Influenza

The Public Health Commission's Advice to the Minister of Health 1995-1996

Public Health Goal

To improve and protect the health of older people.

Objective

To protect older people from preventable infectious diseases, such as influenza.

The specific objective of this advice is to prevent influenza complications (hospitalisations and deaths) by increasing the use of influenza vaccine in those at higher risk of these complications.

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Foreword

Between June 1993 and January 1996, the Public Health Commission (PHC) published 23 papers providing advice to the Minister of Health on specific health issues. This paper, the last in the series, adds to the number of public health issues that have been systematically reviewed. This work will be continued by the Public Health Group of the Ministry of Health.

As with the previous papers, this document should be read in conjunction with *A Strategic Direction to Improve and Protect the Public Health*, which provides an overall framework for improving the health of New Zealanders.

I would like to thank the many individuals and organisations who commented on the draft of this paper. Comments were received from:

- regional health authorities
- Crown health enterprises
- individuals and groups with an interest in public health
- non-government organisations and other statutory bodies
- health professionals and professional organisations
- Government departments
- international experts.

All comments were carefully considered by the PHC and changes made where appropriate.

The PHC has been particularly grateful to Dr Lance Jennings, a virologist with Canterbury Health, for preparing the initial paper.

The PHC was disestablished on 22 January 1996. This paper has been published by the Ministry of Health on behalf of the PHC. The Health and Disability Services Amendment Act 1995 places public health responsibilities on the Minister of Health, the Director-General, the Ministry of Health, the National Health Committee, the Director of Public Health and regional health authorities. It also increases the public health responsibilities of territorial local authorities. The legislation provides for the following:

- The Minister to receive advice on public health matters from three sources:
  - the National Advisory Committee on Health and Disability
  - the Ministry of Health
  - the Director of Public Health (who also reports on public health matters).
- The Minister to issue the Crown's objectives for public health before entering into a funding agreement in relation to public health services with a purchaser, ie the regional health authorities.

- The Ministry of Health, the regional health authorities, and territorial local authorities to have a statutory function or objective to improve, promote, and protect public health.
- The Director-General to produce an annual report on the state of the public health which is tabled in Parliament.
- The Ministry of Health to have a Public Health Group which advises the Director-General on public health matters. This Group is required to institute a regular programme of consultation with the public, providers, and other appropriate people.
- The regional health authorities are the purchasers of public health services and also have a statutory duty to consult, with respect to their purchasing activities.

The statutory and administrative arrangements for public health will ensure that public health strategies make a significant contribution to achieving gains in health status in the future.

Karen O Poutasi (Dr)
Director-General of Health and
Chair of Public Health Commission (to 22 January 1996)

Contents

Introduction

Public health objectives, as set out in the Health and Disability Services Act 1993, include – to improve and protect the public health, and to meet the Crown's objectives for public health.

Public health services are concerned with whole populations, or population groups such as Pacific Islands people or children, rather than individuals. The areas of responsibility include environmental health (eg, water quality), food and nutrition, the prevention and control of communicable diseases, major lifestyle and public health problems (such as tobacco and alcohol), and the public health needs of Maori and of special groups.

The Public Health Commission's (PHC's) document *A Strategic Direction to Improve and Protect the Public Health* (PHC, 1994a) provides a framework for public health in New Zealand and forms the basis for the development of *Influenza: The Public Health Commission's Advice to the Minister of Health 1995–1996.*

A Strategic Direction to Improve and Protect the Public Health provides recommendations at three levels of detail: public health goals, objectives and targets.

This issues-based paper provides recommendations on outcome targets, and the policy, programme, and research and information targets to achieve the outcomes. These recommendations include new initiatives or improvements in effectiveness and efficiency of established programmes.

All of the papers have a common structure which is summarised as follows:

- **Title**
- **Background**
- **Objectives**

This section identifies those public health objectives related to this paper.

- **Setting Outcome Targets**

This briefly describes the health status issues and provides justification for the choice of some outcome targets. Recommendations for outcome targets are included.

- **Setting Healthy Public Policy Targets**

This section relates to the policy advice function. As well as providing specific policy advice that the Government can consider accepting, the PHC may also provide justification for further policy development work. This may

include, for example, recommendations for developing discussion documents or holding consensus conferences. In future, this work will be undertaken by the Public Health Group, Ministry of Health.

- **Setting Public Health Programme Targets**

These include recommendations for programmes which could be purchased in the 1996–1997 financial year and succeeding financial years. Each paper identifies the responsibilities of purchasers for achieving public health goals and objectives.

- **Research and Information Targets**

These include recommendations for research that would normally be funded by research funding agencies. The recommendations provide information for research workers who may wish to develop research proposals in these areas. Funders such as the Health Research Council may want to consider funding high-quality proposals to address the hypotheses listed.

The information recommendations relate to improving the availability or quality of data which could be purchased by the Public Health Group, Ministry of Health and, therefore, have the same standing as the programme targets.

- **Summary of Benefits**

Benefits of the proposed programmes are listed in the papers. Detailed costing of the proposals has been undertaken by the PHC and provided to the Minister of Health. As with personal health services, formal cost-benefit studies are currently available for only a minority of public health programmes.

- **References**

The references which have been used for each paper are listed.

Influenza is one of the most significant viral infections of the human respiratory tract worldwide. The two most important features of influenza are its epidemic nature, with attack rates often reaching 10 to 40 percent over a five to six week period (Betts, 1995), and the mortality that results, in part from pulmonary complications (Lui, 1987). The disruption caused in the community with absenteeism from school, work and loss of productivity in industry add to the high economic cost of influenza (Schoenbaum, 1987).

The causal agents include the Influenza type A and type B viruses which belong to separate genera within the family Orthomyxoviridae.

Influenza type A virus was first isolated in 1933 (Smith et al, 1933). It causes regular seasonal epidemics. The Influenza A viruses are classified into subtypes on the basis of their external glycoproteins, the haemagglutinin (H) and neuraminidase (N) antigens. In humans, three haemagglutinin (H1, H2, H3) and two neuraminidase (N1, N2) types have been recognised. In animals, a total of 14 H and 9 N antigen types exist. Within a subtype each strain is further identified by the site, and year of isolation, eg, A/Port Chalmers/1/73 (H3N2). Immunity to these antigens, particularly the H antigen, is associated with protection against that influenza subtype.

The Influenza A virus genome (see Glossary) consists of RNA which is segmented and inherently unstable. The changes that occur result in antigenic variation, a phenomenon which helps to explain why influenza continues to be a major epidemic disease of humans.

'Antigenic drift' is the emergence of a strain with a minor change occurring through mutation in the genes coding for the H or N antigens. This results in the emergence, almost annually, of viruses with a selective advantage and able to grow in the presence of antibody against previously prevalent strains.

