

Sickness absence following a campaign of vaccination against influenza in the workplace

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This study was designed as a retrospective cohort study of those employees vaccinated against influenza vs. unvaccinated employees in a service company. The objective was to investigate whether vaccinating employees against influenza in an occupational setting was of any benefit. There were 2,557 persons entered in the study who were in continuous employment between 1 October 1990 and 31 March 1992 of which 23.5% (601) were vaccinated. The study was carried out at First Data Resources Limited in Basildon, Essex UK. The main outcome measure was self-reported influenza sickness lasting four or more days and reduction in sickness absence due to vaccination against influenza. The results were surprising. In the vaccinated members of staff, influenza illness was halved, Relative Risk=0.46, 95% confidence limits (0.27<RR<0.76). The conclusions were that the study showed a significant decrease in sickness absence due to influenza illness, as a result of an active vaccination campaign carried out amongst otherwise healthy individuals in the occupational health environment. This is the first study of this nature in the UK to show statistically significant evidence of benefit from vaccinating healthy employees. It lends support to immunization against influenza in the workplace.

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INTRODUCTION

As a result of changes of emphasis in the occupational health policy of First Data Resources, it was decided to take a more positive approach to health promotion. An influenza vaccine campaign was undertaken aiming to offer immunization, on a volunteer basis, to all employees of the company.

The overall burden of influenza remains high. The clinical picture is one of relatively sudden onset of fever, prostration and malaise, accompanied by headache, myalgia, anorexia, sore throat, non-productive cough and nasal discharge. The most severe outbreak known in 1918 was responsible for an estimated 100,000 deaths.¹ An equivalent clinical picture can result from adenovirus, rhinovirus and respiratory syncytial viruses and so the term 'influenza-like illness' has come to being accepted. However, from the clinical viewpoint, this is not usually important, as treatment and

prognosis are similar for all other than severe or complicated cases.

Influenza epidemics occur yearly spanning some 1-4 months in the winter, i.e. October-April.¹ It is an important cause of morbidity and occasional mortality. The RCGP meeting on influenza expressed concern that influenza can kill up to ten thousand individuals a year, it causes the loss of more working days per year than musculoskeletal disorders and takes more general practitioner's time than back pain or cardiovascular disease, even in non-epidemic years.² The relatively mild epidemic of 1989 has been calculated to have resulted in about 25,000 additional deaths in England and Wales.³ In the UK the Chief Medical Officer for the Department of Health, Dr D. K. Calman, stated in his 1991 circular that an improved uptake of influenza vaccine in the vulnerable groups will reduce mortality and morbidity from influenza and that appropriately formulated influenza vaccine would give about 70% protection against infection; immunity can be expected to last through the winter. The immunization of healthy adults is left to the individual Medical Practitioner.⁴

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We felt that it would be important to demonstrate the outcome of our campaign in terms of protection afforded to the otherwise healthy individual. At the same time it was proposed to look at the effects and the result of this scheme in a systematic way by studying its impact upon sickness absence. This was because of a lack of evidence of any substantial benefits arising from similar schemes. Previous studies, in particular the five year Post Office study, failed to demonstrate any consistent benefit to those vaccinated. This study in 1979, showed that a campaign of vaccination led to a small reduction in sickness absence, explained by various factors. These were, the placebo effect and the 'Hawthorne' effect whereby, a group provided with an improvement in their welfare may show an improved attendance⁵ and also, the prevention of illness amongst the employees suffering from chronic ailments. The overall saving in sickness absence in this study was a little over 4%.⁶

Another study in the USA showed that influenza was responsible for approximately fifteen million work days lost and the annual expenditure to treat influenza with its complications averaged some three hundred million dollars. The final cost effectiveness of a vaccination against influenza was assessed to be very favourable.⁷

Of equal importance was the need to provide some concrete data on the outcome of the campaign to management within the company. Sickness absence is now a major issue both locally and at national level and any impact upon it would be of interest to the company as a whole. In an ordinary year, it is generally accepted that 10–12% of all absence is attributed to 'flu'.⁸

MATERIALS AND METHODS

The vaccine was made by one of the major manufacturers in the UK, containing purified surface antigen, and it is prepared from inactive highly purified virus grown in hens' eggs. It is associated with an estimated protection rate of 66%.⁹ The precise antigenic profile of the vaccine is as follows:

