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Vaccination against influenza: a five-year study in the Post Office

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SUMMARY

An injection of influenza vaccine was offered to approximately 60000 Postal and Telecommunications staff at the beginning of five successive winters. The sickness absence of this group, which included those who accepted the offer of vaccine as well as those who did not, was compared throughout the winter with that of a similar number of employees who were not offered vaccine. The two groups, 'vaccinated' and control, comprised the staff of nearly 400 Post Office units scattered throughout Great Britain, the units of the two groups being matched as far as practicable for numbers employed, type of work, region and type of location.

The proportion who accepted vaccine fell from 42% in the first year (when only 26000 Telecommunications employees were offered vaccine) to 35% in the second year, and 25% by the fifth year.

With the exception of Telecommunications employees in 1972–73, the sickness absence rate of the group offered vaccine was less than that of the group not offered vaccine, and the difference was evident during the winter observation periods both when influenza was prevalent and when it was not. In the last four years of the study the average difference in sickness absence between the 'vaccinated' and control groups was 1·26 days per 100 employees per week during and 1·12 days outside the influenza periods. Moreover, the difference during the influenza periods was greater than could be expected from the acceptance rate of vaccine and the estimated attack rate of influenza. The apparent reduction in sickness absence of the group offered vaccine in comparison with the group not offered vaccine represented an appreciable saving in cost.

It is suggested than an annual influenza vaccination campaign in industry may produce financial benefit, but that only a proportion of the benefit is due to an improvement in health.

INTRODUCTION

The benefit to health, and consequently to the rate of sickness absence, conferred by an annual offer of influenza vaccine to working adults will be influenced by a number of factors. There is the protective effect of influenza vaccine, which is

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liable to vary from year to year depending on the antigenic relationship between the vaccine and the influenza viruses to which the population is exposed. The attack rate of influenza is important; a nil attack rate, for example, would allow no specific benefit from vaccination. The rate of acceptance among a population offered vaccine, their age and sex composition, as well as the proportion who have diseases such as chronic bronchitis, are interrelated factors that may also affect the benefit to be obtained from a vaccination campaign. Sickness absence rates may also be influenced by placebo effects and other, ill-understood factors such as the 'Hawthorne' effect (Roethlisberger & Dickson, 1939). The complexity of these various influences is such that the benefit to sickness absence rates of an influenza vaccination campaign can be estimated only by means of a field trial.

The design of a suitable field trial to measure the value of a vaccination campaign is not straightforward. A comparison of sickness absence rates among people who have accepted vaccine with those who have not is unlikely to give an entirely valid measure since it represents a comparison between volunteers and non-volunteers. Influenza vaccine acceptors were found to form a group with lower absence rates than non-acceptors, even before they accepted the vaccine (Smith *et al.* 1974). A comparison of absence among volunteers given vaccine and those given placebo will provide a measure of the value of vaccination (Edmondson, Graham & Warburton, 1970), but the findings would relate specifically to volunteers who were prepared to accept a placebo inoculation, and would not necessarily indicate the results to be expected from a general vaccination campaign. A new approach was therefore adopted in a collaborative study with the British Post Office (Smith, 1974). In this study the sickness absence rate among approximately 60000 Post Office employees who were offered influenza vaccination annually for five winters was compared with that among a matched group of controls not offered vaccine. This method is believed to take into account the various influences that were considered above and thus to provide an insight into the total effect of an influenza vaccination campaign in industry.

METHODS

The study procedure was as described previously (Smith, 1974). Units of the Postal branch of the Post Office, which includes sorting, delivery and administration offices, as well as Post Offices open to the public, and units of the Telecommunications branch, which includes exchanges, engineering centres, and administration offices, were selected for vaccination. The units were selected to include ones of differing size, locality and type of work. For each unit a matching control unit was selected, being matched as far as practicable in terms of type of work, numbers employed, region, and type of location. For example, a large sorting office in a North-Eastern industrial town might be matched with a sorting office of similar size in another North-Eastern industrial town. The selection of the vaccinated units and their controls was made by the Post Office. In certain cases groups of units had to be matched owing to the need to offer vaccination uniformly to all units within a confined locality. The units were chosen to cover all

