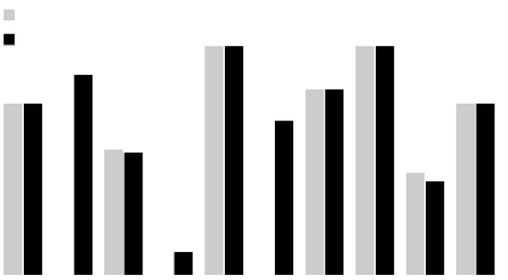
Evidence points to influenza vaccination being cost-saving in healthy working adults



Although influenza causes few medical complications in healthy working adults, it is associated with substantial absenteeism and loss of productivity in the workplace. Using comprehensive cost-benefit analysis, 8 of 11 studies have found influenza vaccination to be cost saving. In contrast, when the costs/benefits of production loses/gains were excluded from analysis, only a single study found vaccination to be cost saving.

The cost benefit of influenza vaccination is influenced by many factors. The different healthcare delivery systems and economies of different countries mean that analyses must be country specific. Company-specific factors are also important. Vaccination is more likely to be cost saving in workplaces with a high incidence of influenza, high level of influenza-related absenteeism and a high average salary.

Vaccination of certain occupational groups may confer additional benefit. Vaccination of healthcare or rest home workers may reduce the risk of transmission of influenza to high-risk individuals; however, the cost benefit of this has not been assessed.

Few influenza complications in adults

It is now well accepted that influenza vaccination of the elderly (>65 years of age) is a cost-effective preventive strategy.[1] This is not only because the vaccine is effective and relatively inexpensive, but also the elderly are at relatively high risk of developing influenza-related complications resulting in the need for medical care and/or hospitalisation. Because healthy adults <65 years of age have a much lower incidence of influenza-related complications, from a purely medical perspective influenza vaccination is less relevant for this age group than it is for the elderly.[2]

But considerable burden in the workplace

From an employer's perspective, however, influenza can confer a significant burden.[3] During each annual influenza epidemic, approximately 5–20% of the population is infected. If the influenza strain is particularly virulent up to 50% of the population may develop the disease. In the workplace this has the potential to cause substantial absenteeism and loss of productivity. This has lead to some employers urging employees to get vaccinated against influenza.[2]

Evaluation in workers widespread

Given the level of interest shown by employers, it is not surprising that, particularly in the past several years, pharmacoeconomic analysis of influenza vaccination in healthy working adults has been relatively widespread.[2] A total of 11 studies (see figures 1 and 2) have been undertaken to assist the healthcare decision-making in six different countries (USA, UK, Canada, France, Finland and Brazil). All studies were undertaken from a societal viewpoint, and generally included indirect costs and benefits in addition to direct costs and benefits.

Study groups and methodology vary

Study methodology varied across the studies. Five studies were observational,[4-8] two were of a randomised placebo-controlled experimental design[9,10] and four studies used simulation techniques, such as the Monte Carlo simulation.[11-14] Effectiveness of the vaccine (i.e. the extent to which the vaccine reduced the direct and/or indirect costs related to influenza infection [table 1]) was either estimated as part of the study or was based on data from other sources.

Adding to this variability, studies were undertaken in a range of employee groups and a range of healthcare environments. Most studies were conducted in discrete

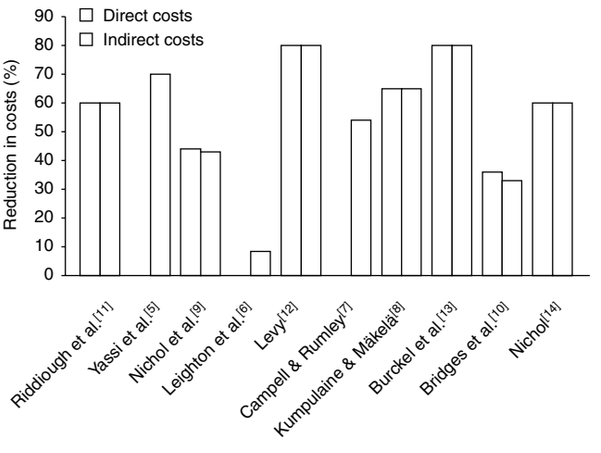
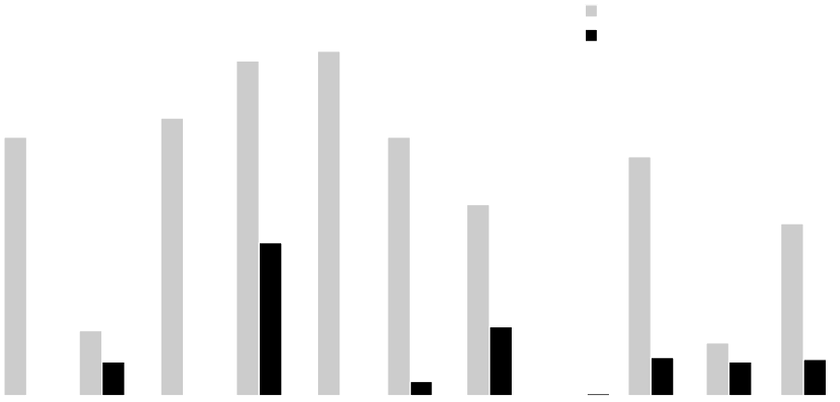


Fig. 1. Overview of the effectiveness of influenza vaccination in preventing direct and/or indirect costs in healthy working adults.