A/Singapore /6/86 (H1N1) like strain	15 micrograms
A/Beijing /353/ 89 (H3 N2)	15 micrograms
B/Yamagata 16/88	15 micrograms

The dosage was a single 0.5ml injection given intramuscularly in the deltoid muscle with needle and syringe. Each dose contains haemagglutinin and neuraminidase antigens in accordance with WHO recommendations and endorsed by the Chief Medical Officer. The antigenic match to the prevailing influenza strain was deemed to be of an excellent fit for the year in question, which was not a major epidemic one.¹⁰ The immunization campaign ran between 1–30 October 1991 as it is calculated that it takes 10–14 days to develop antibodies of significant value in order to

provide immunity for the 'flu' season of November to April.⁴ Vaccination was carried out by the Occupational Health Nurses during a 10 minute appointment booked 2 weeks in advance, so as not to disrupt working arrangements. The population was defined as those in full employment in the company. A form was circulated informing all employees of the campaign and requesting those interested to send their details to the Medical Centre. The campaign was based entirely upon self-selection and those wishing to be vaccinated were interviewed and given appropriate information in terms of benefits and potential side-effects. Any staff receiving influenza vaccine outside these dates were excluded from the study. It is unknown if any staff in the unvaccinated group were vaccinated by other agencies, but since being vaccinated does not *a priori* increase the incidence of influenza this will only go to reduce the magnitude of the positive benefit shown by the study. The outcome measure was the sickness absence due to influenza reported to the company by the employees between 1 October 1991–24 March 1992. All manner of sickness is routinely reported to the Medical Centre and the staff enters these details into the computer held data base from which we extracted our figures. Absence normally requires an internal sickness form; under 7 days self-certification is compulsory and over this time lapse, a doctor's certificate needs to be provided. Sickness due to influenza was identified and defined by the presence of the cardinal symptoms described earlier with fever being the single most prominent sign in adults.¹ Both groups were observed for the same period and there was no recruitment into either group or loss to follow-up. Those absent with flu and flu-like illness of <4 days, or >2 weeks duration, were excluded.

The duration of influenza we chose for the study was one based on clinical symptoms of 4 or more days' duration and lasting up to 2 weeks, which corresponds with that defined by Young in 1989.¹¹ The pyrexia peaks at the height of systemic features and may last for 1–5 days, but other symptoms may last for 1–2 weeks.¹

In order to overcome potential misclassification bias, we also looked at sickness absence for illnesses of whatever cause in the previous year and the year covering the study period. We also looked at the demographic details of the individuals, in terms of their age, sex, number of children and managerial status. The data was obtained from the payroll and employee data base compiled by the occupational health nurses. The main analysis of data was done by a manager in the company data department independently of the medical staff involved in the study. Ninety-five per cent confidence intervals for illness rates were calculated using the Poisson approximation.¹³

Serum titres were not measured and the study was run on a self-selected basis, as a randomized control trial was felt to have been inappropriate given that this is a report of general usage of vaccine.

RESULTS

Out of the 2,557 employees of the company, 601 (23.5%) chose to be vaccinated. In the vaccinated group 16 out of 601 individuals experienced influenza lasting between 4–14 days in comparison with 114 out of 1,956 non-vaccinated (Table 1).

The incidence of influenza followed a predictable pattern with the unvaccinated group reporting 70% of cases and the vaccinated group, 56.25% between 1 October 1991–7 January 1992, i.e. a period of 14 weeks (Figure 1). In the equivalent period the Influenza Monitoring Centre recorded rising levels of reported flu and flu-like illness, reaching a peak in January 1992 with 108.35 cases per 100,000 of population. This pattern of incidence reflects the one found in our study population.

The demographic profile (Table 1) of the vaccinated and unvaccinated groups was statistically similar in terms of age, sex and managerial status. No information was available on the ethnic make-up or smoking habits of each group.

Adverse reactions were low, in keeping with previous reported incidences,¹⁰ and included ten mild localized skin reactions and two simple faints due to vasovagal reflex.