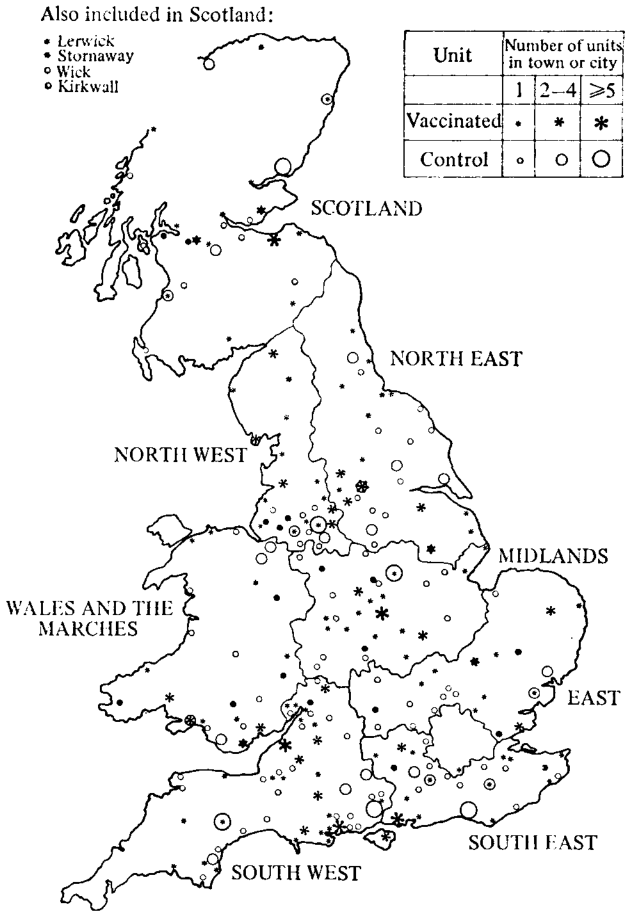

Fig. 1. Location of Post Office Regions and of Units in the Study.

areas throughout Great Britain with the exception of London and Birmingham, which were excluded to ensure a reasonably static population (Fig. 1). The total number of units and employees taking part is shown in Table 1.

An offer of an injection of influenza vaccine was made to every employee of the selected group of units in the late autumn of each year, the other group of units acting as the unvaccinated control. The offer of vaccination was made by means of a letter to each employee explaining the purpose of the study and the benefits of vaccination. Posters and articles in Post Office journals were also used to publicize the offer. The large group of units in which vaccination was offered was the same each winter – it is referred to as the 'vaccinated' group of units. Since not all employees who were offered vaccine accepted it, the population in the 'vaccinated' group of units included those who accepted vaccine as well as those who did not. The vaccine used each year was a current standard commercial preparation ('Admune', Evans Biological Ltd) and was given intramuscularly with a needle and syringe by the staff of the Post Office Occupational Health Service, or under their supervision. The antigenic composition of each year's vaccine is given in Table 2.

Table 1. *Number of employees in the trial*

		Telecommunications numbers		Postal numbers	
		Units	Employees	Units	Employees
1971–2	'Vaccinated'	101	26317	—	—
	Control	97	25202	—	—
1972–3	'Vaccinated'	100	26779	101	31591
	Control	97	26130	100	33796
1973–4	'Vaccinated'	99	28158	101	31626
	Control	96	26536	100	33813
1974–5	'Vaccinated'	99	29241	101	31612
	Control	96	25946	100	34997
1975–6	'Vaccinated'	98	29247	101	32564
	Control	96	25591	100	35458

Table 2. *Influenza vaccines and outbreaks*

			Characteristics of influenza outbreak		
Winter	Period of observation (weeks)	Vaccine composition	Estimated duration (weeks)	Predominant virus	Estimated clinical attack rate among working population*
1971–2	21	400 i.u. A/HK/31/68 200 i.u. B/Vic/98926/70 in 1.0 ml dose	6	A/HK/31/68	2%
1972–3	26	400 i.u. A/HK/31/68 200 i.u. B/Vic/98926/70 in 1·0 ml dose	16	A/Eng/42/72	3%
1973–4	25	400 i.u. A/Eng/42/72 100 i.u. B/Vic/98926/70 100 i.u. B/HK/8/73 in 1·0 ml dose	10	A/PC/1/73 B/HK/8/73	3%
1974–5	30	300 i.u. A/PC/1/73 100 i.u. A/Eng/42/72 300 i.u. B/HK/8/73 in 0·5 ml dose	14	A/PC/1/73 A/Scot/840/74	2%
1975–6	28	400 i.u. A/Scot/840/74 400 i.u. A/PC/1/73 300 i.u. B/HK/8/73 in 0·5 ml dose	10	A/Vic/3/75 B/HK/8/73	3%

* Clinical attack rate estimated from PHLS Influenza Study (Report 1977).

