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Trends in influenza vaccination uptake among people aged over 74 years, 1997–2000: Survey of 73 general practices in Britain

Elizabeth Breeze*[1], Punam Mangtani[2], Astrid E Fletcher[1], Gill M Price[1], Sari Kovats[3] and Jenny Roberts[3]

Address: [1]Department of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, London, UK, [2]Department of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, London, UK and [3]Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, London, UK

Email: Elizabeth Breeze* - elizabeth.breeze@lshtm.ac.uk; Punam Mangtani - punam.mangtani@lshtm.ac.uk; Astrid E Fletcher - astrid.fletcher@lshtm.ac.uk; Gill M Price - gill.price@lshtm.ac.uk; Sari Kovats - sari.kovats@lshtm.ac.uk; Jenny Roberts - jenny.roberts@lshtm.ac.uk

* Corresponding author

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Abstract

Background: Influenza vaccination policy for elderly people in Britain has changed twice since 1997 to increase protection against influenza but there is no information available on how this has affected vaccine uptake, and socioeconomic variation therein, among people aged over 74 years.

Methods: Vaccination information for 1997–2000 was collected directly from general practices taking part in a MRC-funded Trial of the Assessment and Management of Older People in the Community. This was linked to information collected during assessments carried out as part of the Trial. Regression modelling was used to assess relative probabilities (as relative risks, RR) of having vaccination according to year, gender, age, area and individual socioeconomic characteristics.

Results: Out of 106 potential practices, 73 provided sufficient information to be included in the analysis. Uptake was 48% (95% CI 45%, 55%) in 1997 and did not increase substantially until 2000 when the uptake was a third higher at 63% (50%, 66%). Vaccination uptake was lower among women than men (RR 0.9), people aged 85 or more compared to people aged under 80 (RR 0.9), those in the most deprived areas (RR 0.8) compared to the least deprived, and was relatively high for those in owner-occupied homes with central heating compared to other non-supported housing (RR for remainder = 0.9). This pattern did not change over the years studied.

Conclusions: Increased uptake in 2000 may have resulted from the additional financial resources given to practices; it was not at the expense of more disadvantaged socioeconomic groups but nor did they benefit disproportionately.

Background

Influenza can have a dramatic impact on morbidity and mortality. Routine influenza vaccination is protective against illness [1], acute respiratory hospitalisations and deaths [2]. The Department of Health recommended routine administration of the influenza vaccine to all aged over 74 years in 1998 and in 2000 extended this to all aged over 64 years while adding an item-of-service payment [3]. The GPs were allocated extra funds for the purposes of identifying and communicating individually

with those eligible, monitoring progress of the vaccination campaign, and helping practices with insufficient staff. Financial incentives for interventions have been proposed as a factor for successfully translating other evidence into practice [4] and trials randomising US primary care physicians confirm this for influenza vaccination. In the US healthcare setting an offer of up to $1.60 per vaccine produced a 7% increase in immunisation rates in patients aged over 64 years [5,6] and in the UK target performance-related bonuses have been effective for other preventive practice [4].

In 2000 65% of over-64 year olds in Britain were vaccinated against influenza [7]. We are not aware of any prospective studies specifically designed to evaluate how change in policy was changing the patterns of uptake by socioeconomic factors in Britain. This is of interest in the light of the Government Policy to tackle health inequalities [8]. The MRC Trial of Assessment and Management of Older People in the Community (MRC Study) provided the opportunity to evaluate these changes in vaccination policy retrospectively in terms of overall uptake and variation by socioeconomic status in the more vulnerable over-74 year olds during the period 1997–2000.

Methods

Assessments for the MRC Study, described elsewhere [9], took place between 1995 and 1999 in 106 general practices that belonged to the General Practice Research Framework. They were spread throughout Great Britain and the selection was stratified by practice-level tertiles of Jarman score and Standardised Mortality Ratio. For any one practice the assessments were spread over one year but the practices were recruited in phases during this period. In May 2000 these practices were asked to provide data on individuals' vaccination status in each year from the year they joined the Study to 1999. They were approached again in 2001 to provide data for the winter 2000 season. They were asked to use their own records for the data.

Seventy-three practices provided useable data on vaccinations: 55 supplied data for each of 1997–2000 winter seasons (September-February), 11 for 1997–1999, and seven for 2000 only. Their characteristics are given in Table 1: 28 practices provided the data direct from their electronic records and 44 practices extracted the data manually from their records (one not known). Eleven other practices were excluded because not able to provide information on past vaccination status for people who had since died.