'Antigenic shift' is a major change in one or both of the antigens through a recombination event with another Influenza A virus, and is usually associated with worldwide epidemics or pandemic influenza. In the recent past, pandemics have occurred after the emergence of the 1957 Asian (H2N2) and the 1968 Hong Kong (H3N2) influenza viruses.

Influenza type B virus was first identified in 1939 (Francis, 1940) and causes regional outbreaks or epidemics, although less frequently than type A influenza viruses. Influenza B also undergoes 'antigenic drift', but at a slower rate than Influenza A. This virus does not have an animal source.

Influenza type C virus belongs to a third genus within the Orthomyxoviridae. It is widely distributed, but unlike Influenza A and B viruses, does not exhibit a regular pattern of seasonal epidemics, or undergo antigenic variation.

Influenza is an acute, usually self-limited, feverish illness. During an outbreak it can vary in severity, from an illness with mild symptoms through to being fatal. The mortality results from a wide range of pulmonary and non-pulmonary conditions (Betts, 1995). Most individuals have the classic symptoms of influenza, which include the abrupt onset of fever, chills, headaches and muscular pain, after an 18 to 72 hour incubation period. Prostration usually occurs. As systemic symptoms abate, respiratory symptoms of nasal discharge and dry cough become more apparent. A convalescent period follows of one, two or more weeks until full recovery (Betts, 1995).

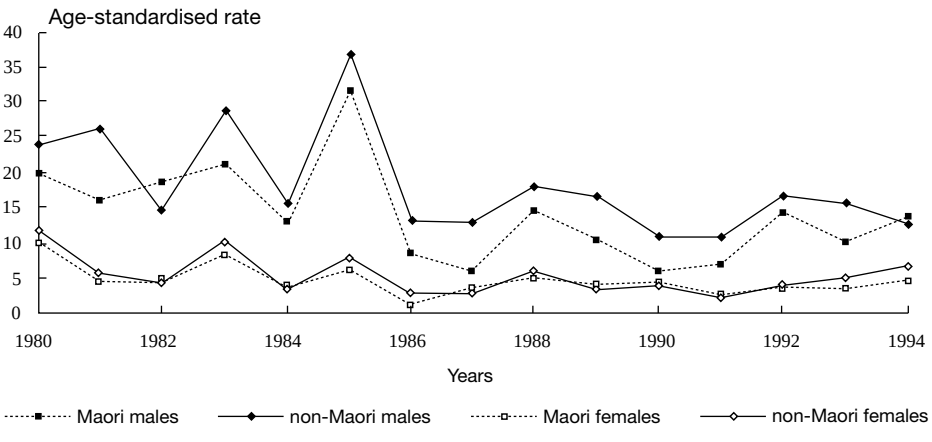
Transmission is by small particle aerosols expelled by sneezing, talking and coughing (Moser et al, 1979). Virus is first detected just before the onset of illness and remains detectable for 5 to 10 days (Murphy et al, 1973). In young children, shedding of virus in large amounts is prolonged (Hall and Douglas, 1975).

Attack rates are generally higher in children than in adults, while the incidence of pulmonary and other complications is higher in adults.

Epidemics of influenza tend to occur in the colder months in temperate climates, while in equatorial climates influenza activity occurs all year round, with epidemics both in the summer and winter months (Reicheldererfer et al, 1989). Undoubtedly the New Zealand population is continually being exposed to viruses from other regions throughout the year.

Hospitalisations due to influenza for 1980 to 1994 show the variable impact from year to year (Figure 1). Fluctuations in the level of hospitalisations for 1980 to 1994 occur in a pattern comparable to mortality attributed to influenza.

Figure 1: Influenza (primary diagnosis) hospitalisations 1980–1994



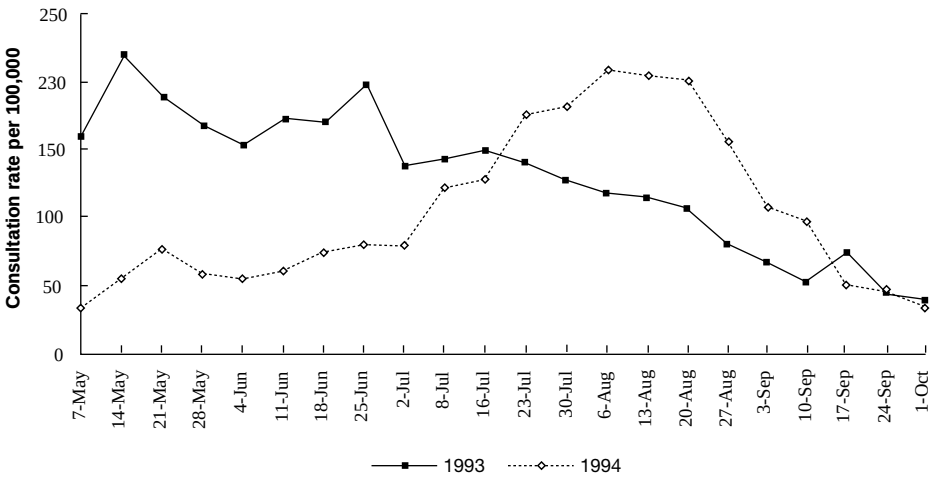
Rates per 100,000 standardised to Segi's world population

Source: NZHIS

The occurrence of influenza in New Zealand has been extremely well documented. In recent years the presence of influenza type A and B virus strains has been recorded in the New Zealand Virus Report (in various forms) and other papers (Jennings et al, 1978). Significant influenza activity has occurred in most years, with peak periods of prevalence usually occurring between May and September. However, influenza activity has been reported in every month of the year. When significant new viruses have entered New Zealand, such as A/Hong Kong/68 (H3N2) in 1969 and A/USSR/79 (H1N1) in 1979, activity has first been detected in the summer months of January and February. This was also recorded in 1976 when A/Victoria/3/75 (H3N2) drifted from A/Port Chalmers/1/73 (H3N2).

National influenza surveillance between May and September of each year by sentinel general practices allows the calculation of a consultation rate. The rates for 1993 (2140 per 100,000) and for 1994 (2422 per 100,000) are shown in Figure 2 (Bandaranayake et al, 1995).

Figure 2: Weekly consultation rates for influenza-like illnesses



Source: Bandaranayake et al, 1995

The mainstay of influenza prevention is the use of inactivated virus vaccines. There are three forms of inactivated vaccine: whole virus, split product, and subunit (purified surface antigen). All are prepared by growing virus in embryonated hens' eggs. They are highly purified to remove reactogenic egg proteins and are inactivated so they cannot cause influenza. They are standardised in terms of antigenic mass. Only split product vaccine is used in New Zealand.