Each unit, 'vaccinated' and control, provided an annual return of the number of staff employed at the time of vaccination, and the 'vaccinated' units also recorded the number accepting vaccine. During the winter, weekly returns of sickness absence were made by all units to provide the number of working days lost and the number of new absences each week. In addition, the weekly return

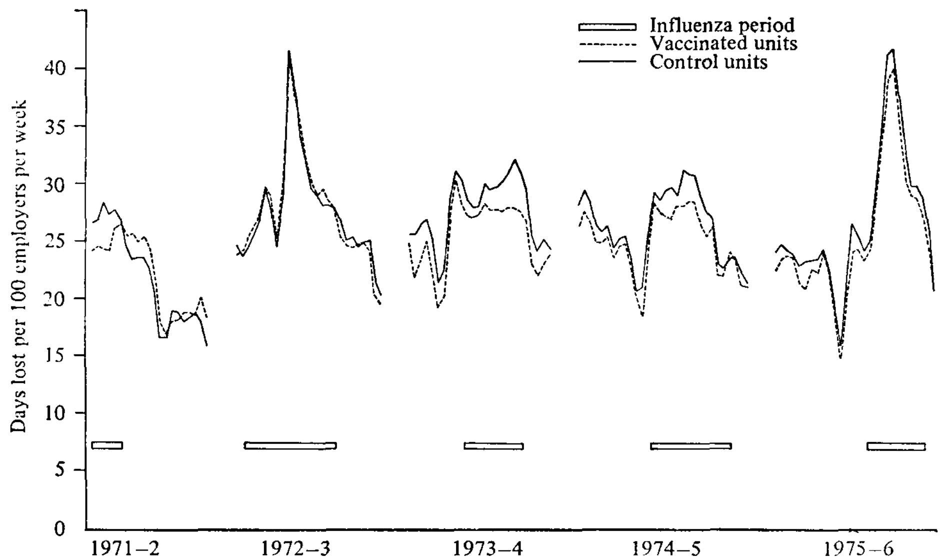

Fig. 2. Sickness absence from all causes for 'vaccinated' and 'control units' in the winter study periods.

included an analysis of the causes of illness given on the medical certificates submitted by staff returning to work after a certified illness of more than 3 days duration. Also recorded were the number of staff leaving and recruited. These weekly returns were started at about the time of vaccination and continued until the spring of the following year – a period of about 6 months. The returns were analysed for Postal and Telecommunications branches separately, as well as for the two branches combined. Matched pair *t* tests were made to estimate the statistical significance of the differences in absence rates between the 'vaccinated' and control groups in the different periods of observation.

The duration and severity of influenza outbreaks were estimated from consideration of the number of influenza virus isolations reported to the Public Health Laboratory Service (PHLS), new sickness benefit claims and deaths attributable to influenza and influenzal pneumonia published by the Office of Population Censuses and Surveys, and the rate of diagnosed cases of influenza reported by the Royal College of General Practitioners. In addition, data from the PHLS influenza surveillance study was taken into account (Report, 1977). From an inspection of these data an 'influenza period' was defined for each winter, being the period in which influenza was judged to be prevalent (Fig. 2). Characteristics of the influenza outbreaks for each year of the trial are summarized in Table 2.

A separate study was made in the Post Office Giro office to examine the extent to which vaccination itself caused sickness absence. Employees of Giro were offered vaccination and invited to complete a 5-day calendar record of subjective reactions (Smith, Fletcher & Wherry, 1975), and arrangements were made to collect and analyse the absence records of the staff.

An estimate of the costs of the main vaccination programme was made in 1975.

Table 3. *Acceptance of influenza vaccine*

	Approx no. of employees offered vaccination annually	Percentage acceptance of vaccines in the year				
		1971	1972	1973	1974	1975
All Post Office	60000	—	35	31	26	25
Telecommunications	28000	42	34	35	30	29
Posts	32000	—	36	28	23	22

The vaccine and syringes cost £14600 (94p per injection). The direct cost of the doctors and nurses of the Occupational Health Service of the Post Office (travelling expenses, etc.), together with the indirect cost of the time spent on vaccination, was £4039 (26p per injection). The non-medical costs of the work of organizing vaccination sessions, payment to assistants and time lost by the staff attending for vaccination was £9454 (61p per injection). The total estimated cost per injection in 1975 was, therefore, £1.81. The daily cost to the Post Office of the absence of an employee (over and above any sick pay allowed) was estimated to be approximately £10 in 1975.