Postcode linkage gave the area Carstairs deprivation score [10] and population density for the Enumeration District of patient's residence. One of the trial interventions compared giving a detailed as well as a brief assessment to everyone (universal arm) with giving a detailed assessment only to those whose brief assessments fulfilled pre-specified criteria of need for further investigation (targeted arm).

Table 1: Characteristics of practices by years took part in the vaccination study

	Years provided vaccination records used in analyses			
	1997–1999	2000	1997–2000	None
Jarman tertile				
Low	3	3	16	13
Med	7	2	16	8
High	1	2	23	12
SMR tertile				
Low	2	2	18	10
Med	3	2	19	11
High	6	3	18	12
List size				
<5000	3	0	20	10
5000 or more	8	7	35	23
Number of GPs				
<7	10	6	51	31
7 or more	1	1	4	2
	11	7	55	33

The Trial included people aged over 74 years in the year the practice undertook the trial intervention; it excluded people in long-term nursing care or with terminal illness. Additional inclusion criteria for the vaccination analysis in any year were being alive on 30 November and still registered with the Trial practice.

Analysis strategy

The analyses are confined to those for whom vaccination records were available in the practices that provided information. Trends were confined to 1997–2000 since relatively few practices were participating before this time. Generalised estimating equations based on Poisson regression with robust standard errors were used – this is an alternative to logistic regression and enables direct estimation of risk ratios. Modelling took into account clustering within practice and person by adjusting for intracluster correlations in using robust standard errors at the practice level. The software package Stata 7 was used [11].

First, analyses of uptake by year were carried out only adjusting for age and gender, using information from all 73 practices (Model 1). Then these were adjusted for the deprivation and urbanisation levels of enumeration districts in which people lived (Model 2). Analyses with both individual and area level socio-economic factors were

confined to the 42 practices in the universal arm where all subjects had detailed assessments. Before adding in these socioeconomic factors (Models 4 and 5) the analysis by year adjusted for gender and age was repeated on the universal arm subset (Model 3) so that any differences in trends in this subset compared to the full sample could be seen. To assess whether variation by socioeconomic factors had changed over time, Wald tests were carried out for statistical significance of interactions between year and each of the socioeconomic and urbanisation measures in turn.

The analyses presented took advantage of the larger sample size from including everyone in the relevant practices with a vaccination record. To exclude the possibility that the yearly uptake figures might be distorted by changes in practices and people included in the figures, analyses were also run on the subgroup who had records for all four years.

Results

There were 42057 people eligible for the trial in all 106 practices, 28492 in the 72 practices participating, of whom 24654 (87%) people had vaccination records for at least one year. This may underestimate success rate in obtaining information since some of those who were eligible for the trial may no longer have been in the practice for the vaccine follow-up period; information was not sufficiently complete for non-responders to the Trial to calculate the exact numbers left in the practice. Postcode linkage was missing for 3079 (12%) leaving 21575 for analysis; 51% of these, (10951) had information for all years (the 4-year subsample). The characteristics of the sample in each year are given in Tables 2 (73-practice sample) and 3 (42-practice sample). The sample in successive years aged as expected. Composition by gender, Carstairs deprivation index and urban indicator changed little in successive years. The only consistent difference between the 73-practice and 42-practice samples, other than size, were a smaller percentage living in the most deprived areas in the latter. The people that were in the sample for all four years were younger than the total sample available in 1997. The gender age composition of the two subsamples in 1997 was also very similar to that of the 42057 people eligible for the trial (not shown).

Table 2: Characteristics of sample for whom vaccination data available, by year: all practices