Because of the frequent (nearly annual) antigenic variation that occurs, the vaccine content is reviewed each year and updated to include virus strains likely to cause illness in the coming influenza season. In September of each

year the Australian Influenza Vaccine Committee decides the influenza vaccine composition by reviewing virus isolate and epidemiological data from New Zealand, South Africa, Australia and the rest of the world. New Zealand now has representation on this committee. Since 1978, two subtypes of Influenza A (H1N1 and H3N2) and influenza B components have been included in the vaccine.

Influenza vaccines were developed in the 1940s, a relatively short time after the first Influenza A virus was isolated in 1933. They have been shown to be safe and at least 70 percent effective in preventing laboratory-confirmed influenza in healthy adults when vaccine and epidemic strains are closely related (Davenport, 1961). Effectiveness in older people diminishes with poorer health status. For older people living in the community, immunisation has been shown to lead to reduction in hospitalisation of 48–57 percent for pneumonia and influenza and of 15–39 percent for all respiratory conditions, as well as a 39–65 percent reduction in 'all-cause' mortality (Fedson et al, 1993; Nichol et al, 1994). Among frail institutionalised older people effectiveness in preventing influenza illness may be as low as 27 percent (Arden et al, 1986). Of greater relevance however, are the considerable reductions in influenza complications.

Unlike earlier vaccines, the vaccine is not associated with significant side effects. Two placebo-controlled randomised studies in older people involving a total of over 2000 subjects have found only local reaction to be more common in recipients of vaccine versus placebo (Govaert et al, 1993; Margolis et al, 1990). These local reactions were mild.

The only known fatal complications of influenza vaccination are from the Guillain-Barr syndrome (GBS). During the 1976 National Immunization Program against swine influenza in the United States, when 45 million people received influenza vaccine, the mortality of vaccination was calculated to be 1 in 2 million people immunised (Centers for Disease Control, 1977). Subsequent vaccines prepared from other virus strains have not been associated clearly with an increased frequency of GBS (Kaplan et al, 1982). A possible association has been found in those under the age of 65 years (Chen et al, 1992). Even if GBS were a true side effect, the very low estimated risk of GBS is less than that of severe influenza that could be prevented by vaccine (Centers for Disease Control, 1994).

The current strategy in New Zealand is for individual protection by immunisation of people at special risk and not for the attempted control of the general spread of influenza (Ministry of Health, 1996). It is recommended that the following groups receive annual immunisation with influenza vaccine, because of their increased risk of complications due to:

- medical condition:
  - adults and children with chronic debilitating disease, particularly chronic cardiac, pulmonary, renal and metabolic disorders
  - children who require long-term aspirin therapy (risk of Reye's syndrome)
  - children with sickle cell or other haemoglobinopathies
  - immune-compromised individuals.

NB. Since influenza has not caused excessive morbidity in HIV infected people, and some studies show adverse effects with respect to plasma viraemia and CD4 count following influenza vaccine, this vaccine is not routinely recommended for those who are HIV positive.

- age:
  - people aged 65 years and older
  - residents of rest homes, geriatric hospitals and other chronic care facilities.

Healthy individuals should also consider the use of the vaccine, especially if they are in close contact with those at high risk of complications. Employers should consider providing influenza vaccine to avoid illness in their employees, especially those who are engaged in essential community services.

These recommendations are in line with the recommendations of other countries, including Australia. The Australian National Health and Medical Research Council (NHMRC) has recently revised its recommendations, with guidelines focusing on those at greatest risk of death from influenza (NHMRC, 1994). The Australians recommend giving vaccine to people over 65 years of age and to Aboriginal and Torres Strait Islander adults over 50 years of age, with consideration being given to vaccination of the other groups.

Objective

To protect older people from preventable infectious diseases, such as influenza.

The specific objective of this advice is to prevent influenza complications (hospitalisations and deaths) by increasing the use of influenza vaccine in those at higher risk of these complications.

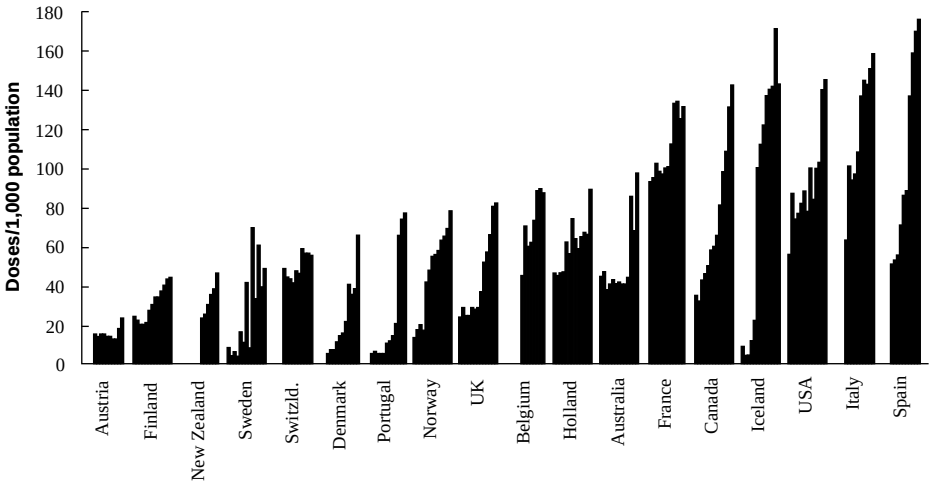
Setting Outcome Targets

An estimated 20 percent of New Zealanders at risk of influenza complications were immunised in 1991 (Tobias, 1991). In 1994, 415,580 (11.8 percent) of the New Zealand population were 65 years or over, and an estimated 330,000 (9.3 percent) were in the under-65 years at-risk groups (INFOS, 1995; Tobias, 1991). Vaccine distribution in 1994 by CSL New Zealand Ltd and Rhone-Poulenc Rorer NZ Ltd totalled 196,000 doses. This suggests that, of the estimated 745,000 at-risk individuals, a maximum of 26 percent were vaccinated. The actual percentage would have been lower, as not all the vaccine would have been administered to the at-risk groups.

The distribution of influenza vaccine in New Zealand compared to other developed countries is shown in Figure 3. New Zealand is well behind Australia and the other western countries in vaccine usage. The 1994 New Zealand level at 56 doses distributed per 1000 population, compares to the Australian level at 100 doses per 1000 population (estimated for 1994).

The USA has set a target of 60 percent coverage, which their demonstration projects have rapidly achieved. It is therefore proposed to set a coverage target a little higher than this at 75 percent of the at-risk population. This could be monitored either by using data from immunisation benefit claims, if a benefit becomes available for this immunisation, or by population surveys.

