that no screening reflects usual practice and that there is a high rate of people with undiagnosed or untreated asthma and COPD in the general population of the Netherlands. You, as a user of this database should decide if no screening is representative of usual practice in your own setting.

**Validity of estimate of measure of effectiveness**
The authors described the study as a randomised controlled trial. However, they did not report data for the control group. Effectively, the outcomes of the screening programme plus monitoring were estimated from a prospective observational cohort study. This means that, for the analysis reported, there was no control for confounding factors that could affect the number of cases of asthma or COPD detected. These could include detection of cases in usual practice due to disease progression, or changes in usual practice over the time period of the study that could increase or decrease the rate of detection. Of importance for the analysis reported in this paper, the authors appeared to assume that no cases of asthma or COPD would be detected without screening plus monitoring. This potentially over estimates the effectiveness of the intervention. For example the authors noted that 74% of the people with signs or symptoms of asthma or COPD did not consult their general practitioner. This suggests that 26% of people with signs or symptoms did consult their general practitioner and could have been diagnosed without the screening programme. Participants, health care providers and researchers knew of the intervention and results of screening which may have biased the estimates of the number of cases confirmed by the subsequent monitoring stage of the programme.

In addition, the study design meant that there was no evaluation of differences in false positive and false negative diagnoses between the intervention and no screening. The authors reported a relatively high rate of false positive diagnoses. They also reported that there were indications that the false negative rate was very low, but did not present any data to support this. The authors reported that there were some differences at baseline between participants and non participants. However, they also reported that statistical analysis indicated that there was no evidence of recruitment or selection bias that would have led to an over estimation of the number of cases detected. The authors reported that statistical analysis (proportional hazards) was used to adjust for dropouts during the study.

**Validity of estimate of measure of benefit**
The summary measure of benefit was cases of COPD or asthma detected. This does not include a measure of the impact on overall health status due to detection, treatment or related adverse events. However, the authors did report that the preliminary results of 3 randomised controlled trials of the efficacy of treatment in screened patients indicated health gains from the intervention and treatment. The measure used did not indicate the value to patients of detection or changes in health status due to detection, treatment or related adverse events.

**Validity of estimate of costs**
The authors reported resource use and unit costs separately. The resource use data were estimated from observed data.
in the experimental group. Unit costs were estimated from reimbursement fees in the Netherlands health insurance system. The analysis included direct costs to the health care system and patients. The analysis included the costs of screening and monitoring for people who were subsequently classified as having a false positive diagnosis. However, the analysis did not include the costs of those with a false negative diagnosis. The authors reported that follow up of those with a negative screen indicated that the costs of health care for respiratory reasons in this group was low. The authors reported that there was a significant difference in the use of asthma or COPD related health care between the group that screened positive, and the group that screened negative for disease. However, the analysis did not include the costs of management for asthma or COPD for detected cases in the experimental group, or the costs of other health or social care or lifestyle changes related to diagnosis. The analysis did not consider the costs of health or social care or lifestyle changes in people who had not had screening. The robustness of the results was tested by univariate and multivariate sensitivity analysis on the detection rate and unit costs of tests. The sensitivity analysis did not include tests of changes in the level of resource use. In addition, the authors only reported changes in the average cost per case detected, not in the incremental cost per case detected. The multivariate analysis indicated that the average costs per case detected ranged from 37% less to 53% more than the average costs per case estimated in the base case analysis.

### Other issues

The authors reported that the protocol for the screening programme might not be feasible in other settings. They suggested that the network of general practitioners available in the Netherlands allows long term follow up of patients and repeated measurements and evaluation over time, which is important for the success of the intervention. If this is not available, then the benefits of the programme may be limited. The authors noted that they used broad criteria to detect relatively mild symptoms of disease. This led to a relatively high number of false positive cases, which could be reduced by only using the more sensitive and specific criteria. The authors also noted that attendance for monitoring was high, due to the motivation of the staff involved. This high rate of attendance may not be sustained in routine practice.

The authors did not compare the results of the evaluation to other published studies of screening for asthma or COPD. However, they did compare the results with those of screening programmes for other diseases. Taking into account the problems associated with such a comparison, the authors concluded that the costs of screening found in this study compared well with those of screening programmes for other diseases.

### Implications of the study

Early detection of COPD and asthma is only possible through repeated measurements and evaluation over the course of time. The results of DIMCA may trigger health-care organisations in other countries to (re)organise their services so that long-term monitoring is possible. Alternatively, current health plans provided by health maintenance organisations and regular examinations in the setting of occupational medicine may incorporate early detection protocols. Such protocols may not address the entire population but secondary prevention on a limited scale will also result in health gains and substantial future savings.

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### Bibliographic details


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