	1997 n = 18162 63 practices[1]		1998 n = 17962 66 practices[2]		1999 n = 16254 66 practices		2000 n = 13762 62 practices[3]		In all years n = 10951 53 practices Age in 1997	
	No	%	No	%	No	%	No	%	No	%
Male	6457	35.6	6339	35.3	5687	35.0	4797	34.8	3778	34.5
< 80 yrs	2773	15.3	2376	13.2	1612	9.9	672	5.1	1873	17.1
80–84 yrs	2231	12.3	2349	13.1	2377	14.6	2535	18.0	1298	11.9
>= 85 yrs	1453	8.0	1614	9.0	1698	10.4	1588	11.5	607	5.5
Median age		(80)		(81)		(82)		(82)		(80)
Female	14551	64.4	11623	64.7	10567	65.0	8967	65.2	7173	65.5
<80 yrs	4139	22.8	3503	19.5	2387	14.7	1015	7.4	2954	27.0
80–84 yrs	4041	22.2	4156	23.1	4089	25.2	4106	29.8	2517	23.0
>=85 yrs	3525	19.4	3964	22.1	4091	25.2	3846	28.0	1702	15.5
Median age		(82)		(82)		(83)		(84)		(81)
Deprivation quintile[4]										
Least deprived	4567	25.2	4689	26.1	4287	26.4	3419	24.8	2587	23.6
2nd quintile	5479	30.2	5420	30.2	4933	30.4	3963	28.8	3290	30.0
3rd quintile	3822	21.0	3694	20.6	3336	20.5	3037	22.1	2399	21.9
4th quintile	2444	13.5	2432	13.5	2182	13.4	2000	14.5	1518	13.9
Most deprived	1850	10.2	1727	9.6	1516	9.3	1343	9.8	1157	10.6
Population density[5]										
<250 pers km^{-2}	6156	33.9	6116	34.0	5539	34.1	4509	32.8	3931	35.9
250–1000 pers km^{-2}	4472	24.6	4336	24.1	3913	24.1	3652	26.5	2691	24.5
1000–2500 pers km^{-2}	5074	27.9	4966	27.6	4511	27.8	3549	25.8	2602	23.8
>=2500 pers km^{-2}	2460	13.5	2544	14.2	2291	14.1	2052	14.9	1727	15.8

1. 53 practices in all years plus 10 practices in years 1997–1999 2. 53 practices in all years plus 11 practices in years 1997–1999 plus 2 practices in 1998–2000 3. 53 practices in all years plus 7 practices in 2000 only plus 2 practices in 1998–2000 4. Quintiles defined according to distribution of Enumeration Districts in Britain 5. Population density smoothed over a 5-kilometre radius from the centroid of the Enumeration District

Table 3: Characteristics of sample for whom vaccination data available, by year: practices with individual socioeconomic information

	1997 n = 8334 37 practices[1]		1998 n = 7944 38 practices[2]		1999 n = 7294 38 practices		2000 n = 6159 34 practices[3]		In all years n = 5130 29 practices	
	No	%	No	%	No	%	No	%	No	%
Male	3170	38.0	3026	38.1	2753	37.7	5498	34.7	1938	37.8
< 80 yrs	1378	16.5	1116	14.0	735	10.0	815	5.1	948	18.5
80–84 yrs	1105	13.3	1135	14.3	1184	16.2	2857	18.0	677	13.2
>= 85 yrs	687	8.2	775	9.8	834	11.4	5498	11.5	313	6.1
Median age		(80)		(81)		(82)		(82)		(80)
Female	5164	62.0	4918	61.9	4541	62.3	1035	65.3	3192	62.2
<80 yrs	1873	22.5	1509	19.0	1030	14.2	6	7.9	1354	26.4
80–84 yrs	1775	21.3	1760	22.2	1794	24.6	1259	29.7	1109	21.6
>=85 yrs	1516	18.2	1649	20.8	1717	23.5	4711	27.7	729	14.2
Median age		(81)		(82)		(83)		(83)		(81)
Deprivation quintile[4]										
Least deprived	2247	27.0	2206	27.8	2060	28.2	1811	29.4	1429	27.9
2nd quintile	2412	28.9	2269	28.6	2076	28.5	1768	28.7	1468	28.6
3rd quintile	1831	22.0	1767	22.2	1620	22.2	1380	22.4	1155	22.5
4th quintile	1203	14.4	1128	14.2	1025	14.1	790	12.8	708	13.8
Most deprived	641	7.7	574	7.2	513	7.0	410	6.7	370	7.2
Population density[5]										
<250 pers km^{-2}	2578	30.9	2363	29.8	2164	29.7	1944	31.6	1778	34.7
250–1000 pers km^{-2}	2168	26.0	2071	26.1	1905	26.1	1610	26.1	1240	24.2
1000–2500 pers km^{-2}	2382	28.6	2250	28.3	2085	28.6	1591	25.8	1259	24.5
>=2500 pers km^{-2}	1206	14.5	1260	15.9	1140	15.6	1014	16.5	853	16.6
Socioeconomic status[6]										
Owner & c heating	4896	58.8	4737	59.6	4440	60.9	3893	63.2	3225	62.9
without c heating	784	9.4	738	9.3	675	9.2	575	9.3	484	9.4
Renter & c heating	1648	19.8	1557	19.6	1378	18.9	1104	17.9	908	17.7
without c heating	356	4.3	322	4.1	287	3.9	197	3.2	181	3.5
Supported housing	650	7.8	590	7.4	514	7.1	390	6.3	332	6.5