Figure 3: Influenza vaccine use in 18 developed countries 1980–1992



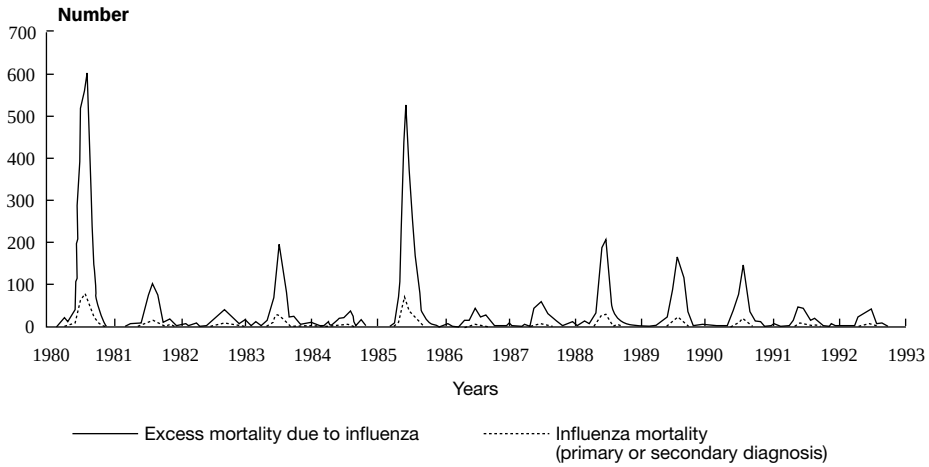
Source: Fedson, 1993

A model for all-cause mortality for 1980 to 1992 was developed using month, year, temperature and influenza mortality. This was used to calculate excess mortality attributable to influenza as follows:

(Predicted all-cause mortality) – (Predicted all-cause mortality when influenza is assumed to be zero).

The method is similar to that developed by Sprenger and colleagues for data from the Netherlands (Sprenger et al, 1993), with the addition of temperature, as for the model developed by Clifford and colleagues (Clifford et al, 1977). Consideration of subsets of the years suggests that the model is conservative, in that it underestimates the number of deaths attributable to influenza (Figure 4).

Figure 4: Mortality attributed to influenza, by month, 1980–1992



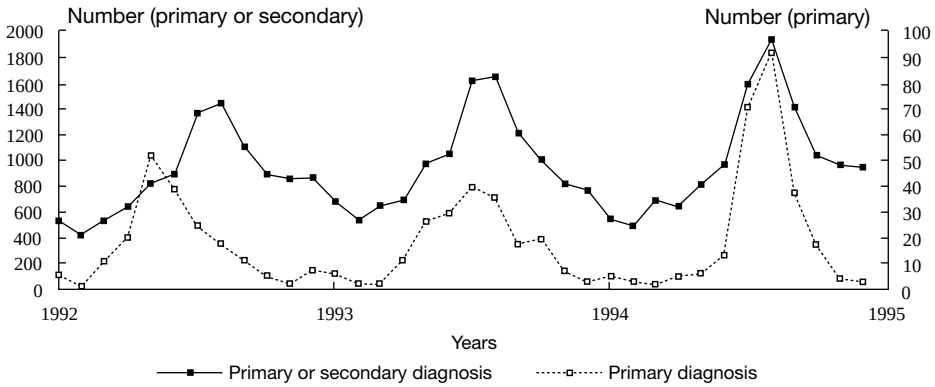
Source: NZHIS

The years during which there is an epidemic of influenza can account for over 1000 deaths. For the 13 year period (1980–1992), there were 769 deaths diagnosed as due to influenza and 5650 excess deaths attributed to influenza. This suggests that for every death that is recorded as due to influenza there are 7.7 deaths which are also due to influenza but are not recognised as such. Hence, the overall impact of influenza on mortality is estimated to be 8.7 times greater than the number of recorded influenza deaths. This is higher than the factor of 3.7 for the Netherlands (Sprenger et al, 1993), but similar to the factor of 10 for England and Wales (Ashley et al, 1991).

Historical data for indicators of influenza activity are considered inadequate for modelling morbidity data, so that we are unable to estimate the number of hospitalisations due to influenza. There are a considerable number of hospitalisations with secondary diagnoses of influenza (Figure 5). There is a characteristic winter peak, and a good degree of correlation between primary diagnosis and any diagnosis of influenza. There were 12,170 discharges in 1994 with pneumonia and influenza as a primary or secondary diagnosis, averaging 17.8 bed days per patient. Of those discharges, 269 had influenza as the primary diagnosis, averaging 5.2 bed days per patient.

It is likely that there are many more hospitalisations which are caused by influenza where the diagnosis of influenza is not made. An American study of people aged 65 years and over found influenza immunisation reduced hospitalisations for all acute and chronic respiratory conditions by between 27 and 39 percent over three years (Nichol et al, 1994). In 1994 there were 10,000 such respiratory admissions among those aged 65 years and over, suggesting the potential to prevent between 2000-4000 acute respiratory admissions per year.

Figure 5: Discharges due to pneumonia and influenza by diagnosis and month, 1992–1994



Source: NZHIS

Development of a model for excess hospitalisations due to influenza would allow estimation of the total load on the health system from this source.

There are a number of qualities required of a set of targets used to measure the attainment of related goals. The targets should be *measurable* and *practicable*, such that there are information sources available to estimate the targets on a *regular* basis. The targets should be, in some sense, *representative*, or indicators of aspects of the goal or goals. *Comparability* of the measure over time is needed for consideration of progress; comparability with measures used by other agencies or countries allows for comparisons or more precise, valid estimates. *Historical* information is needed for analysis of trends. For estimation of the targets, we require *precision* and *validity* from the estimates.

Due to variability between years and the unpredictability of the incidence of an influenza epidemic, it is difficult to fulfil the above criteria. Careful evaluation of the baseline level of mortality and morbidity may allow targets for outcomes in the absence of an influenza epidemic. The impact of an influenza epidemic can vary considerably. Further investigation of this area is recommended before the setting of targets.

Outcome Recommendations

To increase the proportion of the at-risk population who receive annual influenza vaccine to at least 75 percent by the year 2000.

Setting Healthy Public Policy Targets

Children and young adults have the highest incidence of illness due to influenza infection (Monto, 1987). Control of disease in these groups would be difficult, given the need for annual injections with current inactivated vaccine which is only moderately effective. The vaccines' main contribution to public health is in preventing the morbidity and mortality caused by influenza in the at-risk population.

A large case-control study among non-institutionalised people aged 45 years or older living in Manitoba, Canada (Fedson et al, 1993), and a large study of serial cohorts of individuals aged over 65 years enrolled in a health maintenance organisation in Minnesota, USA (Nichol et al, 1994), have confirmed the effectiveness of influenza vaccine in preventing hospitalisations for respiratory and cardiac diagnoses and in preventing deaths from all causes. In the latter study, an economic analysis was also conducted which showed that direct savings in health expenditure per year averaged US$117 per person vaccinated, with cumulative savings of US$5 million.