RESULTS

Staff changes

The number of staff leaving employment during the study period of each winter was small – on average, 94 % of staff present at the beginning of the winter were still employed at the end – and there were no significant differences in this respect between 'vaccinated' and control units.

Acceptance

At the first offer of vaccination, in 1971, only the Telecommunications branch of the Post Office was participating in the trial, and 42 % of approximately 26000 employees accepted vaccination (Table 3). The initial response of the 31500 employees of the Postal branch in the following year was an acceptance rate of 36 %, and in each succeeding year the rate was lower than in the Telecommunications branch. There was a steady decline in both these rates throughout the period of the trial.

There were considerable differences in the acceptance rates of individual units, although the extremes tended to occur in units with only small numbers of employees. Nevertheless, in units of over 50 employees rates as low as 3 % and as high as 88 % occurred (Table 4). There were also regional differences in acceptance (Table 5), with Scotland, Wales, Midlands and the North West having rates below those in the South West, South East and East in every year except 1971.

Table 4. *Range of acceptance of influenza vaccine*

Acceptance (%)	Number of units* with the indicated acceptance rate				
	1271†	1972	1973	1974	1975
0–9	0	2	2	8	12
10–19	4	10	29	37	37
20–29	11	34	47	55	66
30–39	15	53	43	56	51
40–49	25	46	43	33	19
50–59	16	28	17	8	8
60–69	8	8	5	0	1
70–79	4	7	4	1	1
80–89	3	2	0	0	1
Total	86	190	190	198	196

For this analysis Postal Units in which counter staff were employed were regarded as two separate units.
* Only units of 50 or more employees are included.
† Telecommunications only.

Table 5. *Acceptance of influenza vaccine by region*

Region	Percentage acceptance of vaccine in the year				
	1971*	1972	1973	1974	1975
Scotland	42	30	24	19	19
North West	48	32	27	21	20
North East	43	38	37	29	27
Midlands	33	32	27	22	23
East	45	39	38	35	33
South East	38	39	37	30	29
South West	46	42	37	35	30
Wales and the Marches	39	33	27	22	21

* Telecommunications only.

Sickness absence

Sickness absence, as measured by the number of working days lost due to all causes, was calculated week by week for the 'vaccinated' and unvaccinated groups of units as a rate per 100 employees (Fig. 2). Table 6 gives the weekly rates during and outside the influenza periods, and Table 7 gives the percentage by which sickness absence was lower in the 'vaccinated' units. For example, during the influenza period in 1972/73, the 'vaccinated' units experienced 8·4 % fewer days lost from sickness absence than the unvaccinated controls.

In both Posts and Telecommunications the number of working days lost was lower in the 'vaccinated' units in each winter of the study, with the exception of Telecommunications in 1972/3, when the 'vaccinated' units had a higher absence rate than their controls. The apparent benefit to the 'vaccinated' units was found to be present both during and outside the influenza periods, the percentage by which sickness absence was lower in 'vaccinated' units differing little between

Table 6. *Comparison of sickness absence (all causes) in 'vaccinated' and control groups of units*

Period of observation*	Days lost from sickness absence per 100 employees per week in the winter of											
	1971–2		1972–3		1973–4		1974–5		1975–6		Annual average	
	Vac. †	Cont.‡	Vac.	Cont.	Vac.	Cont.	Vac.	Cont.	Vac.	Cont.	Vac.	Cont.
	Telecommunications											
Influenza period	24·9	27·3	27·9	26·2	22·4	24·4	22·2	23·2	26·7	28·4	24·8	25·9
Non-influenza period	20·9	19·9	19·9	19·9	20·1	22·1	20·4	21·3	19·0	19·4	20·1	20·5
Whole period	22·0	22·0	24·8	23·8	21·0	23·0	21·2	22·2	21·7	22·6	22·6	22·7
	Posts											
Influenza period	—	—	32·1	32·7	31·7	34·1	30·5	31·6	36·1	36·4	32·6	33·7
Non-influenza period	—	—	26·8	27·6	28·3	29·6	27·0	27·7	25·1	25·8	26·8	27·7
Whole period	—	—	30·1	30·7	29·7	31·4	28·7	29·5	29·0	29·6	29·4	30·3
	All											
Influenza period	—	—	30·2	29·9	27·3	29·8	26·5	28·1	31·7	33·0	28·9	30·2
Non-influenza period	—	—	23·6	24·2	24·5	26·3	23·8	25·0	22·2	23·1	23·5	24·7
Whole period	—	—	27·7	27·7	25·6	27·7	25·1	26·4	25·6	26·7	26·0	27·1

