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
Influenza vaccination: split virion vaccine composed of A/Texas/36/91 (H1N1), A/Beijing/353/89 (H3N2) and B/Panama/45/90.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Three groups of workers (volunteers who were vaccinated) from three factories, compared to a group of non-vaccinated factory workers from three other factories within a 120 miles radius.

Setting
Six sock manufacture and distribution plants in North Carolina (USA).

Dates to which data relate
Data were gathered in the winter of 1992-93.

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

Link between effectiveness and cost data
Calculation of the costs of vaccine and number of lost workdays saved in the two cohorts were based on the same patient sample. Cost data appear to have been collected both prospectively and retrospectively, but this was not clearly stated.

Study sample
Each arm of the study consisted of 131 persons matched for age, work-activity and gender. It is unclear how the samples were obtained. It appears that all vaccinated persons were recruited, but the method of recruitment of controls, and the number refusing or excluded were not stated.

Study design
Prospective, open, non placebo-controlled, comparative study of two cohorts.
**Analysis of effectiveness**
Health outcome measures were: the incidence of ILI, the proportion of workers reporting lost work days due to ILI, total lost work days due to ILI, mean number of work days lost due to ILI, and percentage of workers with ILI reporting seeing a physician during the illness, proportion reporting upper respiratory illness (URI) symptoms, proportion of lost work days due to URI, and total number of work days lost due to URI. The basis for the analysis (intention to treat or treatment completers only) was not stated. The groups were not found to be statistically significantly different based on smoking, having a personal physician, having a chronic medical condition, or specifically cardiovascular disease. The median age was 45 in the vaccine group and 44 in the non-vaccinated group.

**Effectiveness results**
Vaccinated workers had significantly fewer episodes of ILI (20% versus 49%, P=0.0000008), working days lost (11% versus 24%, P=0.01) and total lost working days because of ILI (43 versus 93, P=0.00004). No differences were found between the two cohorts for upper respiratory symptoms (URI). Systemic side effects were present in 16.8% of vaccines, while localised effects occurred in 38.9% of vaccines. Severity of illness measures (i.e. mean duration of ILI) were not different between workers reporting ILI in either group.

**Clinical conclusions**
The vaccine was found to be safe and effective.

**Measure of benefits used in the economic analysis**
The measure of benefits used in the economic analysis was the number of lost working day saved by vaccination (from nurse-administered questionnaire). Valuation was based on the authors' assumptions, based on an estimate of $80 per worker per day provided by the company.

**Direct costs**
Medical care received for ILI episodes and the cost of the vaccine and supplies were included. Additionally, the cost of the nurse's and employee's time to administer/receive the vaccine and complete paperwork were included, but were listed as indirect costs. Cost and quantity were reported separately for most costs, except for medical care. Quantities were based on actual data, but the basis for the cost was unclear. The source of costs was not reported. The boundary assumed was that of the company.

**Indirect Costs**
The cost of ILI-related lost productivity for one worker for one day, estimated by the company at $80, was used for the valuation of productivity losses. The cost of lost productivity due to vaccine side effects was also considered. Cost and quantity data were reported separately. Quantity estimates were derived from actual data, but it is unclear what the $80 per worker per day was based on.

**Currency**
US dollars ($).

**Sensitivity analysis**
A one-way, simple sensitivity analysis was performed. The following variables were tested: number of lost work days saved, cost of medical care, cost of vaccines and supplies, nurse's time to vaccinate and complete paperwork, and employee's time to be vaccinated and complete paperwork. The areas of uncertainty being investigated were data variability and generalisability of findings. It is unclear in the analysis which of these variables the calculations were sensitive to, as there is no baseline calculation.
Estimated benefits used in the economic analysis
There were 93 lost working days in the non-vaccinated group and 43 in the vaccinated group. The incremental lost working days saved by vaccination was 50. The length of follow up was approximately five months. No work days were lost due to side effects of the vaccine.

Cost results
The total costs over the five month period of the programme for vaccinated individuals was $4,108 and $2,990 for non-vaccinated individuals.

Synthesis of costs and benefits
The costs and benefits were combined by determining the cost per lost work days saved. The incremental cost to the company of lost working days saved by vaccination was $22.36. Sensitivity analysis was performed, but the authors did not discuss the findings. Halving the nursing time reduced the cost per work day saved from $22.36 to $2.22. Doubling nursing time increased the cost to $62.66.

Authors’ conclusions
The results of the study suggest that there are potentially significant savings to be made by a company offering influenza vaccination to its employees, especially in a year when there is good protection offered by the vaccine.

CRD COMMENTARY - Selection of comparators
The selection of comparators, vaccinated and non-vaccinated, is reasonable and accords with similar studies in the literature.

Validity of estimate of measure of benefit
The absence of randomisation introduces the possibility of numerous biases (some of which are listed in the paper's discussion section), making the interpretation of results very difficult. Known biases are reasonably accounted for, but unknown biases can only be accounted for by randomisation. Self-reporting of illness is unreliable and, as no blinding was carried out, the validity of the differential rates of reporting of ILI is questionable.

Validity of estimate of costs
The methods of costing are not explained. The valuation of $80 daily is likely to be the average daily wage with a proportion of overhead costs. This is not likely to be a realistic estimate of productivity losses, but an overestimate. The average time off work per employee with ILI was short (mean: 1.7 days), leading to minimal real losses for the period.

Implications of the study
This pilot study points to a possible cost-effective use of the vaccine in factories during influenza epidemics. Further research with more rigorous methodology should be conducted to confirm these findings.

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