These calculations, of course, ignore the cost of maintaining patients in whom the quality of life is poor. The wisdom of giving vaccine to those who can expect a poor quality of life has been questioned (Nicholson, 1990).

These large studies (Fedson et al, 1993; Nichol et al, 1994) confirm the cost-effectiveness of influenza vaccine, even though the highest quality of evidence (randomised double-blind controlled trial) is not available. The only randomised double-blind placebo-controlled trial of influenza vaccine in people aged 60 years or older did show that the immunisation gave 50 percent protection against infection, but did not look at hospitalisations (Govaert et al, 1994).

Recent studies by the Health Care Financing Administration have shown that vaccine use can be improved when patients and physicians are convinced of its value (Centers for Disease Control, 1993). Medicare in the United States has recently added vaccination against influenza to its list of reimbursable services for 31 million older people.

In view of the cost-effectiveness of this intervention, some consideration should be given to making the vaccine available free of charge. As with most immunisations, there are 'economic externalities' (see Glossary) involved, since immunisation will reduce the risk of transmission in the community. Furthermore, the financial benefit accrues to the health services while the cost is currently borne by the individual.

Proposal: That consideration be given to making influenza vaccine available free to groups where the evidence suggests that this will be a net benefit to the health system. This would apply to all at-risk groups including all those aged 65 years and over.

There are a number of potential benefits of vaccinating health care workers against influenza, which are soundly based but are not supported in the literature. Medical staff are a potential source of infection to patients. Transmission can occur while the infection is subclinical or, as is often the case, through staff continuing to work while sick. In one survey 70 percent admitted to working despite symptoms (Ohrt and McKinney, 1992).

With multiple potential exposures, medical staff are at increased risk of catching influenza and may lose significant work time during an influenza outbreak (Weingarten et al, 1992). If vaccinated, medical staff may be more likely to vaccinate patients at risk. However such staff have the same concerns about the effectiveness of vaccines, vaccine reactions and the inconvenience of an injection as the general public (Pachuchi et al, 1989). In an American study aimed at improving coverage of medical house staff and students, four interventions were used:

- an educational memorandum
- a personal letter
- a telephone call from a specialist
- offering the vaccine directly in clinics and conferences.

Only a 62 percent vaccination rate was achieved despite all these interventions (Ohrt and McKinney, 1992).

A cost-benefit analysis of influenza vaccination given to Canterbury Health Laboratory (CHL) staff found it to be cost-effective. (Schousboe, 1993). Absenteeism due to the 'flu' was considerably less among those vaccinated (39.5 percent), than those not vaccinated (66.7 percent of the total in the group). The vaccinated group had 57 less sick days than the unvaccinated group, at a direct financial saving of $5205. On the basis of these data the management of CHL offered free vaccination to all of its staff for 1994. Promotion was through educational material attached to pay sheets. A preliminary analysis of the 1994 absenteeism data suggests that vaccination afforded similar cost benefits to 1993 (Schousboe, 1994).

Although children and young adults are at greatest risk of infection with influenza, there are strong arguments against the vaccination of these otherwise healthy groups. Vaccination will only provide protection against the specific strains contained in the vaccine for up to a year, whereas natural exposure generates a broader antibody response which is longer lasting –

possibly life long – and may reduce the impact of subsequent infections through cross-immunity.

Prevention of infection should result in savings associated with less time off work and school. The CHL data (Schousboe, 1993; Schousboe, 1994) help substantiate this, as does the US Office of Technology Assessment, which compared costs and benefits for vaccinating high-risk and older people, taking into consideration the financially productive years gained (Congress of the United States, 1990).

A public health campaign to promote influenza vaccine use, if initiated, should target the groups at high risk for complications of influenza. However, it should include the education of both the general public and the health sector. It is reasonable to believe that if such a campaign is successful in increasing overall awareness, it will also increase demand from the general public. Planning for vaccine supply must take this into account.

In summary, although there are sound reasons for immunising health care workers and caregivers who are likely to spread influenza to high-risk groups, there is inadequate evidence of the actual value of such practices. The cost-effectiveness to an employer of providing influenza immunisation will depend on the incidence of influenza in the community in that particular year. Given the limitations of the evidence, the current priority remains increasing the use of vaccine among high-risk groups. Healthy individuals, especially those in regular contact with those who are high-risk, should be encouraged to consider influenza vaccine. Employers should consider the probable cost-effectiveness of providing influenza vaccine free of charge to employees, especially if they are engaged in essential community services.

Proposals: That people are advised of the benefit of influenza vaccine, especially if they are in contact with high-risk individuals.

That employers are advised of the potential economic benefit of offering their employees influenza vaccine.

Pandemic influenza results from the emergence of a ‘new’ virus (antigenic shift) which is spread rapidly as no immunity to this new virus is present globally. It is currently believed that Southern China is the epicentre of these emergencies because of the close association between humans, pigs and ducks. If animals are involved, then ‘new’ viruses could emerge anywhere where there is a close association between humans and animals (Monto et al, 1994). The next pandemic could occur at any time.

Pandemic influenza is associated with high morbidity and substantial mortality (Kilbourne, 1975). During the Spanish Influenza pandemic, over the winter of 1918-19, in the United States there were 25 million clinical cases with 500,000 deaths, and world wide there were between 20 million and 40

million deaths (Monto, 1994). Mortality rates were highest among young healthy adults and the elderly, however this pattern has not been seen since (Noble, 1982). The explanation for the high mortality among young healthy adults during the 1918-19 pandemic is unclear. It is commonly ascribed to be a phenomenon of the pre-antibiotic era. However mortality rates during the 1892 pandemic were highest in the very young and elderly, a pattern similar to the more recent post-antibiotic era pandemics (Monto, 1994).

Given that a 'new' pandemic Influenza A virus could emerge at any time, a New Zealand health service action plan to meet such an emergency should be available. The United Kingdom (Influenza Sub-Committee of the PHLS Virology Committee, 1993), United States of America, Canada and Europe all have plans, some of which are being revised. In Australia the preparation of a plan has been mooted.

Proposal: That the Ministry of Health develops a Pandemic Action Plan for New Zealand, or works with the Australian Influenza Vaccine Committee to develop an Australasian Pandemic Action Plan.

Healthy Public Policy Recommendations

That consideration be given to making influenza vaccine available free to groups where the evidence suggests that this will be a net benefit to the health system.

This would apply to all the at-risk groups, including all those aged 65 years and over.

That people are advised of the benefit of influenza vaccine, especially if they are in contact with high-risk individuals.

That employers are advised of the potential economic benefit of offering their employees influenza vaccine.