* for definition of the periods of observation, see Methods
† Vac = 'vaccinated'.
‡ Cont. = control.

these two periods. The differences were statistically significant ($P < 0·05$), with three exceptions – those of the Telecommunications non-influenza periods in 1972/3 and 1975/6, and the Posts influenza period in 1975/6 (Table 7). The annual average difference during the influenza periods of the last 4 years of the study was 4·2 % and outside these periods 4·5 %.

The percentage by which sickness absence was lower in the 'vaccinated' units gave a less consistent picture when measured in terms of number of new absences per 100 employees (Table 8). In the last two winters of the study the 'vaccinated' units experienced a slightly greater number of new absences than the control units, despite the fact that the number of days lost from sickness absence was lower. In these years, therefore, the benefit in days lost to the 'vaccinated' units was associated with a shorter average duration of absence than in the control units.

The number of medical certificates in which a respiratory cause was indicated for the illness was less in the 'vaccinated' units than in the control units, except in the final year of the study – 1975/6 (Table 9). The difference was present both during and outside the influenza periods – presumably some of the staff ill with influenza did not return to work until after the influenza period was finished. The difference in the number of respiratory certificates provided in the two groups

Table 7. *The percentage by which sickness absence was lower in 'vaccinated' units when compared with control units*

Period of observation	Percentage difference in days lost from sickness absence in the winter of 1971–2	1972–3	1973–4	1974–5	1975–6	Annual average
			Telecommunications			
Influenza period	−8·7*	+6·6	−8·1	−4·5	−5·9	−4·1
Non-influenza period	+4·8*	+0·2NS	−9·3	−4·2	−1·9NS	−2·1
Whole period	0·0	+4·5	−8·8	−4·3	−3·7	−2·5
			Posts			
Influenza period	—	−1·6	−7·0	−3·4	0·8NS	−3·2
Non-influenza period	—	−2·8	−4·3	−2·5	−2·8	−3·1
Whole period	—	−2·0	−5·5	−2·9	−1·9	−3·1
			All staff			
Influenza period	—	+1·2	−8·4	−5·4	−4·1	−4·2
Non-influenza period	—	−2·4	−7·2	−4·6	−3·9	−4·5
Whole period	—	0·0	−7·7	−5·4	−4·0	−4·3

* − figure denotes a lower absence rate in the 'vaccinated' units than in control units; + figure denotes a higher absence rate in the 'vaccinated' units.
NS = not significant at 5% level. All other differences are significant.

Table 8. *The percentage by which the number of new absences was less in 'vaccinated' units compared with control units: all staff*

	Percentage differences in new absences in the winter of 1971–2*	1972–3	1973–4	1974–5	1975–6	Annual average 1972–6
Influenza period	−7·2†	−3·1	−11·3	+0·1	+2·5	−2·9
Non-influenza period	+5·2†	−5·9	−9·4	+1·4	+1·8	−3·0
Whole period	+0·8	−4·1	−10·2	+0·8	+2·1	−2·9

* Telecommunications only.
† − figure denotes fewer new absences in the 'vaccinated units' than in control units; + figure denotes a greater number of new absences in the vaccinated units.

of units was small; even in 1972/3 when the difference was greatest there was an average of only 0·19 fewer certificates for respiratory illness per 100 employees per week provided by the 'vaccinated' group than by the control group over the whole winter period.

Absence associated with vaccination

No serious side-effects were reported that could be attributed to vaccination following the 83012 injections given in the 5 years of the study. One person developed muscular dystrophy and another rheumatoid arthritis after vaccination and it is assumed that the association was coincidental in both.