1. 29 practices in all years plus 8 practices in years 1997–1999 2. 29 practices in all years plus 8 practices in years 1997–1999 plus 1 practice in 1998–2000 3. 29 practices in all years plus 4 practices in 2000 only plus 1 practice in 1998–2000 4. Quintiles defined according to distribution of Enumeration Districts in Britain 5. Population density smoothed over a 5-kilometre radius from the centroid of the Enumeration District 6. C heating = central heating. Supported accommodation includes sheltered housing and residential homes

In successive years 1997 to 2000 48% (95% CI 45–55%), 50% (47–54%), 51% (49–55%) and 63% (60–66%) were vaccinated. The pattern was replicated among gender-age sub-groups and among the 4-year subsample. Adjusted for gender and age the proportional increase in vaccination uptake in 2000 compared to 1997 was 32% (95% CI 25–41%) and small but statistically significant in interim years (Table 4 Model 1). The 4-year subsample produced very similar results (not shown). Additionally in this subsample, whereas only 10% of those unvaccinated in 1997–8 were vaccinated in 1999, 28% of those unvaccinated in 1997–9 were vaccinated in 2000.

Coverage was lower among women and people aged 85 years or over (Model 1) and for those in the most deprived quintile of Carstairs (Model 2). In the subset with information on individual socioeconomic position uptake was similar among people in owner-occupied accommodation with central heating and those in sheltered or residential homes, but 6% lower among others (Model 4). The difference in uptake by area deprivation was statistically significant in this subset before adjustment for individual socioeconomic position (Model 4), but not afterwards (Model 5). Part of the shortfall in uptake in the most deprived areas was accounted for by the individual position. Although variation by population density was not statistically significant there is some indication of higher uptake in urban areas in this group of practices. There were no significant interactions between year and any of area deprivation, population density, individual socioeconomic position, or gender.

Discussion

Compared with 1997, vaccination uptake increased noticeably in 2000, coinciding with greater emphasis on meeting targets, but not in 1998 when policy changed to routine vaccination for everyone aged over 74 years. As our sample only covers those aged 75 years and over, it is

Table 4: Modelling effect of year and socioeconomic factors on vaccination uptake: risk ratios (95% confidence intervals)

Categories	**Model 1**[1] **73 practices** n = 66140 records[3]	**Model 2**[1] **73 practices** n = 66140 records[3]	**Model 3**[1] **42 practices**[2] n = 29731 records[3]	**Model 4**[1] **42 practices**[2] n = 29731 records[3]	**Model 5**[1] **42 practices**[2] n = 29731 records[3]
Year					
1997	1.00	1.00	1.00	1.00	1.00
1998	1.06 (1.02,1.09)	1.05 (1.02,1.09)	1.08 (1.03,1.13)	1.07 (1.03,1.12)	1.08 (1.03,1.13)
1999	1.09 (1.05,1.14)	1.09 (1.05,1.14)	1.10 (1.04,1.16)	1.09 (1.03,1.16)	1.09 (1.04,1.15)
2000	1.33 (1.25,1.42)	1.33 (1.25,1.42)	1.32 (1.22,1.43)	1.32 (1.22,1.42)	1.32 (1.22,1.42)
	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001
Gender					
Male	1.00	1.00	1.00	1.00	1.00
Female	0.89 (0.87,0.91)	0.89 (0.87,0.91)	0.89 (0.87,0.92)	0.88 (0.86,0.91)	0.90 (0.87,0.92)
	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001
Current age (years)					
Under 80	1.00	1.00	1.00	1.00	1.00
80–84	1.01 (0.98,1.04)	1.01 (0.98,1.04)	1.01 (0.97,1.05)	1.02 (0.98,1.07)	1.02 (0.98,1.06)
85 or more	0.92 (0.88,0.96)	0.92 (0.88,0.96)	0.89 (0.83,0.94)	0.91 (0.85,0.96)	0.89 (0.84,0.94)
	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001
Carstairs quintiles (deprivation)					
Least	Not in model	1.00	Not in model	1.00	1.00
Second		1.00 (0.95,1.05)		1.04 (0.97,1.12)	1.05 (0.97,1.13)
Mid		0.98 (0.92,1.05)		1.01 (0.93,1.10)	1.03 (0.94,1.13)
Fourth		0.95 (0.84,1.08)		0.98 (0.84,1.16)	0.99 (0.83,1.18)
Most		0.82 (0.73,0.93)		0.82 (0.72,0.94)	0.85 (0.70,1.05)
		p = 0.011		p =< 0.001	p = 0.10
Population density category (people per sq km)					
-250	Not in model	1.00	Not in model	1.00	1.00
-1000		0.91 (0.80,1.03)		0.99 (0.84,1.16)	0.99 (0.83,1.17)
-2500		0.99 (0.88,1.11)		1.08 (0.93,1.26)	1.10 (0.94,1.30)
>2500		1.04 (0.91,1.19)		1.13 (0.96,1.32)	1.14 (0.95,1.36)
		p = 0.30		p = 0.36	p = 0.27
Individual socioeconomic position[4]					
	Not in model	Not in model	Not in model	Not in model	
A					1.00
B					0.94 (0.89,0.98)
C					1.03 (0.96,1.11)
					p = 0.018