That the Ministry of Health develops a Pandemic Action Plan for New Zealand, or works with the Australian Influenza Vaccine Committee to develop an Australasian Pandemic Action Plan.

Setting Public Health Programme Targets

Population-based public health services

The United States Department of Health and Human Services suggested aiming for vaccine coverage rates of 80 percent in institutionalised high-risk groups, and 60 percent in non-institutionalised high-risk groups, in order to have a significant impact on morbidity and mortality (USDHHS, 1991). Coverage rates of 80 percent or higher are thought to provide population protection (herd immunity), protecting those with diminished immunological response.

Limited data are available on vaccine coverage of older people in New Zealand. In an Auckland study, the effect of educating the caregivers of residents of rest homes regarding the need for influenza vaccination was investigated (Calder, 1994). Coverage was low before (31 percent), increasing to 41 percent after education, with the proportion of homes with at least 75 percent coverage increasing from 34 percent to 39 percent. Only 12 percent of the larger homes reached 75 percent or more vaccination coverage, indicating that highly organised promotion campaigns are required to achieve a satisfactory uptake.

Vaccine promotion in South Australia involved the distribution of vaccine priority forms through pharmacies to target those at risk, particularly adults over 65 years of age (Carrangis, 1994). In addition, advertising on milk cartons, in journals and newsletters and in the media was carried out. Vaccine cover of those at risk increased from 34 percent in 1991 to 57 percent in 1993.

In the Wellington area in 1990, less than one-third of high-risk residents of Stage 1 rest homes were vaccinated (Hoskins, 1991). The author recommended advocating the importance of vaccination promotion among general practitioners, rest home managers and residents, and that there should be ongoing surveillance of vaccination coverage. Influenza vaccine uptake depends largely on whether the individual is advised or reminded to do so. The importance of the general practitioner's attitude in determining coverage was shown by a survey of people 65 years or older in Georgia, USA. Seventy five percent of people to whom vaccination was recommended by the health provider, received the vaccine, whereas only 8 percent of people who received no recommendation took it upon themselves to get vaccinated (see Table 1) (Centers for Disease Control, 1988). Promotion to health professionals is likely to be more effective at increasing appropriate uptake than general promotion to the public.

TABLE 1. *Patient and provider attitudes*

Patient Attitude	Provider Recommendation	% Vaccinated
Positive	Yes	87
Positive	No	8
Negative	Yes	70
Negative	No	7

Source: Centers for Disease Control, 1988

Proposal: That the Ministry of Health develops an education campaign for health professionals on the safety and effectiveness of influenza vaccine, and its value for at-risk groups.

In New Zealand we are very reliant on individual general practitioners instituting call-up systems within their practice for the annual vaccinations of at-risk patients. Such organisational systems have been shown to improve vaccine coverage by 10 to 30 percent (Litt and Lake, 1993). It is now becoming nearly universal for practices to have immunisation recall systems. Influenza vaccine could be added to such systems.

Those defined to be at-risk of influenza complications, and for whom the influenza vaccine is recommended, comprise nearly a third of the population, with 21 percent of the population over the age of 65 (INFOS, 1995). Influenza vaccine is ideally given in the late summer and autumn months, although it can still be of value in the winter months. Administering influenza vaccine to a large eligible population in a relatively short time period can create a hump of activity for general practices. This will be aggravated when coverage increases. Consideration will need to be given to setting up systems to deal with the increased workload without disrupting other aspects of the practice.

Proposal: That the regional health authorities (through primary health care contracts) and the Royal New Zealand College of General Practitioners encourage the inclusion of influenza vaccine in immunisation recall systems, and the setting up of systems which allow general practitioners to deal with the increased workload.

Public Health Programme Recommendations

Population-based public health services

That the Ministry of Health develops an education campaign for health professionals on the safety and effectiveness of influenza vaccine, and its value for at-risk groups.

Personal health services

That the regional health authorities (through primary health care contracts) and the Royal New Zealand College of General Practitioners encourage the inclusion of influenza vaccine in immunisation recall systems, and the setting up of systems which allow general practitioners to deal with the increased workload.

Research and Information Targets

As with all vaccine-preventable diseases, the two key aspects of surveillance are immunisation coverage and disease incidence. There is, at present, no mechanism for surveillance of the former, but New Zealand has perhaps one of the most intensive influenza surveillance programmes worldwide, with five virus laboratories distributed throughout the country. Current surveillance does not include the impact of influenza in terms of hospitalisations and deaths. Extension of this surveillance programme could contribute substantially to the programmes' aims (Galloway et al, 1994):

- to improve knowledge of the prevalence of influenza in the community to assist in developing strategies to control influenza through immunisation
- to provide an indication of the predominant strains of influenza virus in the community to help in planning for the most effective influenza vaccine for the subsequent year.

The surveillance system is similar to that recommended by the World Health Organization (WHO, 1992). Co-ordination is through the Epidemiology and Virology Groups of ESR: Health Communicable Disease Centre, and involves participants of all public health units and the five regional virus laboratories. Sentinel practices are selected which supply information on a weekly basis from May to September annually on the number of consultations for influenza-like illnesses that meet the surveillance case definition (Figure 2). All sentinel practices are also asked to supply three respiratory specimens for viral culture each week. The influenza viruses isolated are typed and forwarded to the WHO Collaborating Centre for Influenza Reference and Research, located at CSL Ltd in Melbourne, Australia, where further antigenic analysis is carried out. Surveillance data are published by ESR: Health during the influenza surveillance period and summaries are prepared prior to the September Australian Influenza Vaccine Committee meeting on vaccine composition for the following year (Featherstone and Miller, 1994), and after completion of the surveillance period.

The value of the information from the sentinel practices has been questioned as they are a non-random sample of practices. An evaluation of the surveillance system may be of some value to define how well it is meeting its stated objectives, whether there are additional objectives it should be addressing, and any ways of improving surveillance.

The surveillance for influenza also needs to monitor the impact on morbidity and mortality from influenza.

Proposal: That the Ministry of Health evaluates the current influenza surveillance programme and investigates options for future surveillance, including immunisation coverage surveillance.

That the Ministry of Health investigates mortality and morbidity attributed to influenza, for consideration of baseline levels and identifying the target populations.

'Opportunistic' hospital-based immunisation

Vaccination of hospitalised patients on discharge has been initiated in Canada to increase coverage of those at risk (Fedson et al, 1992). This approach to immunise patients at obvious increased risk, who might not be otherwise immunised, is now included among the strategies for the control of influenza in the United States (Centers for Disease Control, 1994). Pilot studies are needed to evaluate its feasibility in the New Zealand hospital system.

Proposal: That the regional health authorities consider pilot studies to establish the acceptability, yield and benefit of the delivery of influenza vaccine for the at-risk population, when attending hospital.