Table 9. *Medical certificates for respiratory illness submitted on returning to work after sickness absence*

	Average number of respiratory certificates per 100 employees per week in the winter of*					Annual average
	1971–2†	1972–3	1973–4	1974–5	1975–6	1972–6
'Vaccinated'	0·80	1·01	0·89	0·87	1·10	0·97
Control	0·86	1·19	1·00	0·97	1·07	1·06
Deficit in 'vaccinated' units (%)	−7·5	−15·5	−11·2	−10·1	+2·2	−8·7

* The rates refer to the whole of the 'vaccinated' or control groups for each complete winter.

† Telecommunications only.

Table 10. *Cost analysis at* 1975 *rates*

	Cost in £ per 100 employees in the winter of					Annual average
	1971–2	1972–3	1973–4	1974–5	1975–5	
			Telecommunications			
Cost of vaccination	84	68	70	60	58	68
Cost of absence due to side effects of vaccination*	12	10	10	8	8	10
Cost benefit*	−10	−281	+507	+289	+232	+147
Net benefit	−106	−359	+427	+221	+166	+70
			Posts			
Cost of vaccination		57	44	36	35	43
Cost of absence due to side effects of vaccination*		10	8	6	6	8
Cost benefit*		+162	+433	+260	+158	+253
Net benefit		+ 95	+381	+218	+117	+203

* £10 per day.

Minor reactions to influenza vaccine are common (Smith *et al.* 1974). In the Giro study, 930 of 2884 employees accepted the vaccine and of these 841 (90%) completed and returned the enquiry form on reactions. Twenty-eight per cent recorded a local reaction only, 15% general symptoms only and 38% local and general symptoms. Only 20% recorded no symptoms following vaccination. Among the 930 vaccinated employees there were 15 who reported an absence that they attributed to the effect of vaccination, and these caused a total of 26 days absence or 2·8 days per 100 employees vaccinated.

Cost benefit

An estimate of the cost benefit from vaccination is given in Table 10, which is based on costs in 1975. The cost of absence due to the side-effects of vaccination assumes 2·8 days per 100 employees vaccinated, a figure provided by the Giro study. The cost benefit is calculated in terms of the whole period of the study each winter, because overall the sickness absence rates were lower in 'vaccinated'

Table 11. *Estimates of the effect on sickness absence of the prevention of acute influenza by vaccination*

Vaccination acceptance rate (%)	Influenza attack rate (%)	Effectiveness of vaccine (%)	Difference between 'vaccinated' and control groups during influenza period. Days lost/100 employees/week
20	2·5	60	0·25
20	2·5	90	0·38
30	2·5	75	0·47
40	2·5	60	0·50
40	2·5	90	0·75

Assumptions: (1) one attack gives rise to average of 10 working days lost,
(2) influenza period of 12 weeks.

units both outside and during influenza periods. It may be seen that on this basis there was an estimated net cost benefit to the Post Office of £203 per 100 employees offered vaccination for the Postal branch and £70 for the Telecommunications.

DISCUSSION

The main finding of the 5-year study has been that the influenza vaccination campaign in the Post Office appears to have been associated with a small reduction in sickness absence, evident not only during the influenza outbreaks, but also in the winter periods of observation outside the epidemic periods.

In the last 4 years of the study the average difference in sickness absence between the 'vaccinated' and control groups was 1·26 days per 100 employees per week during and 1·12 outside the influenza periods. Furthermore, it is not unreasonable to assume that differences in the absence rates in favour of the 'vaccinated' group may also have been present in the summer, although it was not possible to record summer absence in the study. In support of this possibility is the finding that in those winters (1973/4; 1974/5; 1975/6) in which observations were made for some weeks before influenza appeared, absence rates were lower in the 'vaccinated' group of units.

The observed difference in sickness absence may be compared with that which might be estimated theoretically from a simple consideration of the observed uptake of vaccine and the estimated attack rate of acute influenza, and of vaccine effectiveness (Table 11). For example, acceptance by 30% of a population of a vaccine giving 75% protection, and with an outbreak lasting for 12 weeks which caused acute illness lasting for 10 working days in 2·5% of unprotected adults (figures appropriate to the present study), should reduce sickness absence by only 0·47 days per 100 employees per week during the influenza period. It is possible only to speculate why the reduced sickness absence found in the trial, 1·26 days per 100 employees per week, was greater than might be expected on the basis of such simple assumptions. It is possible that part of the difference may be accounted for by a placebo effect. A 'Hawthorne' effect may also be involved – whereby a group provided with an improvement to their welfare may show an improved attendance, presumably for ill-understood psychological reasons (Roethlisberger & Dickson, 1939). A further factor of importance may be the prevention of some of the long-term illness that can complicate influenza, for example, due to exacerbation of chronic bronchitis. It would require the prevention of one illness of 6 weeks duration among 100 employees offered vaccination to provide differences in absence rates of the size found in the present study.