The previous year's (1 April 1990–31 March 1991) sickness absence records showed that the vaccinated group had experienced a slightly increased level of sickness due to all causes and, significantly more days lost, than the non-vaccinated one. However during the year covered by the study, (1 September 1991–31 March 1992) this trend was reversed with the vaccinated group experiencing significantly fewer lost days

Table 1. Demographic characteristics and self-reporting influenzal sickness among vaccinees and non-vaccinees

Characteristic	Vaccinees		Non-vaccinees	
	n	%	n	%
No. of employees	601	(23.5)	1,956	(76.5)
Mean age (years)	38.0		35.0	
Men	156	(26)	548	(28)
Women	445	(74)	1,408	(72)
Managerial staff	21	(3.5)	77	(3.9)
Total work days available	109,983	(23.5)	357,948	(76.5)
Total days ill (and % of total available)	101	(0.09)	658	(0.18)
Employees ill (and % of total employees)	16	(2.7)	114	(5.8)
Mean length of influenzal illness	6.3		5.8	

although there was no evidence of a different illness episode rate between the two groups (Table 2).

Over the study period, 16 of 601 vaccinees became ill with influenza, in comparison to 114 of 1,842 non-vaccinees ($\chi^2=8.90$ with 1 degree of freedom, $p=0.0028$), giving a relative risk of influenza of 0.46 (95% CI 0.27–0.76) among the vaccinees.

DISCUSSION

Our company is mainly involved in the financial sector and relies heavily on computerized data handling. Influenza illness has been shown to lead to a reduction in computerized performance task by up to 57%, which

Figure 1. Proportion of total flu

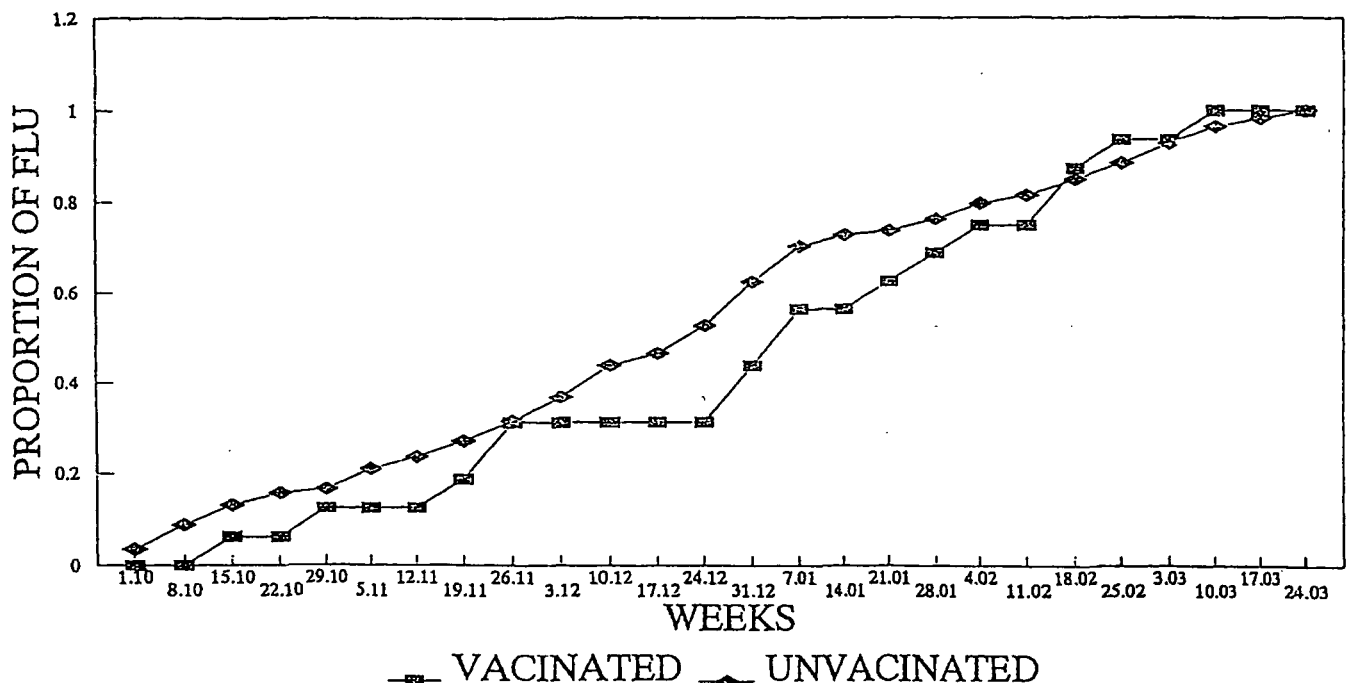


Table 2. All causes of sickness absence of between 0–29 days duration among vaccinees and non-vaccinees in the 1990/91 and 1991/92 seasons