Live attenuated (reduced virulance) influenza vaccines, unlike inactivated vaccines, increase the effectiveness of all relevant systemic and local immune responses by natural but limited infection of the respiratory tract (Shaw et al, 1992). They have been used extensively in the USSR with results comparable to those achieved in other countries with killed virus vaccines.

An anti-viral compound, GR121167, an inhibitor of influenza virus neuraminidase which limits the spread of both A and B viruses by inhibiting the viral neuraminidase (Von Itzstein et al, 1993), is being trialled in a number of countries. The simple administration of this compound by inhalation should enhance its potential in both the treatment and control of influenza.

The possible control of influenza by environmental means has not been widely explored. This could involve the more appropriate design of the workplace layout, for example moving away from open-plan office space, and improving the air circulation in the workplace or school room.

Proposal: That studies evaluate new vaccines and alternative control procedures as they become available.

Research and Information Recommendations

That the Ministry of Health evaluates the current influenza surveillance programme and investigates options for future surveillance, including immunisation coverage surveillance.

That the Ministry of Health investigates mortality and morbidity attributed to influenza, for consideration of baseline levels and identifying the target populations.

That the regional health authorities consider pilot studies to establish the acceptability, yield and benefit of the delivery of influenza vaccine for the at-risk population, when attending hospital.

That studies evaluate new vaccines and alternative control procedures as they become available.

Summary of Benefits

Influenza vaccination of those 65 years or older and those with chronic disease, has been shown to be a highly effective procedure for preventing increased hospitalisation and mortality rates during influenza seasons, even in non-epidemic years. It is one of the most cost-effective procedures currently available for the control of influenza in these at-risk groups.

Increasing the uptake of influenza vaccine will reduce the morbidity and mortality associated with influenza. The reductions in morbidity will lead to savings of treatment costs, especially hospitalisations.

References

Arden NH, Patriarca PA, Kendal AP. Experiences in the use and efficacy of inactivated influenza vaccine in nursing homes. In: Kendal AP, Patriarca PA, eds. Options for the Control of Influenza. New York: AR Liss, 1986: 155-68.

Ashley J, Smith T, Dunnell K. Deaths in Great Britain associated with the influenza epidemic of 1989/90. Population Trends 1991; 65: 16-20.

Bandaranayake M, Galloway Y, Featherstone D. Influenza in New Zealand, 1994. NZ Public Health Report 1995; 2: 15-6.

Betts RF. Influenza Virus. In: Mandell GL, Bennett JE, Dolin RG, eds. Principles and Practice of Infectious Diseases. 4th ed. New York: Churchill Livingstone, 1995; 1546-67.

Calder L. Influenza vaccination coverage in old people's homes in central Auckland. NZ Med J 1994; 107: 202.

Carrangis J. Report of the 1993 South Australian influenza vaccination promotion. CDI 1994; 18; 208-11.

Centers for Disease Control. Follow-up on Guillain-Barre syndrome - United States. MMWR 1977; 26: 52.

Centers for Disease Control. Adult immunization: knowledge, attitudes, and practices - DeKalb and Fulton Counties, Georgia, 1988. MMWR 1988; 37: 657-61.

Centers for Disease Control. Immunisation practices advisory committee: prevention and control of influenza. MMWR 1990; 39: 1-13.

Centers for Disease Control. Final results: Medicare Influenza Vaccine Demonstration - selected states, 1988-1992. MMWR 1993; 42: 601-4.

Centers for Disease Control. Prevention and control of influenza: Part 1, vaccines. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1994; 43: 1-13.

Chen R, Kent J, Rhodes P et al. Investigation of a possible association between influenza vaccination and Guillain-Barré syndrome in the United States, 1990-1991 (abstract). Post Marketing Surveillance 1992; 6: 5-6.

Clifford RE, Smith JWG, Tillett HE, et al. Excess mortality associated with influenza in England and Wales. Int J Epidemiol 1977; 6: 115-28.

Congress of the United States (US Office of Technology Assessment). Cost-Effectiveness of Influenza Vaccination. Washington DC: Congress of the United States 1990.

Davenport FM. Inactivated influenza virus vaccines: past, present, and future. Am Rev Respir Dis 1961; 83 Suppl: 146-50.

Featherstone DA, Miller JA. Recommendation for influenza vaccine composition for 1995. A report for the Ministry of Health / Public Health Commission, October 1994.

Fedson DS, Wajda A, Nicol JP, Roos LL. Disparity between influenza vaccination rates and risks for influenza-associated hospital discharge and death in Manitoba in 1982-1983. Ann Intern Med 1992; 116: 550-5.

Fedson DS, Wajda A, Nicol JP, et al. Clinical effectiveness of influenza vaccination in Manitoba. JAMA 1993: 270: 1956-61.

Fedson DS. Overview of national approaches to influenza vaccination. In: Kendal AP, Hannoun C, Ruben F, eds. Options for the Control of Influenza. Amsterdam: Elsevier Science Publishers BV, 1993.

Francis T Jr. A new type of virus from epidemic influenza. Science 1940; 92: 405.

Galloway Y, Bandaranayake M, Featherstone D. National Surveillance System for Influenza in 1994. Wellington: ESR: Health, 1994.

Govaert TME, Dinant GJ, Aretz K, et al. Adverse reactions to influenza vaccine in elderly people: randomised double-blind placebo-controlled trial. BMJ 1993; 307: 988-90.

Govaert TME, Thijs C, Masurel N, et al. The efficacy of influenza vaccination in elderly individuals: randomised double blind placebo controlled trial. JAMA 1994; 272: 1661-5.

Hall CB, Douglas RG. Nosocomial influenza infection as a cause of intercurrent fever in infants. Paediatrics 1975; 55: 673.

Hoskins R. Survey of influenza vaccine coverage and influenza incidence in Wellington old persons' homes. Communicable Dis NZ. 1991; 91: 99-101.

Influenza Sub-Committee of the PHLS Virology Committee. The PHLS response to a pandemic of influenza: an action plan. PHLS Micrbiology Department, 1993; 10: 147-54.

INFOS (Information Network for Official Statistics). Population Statistics for 1994.

Jennings LC, MacDiarmid RD, Miles JAR. A study of acute respiratory disease in the community of Port Chalmers. II. Influenza A/Port Chalmers/ 1/73: intrafamilial spread and the effect of antibodies to the surface antigens. J. Hyg (Camb) 1978; 81: 67-75.

Kaplan JE, Katona P, Hurwitz ES, et al. Guillain-Barré syndrome in the United States 1979-1980 and 1980-1981: lack of an association with influenza vaccination. JAMA 1982: 248: 698-700.

Kilbourne ED. Epidemiological and clinical aspects of influenza. In: Kilbourne ED, ed: Influenza Viruses and Influenza. New York, Academic Press; 1975: 483.