It should also be considered whether the two groups, 'vaccinated' and control, were truly identical, except for the offer of vaccine. Errors in the selection of units composing the two groups, in the recording of absence by 'vaccinated' and control groups, and other unknown influences, could have given rise to differences in recorded absence rates favouring the 'vaccinated' units. However, we have not been able to identify such factors and unfortunately it was not possible to record absence rates in the two groups of units in the year before vaccine was first offered to one of the groups. In the absence of any other explanation for the differences observed in absence rates they must be assumed to be the result of the vaccination programme.

The results of 1972/3 were disappointing. The influenza outbreak in that winter was fairly extensive, being caused by the variant A/England/72 virus. The vaccine that was available contained A/Hong Kong/68, 400 units and B/Victoria/70, 200 units, i.e. no A/England/72 component, so that its protective effect may not have been high (Pereira *et al.* 1972; Ruben, 1973). In Telecommunications in 1972/3, despite a vaccine acceptance rate of 34 %, absence was less in the control units both during and outside the influenza period. This finding is quite unexplained, but recorded sickness absence is certainly influenced by a wide range of factors that are not understood (Taylor, 1974).

The acceptance rate of vaccine was not high, although similar rates have been observed in other studies in the United Kingdom (Smith, Fletcher & Wherry, 1976). There was a progressive fall from approximately 40 % acceptance in the first year to 22 % in the fifth year of the study. The low uptake of vaccine is perhaps understandable in the United Kingdom where acute respiratory infection from causes other than influenza is extremely common. Indeed, in a study of the aetiology of respiratory infections in the United Kingdom (Poole & Tobin, 1973), which included the periods of the influenza outbreaks of 1964/5 and 1965/6, influenza viruses comprised only 24 % of the viruses isolated from adults with acute respiratory illnesses seen by general practitioners, a possible pathogen being isolated from only about one quarter of the patients. In the United Kingdom the term 'influenza' is often used loosely to describe any acute respiratory illness and precise cause is often difficult for the doctor to diagnose even with laboratory facilities. It is not surprising, therefore, that in most winters benefit from influenza vaccination is difficult to detect, both for the layman and the doctor. Furthermore, because of the non-specific use of the term 'influenza' or 'flu', the illness is often regarded as trivial and not worth preventing by means of vaccination. As a result of our experiences it seems most unlikely that acceptance rates higher than 20–30% will be secured in industry when influenza vaccine is offered annually. Acceptance could possibly be increased if a vigorous campaign was conducted only in the winters when a large epidemic was expected. Unfortunately, accurate forecasting of influenza is not possible at the present time, and until reliable forecasting can be developed it is difficult to offer protection other than by means of an annual vaccination campaign.

The cost benefit analysis suggests that an annual offer of influenza vaccination in industry may give cost savings. Thus the average net cost benefit during the winter periods using 1975 costs was £70 per 100 Telecommunications employees and £203 per 100 Postal Branch employees. The benefit is even greater if the reduction in winter sickness absence recorded in the units offered vaccination also continued through the summer months. Because some of the saving we observed may have been due to placebo effects, the benefit to health resulting from the vaccination programme may have been small despite the apparent cost benefit.

The question should be considered whether the findings justify an annual offer of vaccine to adults in industry and elsewhere. It is evident that only a relatively small amount of acute influenza will be prevented in most winters. Vaccination may be justified in terms of cost benefit, but it is uncertain to what degree this depends on psychological factors such as a placebo effect. It must also be considered that part of the benefit may be due to the protection of individuals particularly susceptible to the long-term effects of influenza – those prone to chest and heart disease, for example. A further factor to be taken into account is the possibility of serious, if rare, side-effects such as the Guillain-Barré syndrome observed in the recipients of swine influenza vaccine in the nationwide campaign in the USA in 1976 (*Morbidity and Mortality Weekly Report*, 1976). Appreciation by employees that this complication may occur is liable to reduce further the acceptance of vaccine, even if the risk was considered insufficient medically to withhold the benefit of vaccination. A study to evalute the effects of confining vaccination in industry to subjects with chest and heart disease, or other specific indications for protection, might well prove worthwhile.

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