1990/91 season	vaccinees	non-vaccinees	difference (and Poisson 95% CI)
Illness episodes/employee	1.13	0.98	0.15 (0.054–0.25)
Total work days available	109,382	355,992	—
Days worked	107,396*	351,163*	—
Days lost	1,986*	4,829*	—
Days lost per 100,000 worked	1,816	1,356	459 (371–548)
<i>1991/92 season (trial year)</i>			
Illness episodes/employee	1.22	1.12	0.05 (-0.03–0.17)
Total work days available	109,983	357,948	—
Days worked	107,982†	350,841†	—
Days lost	2,001†	7,107†	—
Days lost per 100,000 worked	1,819	1,985	-166 (-258 – -74)

* $\chi^2=121.9$, $p<0.000001$ † $\chi^2=12.02$, $p<0.001$

is a substantial reduction compared to other factors known to diminish performance, for instance alcohol which will lead to a 5–10% reduction.¹² It thus would be important to reduce its impact considering that, during the influenza season, the company experiences its busiest period. On a general note, the government is actively encouraging individual companies to deal with their own absenteeism problems.

Although there is a reduction in sickness absence which is in line with the generally accepted protection levels afforded by the vaccine, the issue of selection bias arises. The fact that the vaccinees had experienced a greater level of previous illness episodes, may suggest that they were self-selected for vaccination. Alternatively, the higher previous absence of the vaccinees might be an indicator of greater challenge from respiratory virus disease resulting in greater immunity, so the protection would be over-estimated.

In addition, those with less previous sickness absence may have chosen not to be vaccinated as they may have assumed that they already possessed better protection: in this case they may well have concluded that their influenza-like illness was not in fact such, leading to under-reporting. This effect is closely related to differential reporting which might result when an immunized person may dismiss a diagnosis of an illness against which vaccination has been received, in this case influenza, as unlikely. However, the similarity of reporting of all other illness during the year covering the study period by both groups would indicate similar perceptions of illness in both of them.

At any rate, the figures for the incidence of influenza in the local community as a whole, run reassuringly in parallel to the illness pattern witnessed by our employees. This would seem to indicate that the reporting of influenza by the employees of the company follows the true incidence of such illness outside, as well as inside the company.

The fact that no details on the smoking habits of the cohorts were requested, in line with most of the

other influenza vaccine studies available, could be an issue worthy of interest as it is accepted that this factor does predispose to upper respiratory tract infections.

There are a number of intangible factors difficult to quantify, arising from this study, which can be summarized as follows:

- the worthiness of a health promotion exercise which was welcomed by staff and management alike
- the development of an in-company joint exercise between different departments which usually have no common interest
- the enhancement of the image and status of the Occupational Health Department within the company, away from a first aid facility to a more comprehensive service unit

The potential savings as applied to the current (trial) year is derived from calculating the number of days lost and the total number of days available in both groups.

Vaccination in the 1991/1992 season resulted in a saving of between 74–258 days per 100,000 days worked. Over a total of 467,931 man days available in the company (109,983 + 357,948), between 346–1,207 days would be saved if all employees were vaccinated. Given that only 109,983 man days were worked by vaccinees (23.5%) the saving in the trial year was in fact between 81–283 days. As the fully-loaded cost of an employee, excluding holidays but including benefits and pensions, is £50, it will be seen that the savings from the campaign as it applied to the vaccinees was somewhere between £3,700–£14,150. From such sums, the cost of running the campaign, approximately £2,500 (including the cost of each vaccine at £4.08) must be deducted.

We have concluded through our study that there is evidence to warrant a further influenza campaign which is now under way.

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