Litt JCB, Lake PB. Improving influenza vaccine coverage in at-risk groups: good intentions are not enough. Med J Aust 1993; 159: 542-7.

Lui KJ, Kendal AP. Impact of influenza epidemics on mortality in the United States from October 1972 to May 1985. Am J Public Health 1987: 77: 712-6.

Margolis KL, Nichol KL, Poland GA, et al. Frequency of adverse reactions to influenza vaccine in the elderly. JAMA 1990; 264: 1139-41.

Ministry of Health. Immunisation Handbook. Wellington: Ministry of Health 1996, Pg 121-8.

Monto AS, Shortridge K, Webster RC, Cox N. Pandemic Influenza Planning. Third Asia-Pacific Congress of Medical Virology, Beijing, China, 1994.

Monto AS. Influenza: quantifying morbidity and mortality. Am J Med 1987; 82: Suppl 6A: 20-5.

Monto AS. Surveillance to Detect Epidemic and Pandemic Influenza Virus. Abstracts: Third Asia-Pacific Congress of Medical Virology, Beijing, China 1994: 225.

Moser MR, Bender TR, Margolis HS, et al. An outbreak of influenza aboard a commercial airliner. Am J Epidemiol 1979; 61: 3163-6.

Murphy BR, Baron S, Chelhub EG, et al. Temperature-sensitive mutants of influenza virus. IV. Induction of interferon in the nasopharynx by wild-type and a temperature-sensitive recombinant virus. J Infect Dis 1973; 128: 488.

National Health and Medical Research Council. The Australian Immunization Procedures Handbook 5th ed. Canberra: Australian Government Publishing Service, 1994.

Nichol KL, Margolis KL, Wuorenma J, et al. The efficacy and cost-effectiveness of vaccination against influenza among elderly persons living in the community. N Engl J Med 1994; 331: 778-84.

Nicholson KG. Influenza vaccination in the elderly. BMJ 1990; 301: 617-8.

Noble GR. Epidemiological and clinical aspects of influenza. In: Beare AS, ed. Basic and Applied Influenza Research. Boca Ratou FL: CRC Press, 1982: 11-50.

Ohrt CK, McKinney WP. Achieving compliance with influenza immunization of medical house staff and students. A randomized controlled trial. JAMA 1992; 267: 1337-80.

Pachuchi CT, Papps SA, Fuller GF, et al. Influenza A among hospital personnel and patients: implications for recoginition, prevention and control. Arch Intern Med 1989; 149: 77-80.

Patriarca PA, Weber JA, Parker RA, et al. Risk factors for outbreaks of influenza in nursing homes: a case control study. Am J Epidemiol 1986; 124: 114-9.

Reicheldererfer PS, Kendal AP, Shortridge KF, et al. Influenza surveillance in the Pacific basin. Seasonality of virus occurrence: a preliminary report. In Chan YC, Doraisingham S and Ling AE, eds. Current Topics in Medical Virology. World Scientific, 1989: 412-38.

Schoenbaum SC. Economic impact of influenza. Am J Med 1987; 82: (Suppl A) 26-30.

Schousboe M. The evaluation of influenza vaccination of Canterbury Health Laboratory Staff. Internal Report 1993.

Schousboe M. The evaluation of influenza vaccination of Canterbury Health Laboratory Staff. Internal Report 1994.

Shaw MW, Arden NH, Maassab HF. New aspects of influenza viruses. Clin Micro Rev 1992; 5: 74-92.

Smith W, Andrews CH, Laidlaw PP. A virus obtained from influenza patients. Lancet 1933; 2: 66-8.

Sprenger MJW, Mulder PGH, Beyer WEP, et al. Impact of influenza on mortality in relation to age and underlying disease, 1967-1989. Int J Epidemiol 1993; 22: 334-40.

Tobias M. Influenza vaccination - still underutilised. New Ethicals 1991; September: 23-30.

US Department of Health and Human Services. Healthy People 2000: National Health Promotion and Disease Prevention Objectives. Washington DC: US Department of Health and Human Services, 1991; 521.

Von Itzstein M, Wu WY, Kok GB et al. Rational design of potent sialidase-based inhibitors of influenza virus replication. Nature 1993; 363: 418-23.

Weingarten S, Riedinger M, Bolton LB, et al. Barriers to influenza vaccine acceptance: A survey of physicians and nurses. Am J Infect Control 1989; 17: 202-7.

World Health Organization. Standardization and improvement of influenza surveillance: Memorandum from a WHO/GEIG meeting. Bull WHO 1992; 70: 23-5.

Zuckerman M, Cox R, Taylor J, et al. Rapid immune response to influenza vaccination. Lancet 1993; 342: 1113.

Glossary

Antigen: the part of the influenza virus which stimulates the immune system to prepare a protective antibody.

Antigenic variation (shift and drift): to evade the immune system's defences (antibodies) the influenza virus changes its antigens. A minor change is called 'antigenic drift' while a major change is 'antigenic shift'.

At-risk population/groups: those individuals who belong to groups who are known to be at increased risk of influenza complications. This includes all those aged 65 years and over and those with certain pre-existing medical conditions.

Cross-immunity: the protection obtained from one strain of influenza applying to another strain.

Economic externalities: describes the situation where a consumer's purchase affects another person. In the case of immunisation, there is a positive externality, in that those who are in contact with the immunised person are at less risk of infection.

Excess mortality: deaths caused by influenza which are not recognised or coded as such on the death certificate. Modelling of influenza gives a better indication of the number of deaths caused by influenza than just counting those deaths where influenza was recorded as a cause of death.

Genome: the genetic code of an organism; in this case influenza virus.

Inactivated virus: virus grown in cell culture which is inactivated by a chemical process so that it can no longer cause infection.

Influenza complications: the secondary results of influenza infection which can include hospitalisation for aggravations of pre-existing conditions, development of other infections or even death.

Live attenuated influenza vaccines: influenza viruses which have been weakened so as not to cause serious disease but which can stimulate the immune system to generate protection.

Morbidity: sickness arising from an illness. This usually relates to hospital admissions, but can also refer to other health service use.

Mortality: deaths arising from an illness. In the case of influenza much of this mortality is not recognised as being caused by influenza.

Pandemic influenza: a pandemic is a global epidemic. Pandemics of influenza have occurred with major changes to the virus (antigenic shift) which have spread over the globe.

Population protection (herd immunity): if enough individuals in a community are immune, the disease can no longer spread. Immunising a sufficient proportion of individuals creates population protection, thus protecting those who did not get the vaccine or in whom the vaccine failed.

Surveillance: the systematic collection of information for monitoring a programme.

Vaccine efficacy: this relates to the proportion of people protected by receipt of a vaccine.

Submissions on Influenza

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