1. P-values for contribution of whole factor to the model; modified Wald test. Generalised estimating equations based on Poisson regression with robust standard errors calculated at the practice level. Models all factors shown. 2. Individual socioeconomic information was only available in a subset of the practices because of the nature of the interventions 3. There was one record per person per year of eligibility for inclusion in the vaccination analysis 4. A = owner occupier with central heating. B = three categories combined because very similar in uptake: owner-occupier without central heating, renter with central heating, renter without central heating; C = supported housing

assumed that the financial incentives and resources applied to practices played a greater part in the upturn than the extension of the policy to all aged 65 years and over. In 2000 the target of 60% coverage in over-64 year olds was exceeded in our sample of over-74 year olds. The modest socioeconomic differentials in influenza vaccine uptake were also unchanged over time (no significant interactions), i.e. the increased uptake was not at the expense of the less well-off groups but nor did it benefit them disproportionately. It appears that the extra effort in 2000 did not target by socioeconomic or gender or age-group (e.g. over 80s compared to under 80s). The effort may have been in terms of increasing attention to those not considered of the highest risk. Possibly indicative of this, the relative risk for being vaccinated for people reporting a respiratory problem at assessment compared with those who did not was 1.15 (95% CI 1.09–1.22) in 1997 and 1.06 (95% CI 1.03–1.09) in 2000. Equivalent figures for a CVD history were 1.10 (1.05, 1.15) in 1997 and 1.04 (1.00, 1.07) in 2000. However, this evidence should be treated cautiously since we only have health status at the time of assessment so that by 2000 it may have been out of date. Improved recording might account for some of the observed increase in 2000.

The study has limitations. To increase the size of the study, the analysis presented included everyone in the practices with records in a given year; this means that the year-on-year figures reflect not only real change in uptake for individuals but also any substantial change in composition of the samples from year to year. It is therefore reassuring both that sample composition was similar from year to year (Tables 2, 3) and that confining results to those with information for all four years produced similar results. We did not consider it sufficient to use the subsample with records for all four years, in case they were a select group whose survival in the practice was the result of better health, and a greater tendency to take prophylactic action. However, their uptake of vaccination in 1997 was no higher than the fuller sample in 1997. A separate paper evaluating a wider range of factors at practice and individual level associated with uptake in 2000 is in preparation.

The socioeconomic information refers to that pertaining at the time of assessment. There may be misclassification in later years, if people have moved into sheltered or institutional accommodation where vaccination is encouraged. However, if this was distorting the results, one would expect the tenure differential to be weaker the more time had elapsed since assessment but this was not found.

Conclusions

Substantial scope for improvement remains but the upturn in 2000 should encourage efforts to increase vaccine uptake further. Socioeconomic variation was less substantial than the authors expected but, in keeping with government policy, we recommend periodic assessment of, and response to, socio-economic differentials in access to this preventive health care intervention [12].

Competing interests

None declared.

Authors' contributions

AF was Principal Investigator in the MRC Trial and advised on the add-on studies. PM conceived the idea of collecting vaccination data and the Department of Health grant. PM with EB, JF and AF designed the study and interpreted the data with SK. EB undertook the analyses and took the lead in drafting the paper. SK was investigator in the study on winter mortality. GP advised on the statistical analysis. All authors commented on drafts.

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