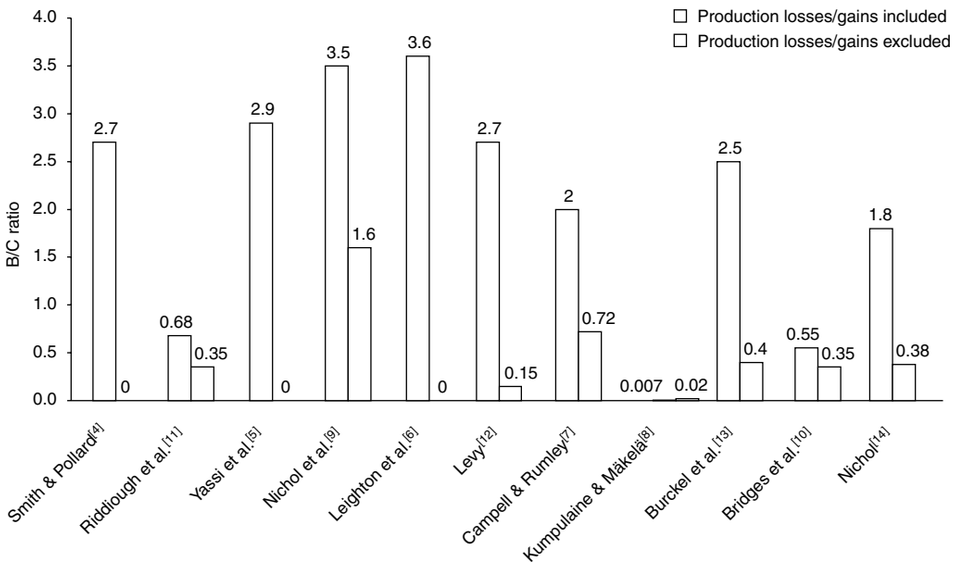


Fig. 2. Benefit-to-cost (B/C) ratio of influenza vaccination in healthy working adults including and excluding benefits related to production losses and gains.

workplaces such as a Canadian teaching hospital,[5] a Brazilian pharmaceutical company,[13] and Ford Motors[10] and textile plants in the US.[7] Other studies were conducted in employee groups such as Postal and Telecommunications staff in the UK[4] and municipal homemakers (caring for children and the elderly in the client's own homes) in Finland.[8] Only one study included a broad range of working adults, who were recruited through advertisements and recruitment sessions in shopping malls.[9]

Studies static rather than dynamic

Regardless of the study methodology, all studies were of a 'static' design.[2] Investigators only considered the effects of vaccination on the immunised individual and not the workforce as a whole. In a dynamic environment, vaccine coverage becomes relevant because the level of coverage helps to determine the degree of spread of influenza within the workplace.

Calculation of B/C ratio standard

Despite the differences in study design, a benefit-to-cost (B/C) ratio was used to assess the financial implications of influenza vaccination related to the costs of providing the vaccination.[2] The B/C ratio compares direct medical benefits (DB) [i.e. cost of healthcare averted through vaccination] and indirect benefits (IB) [i.e. vaccine-averted production losses due to absenteeism] with total vaccine-related costs. Such costs include:

- direct medical costs (DC), including the purchase price of the vaccine;
- indirect medical costs (IMC), such as medical treatment of vaccine-related adverse effects;
- indirect nonmedical costs (InMC).

InMC are subdivided into those related to the productivity lost to enable the employee to be vaccinated ($InMC^1$) and the time lost due to adverse effects of the vaccine ($InMC^2$).

Thus, the B/C ratio is defined as follows:

$B/C = (DB + IB)/ (DC + IMC + InMC^1 + InMC^2)$

Where the B/C ratio is >1, the benefits outweigh the costs and, on a pharmacoeconomic basis, vaccination is justified. Where the B/C ratio is <1, vaccination does not provide any financial benefit but may still provide quality-of-life or other health-related benefits.

The B/C ratio can include all production losses/gains or can be more narrowly focused and include only direct and indirect medical costs and benefits.[2] The former approach is preferred, as it provides evaluation from a comprehensive societal perspective. Indeed, current guidelines for pharmacoeconomic research indicate that studies should incorporate a societal perspective. From a narrow medical focus, the B/C ratio becomes:

$B/C = DB/(DC + IMC)$

Cost-saving if indirect benefits included

On the basis of the results of the 11 studies referred to above, benefits exceeded costs in eight of the studies.[2]

Indeed, for seven studies, the B/C ratio was ≥2 (see figure 2).

In three studies, the costs exceeded the benefits (i.e. B/C ratio <1 [figure 2]).[8,10,11] Although the reasons for this difference are unclear, high relative costs of vaccination, a low incidence of influenza or a low level of influenza-related absenteeism in the absence of vaccination appear to contribute.[2]

Not if production losses/gains excluded

From a purely medical perspective, influenza vaccination of healthy working adults is not cost saving in most settings.[2] Cost savings are extremely sensitive to indirect costs/benefits related to production losses/gains. When production losses/gains were excluded from the B/C ratio, only one of the original studies remained cost saving (see figure 2).[9] In this study, the incidence of influenza was relatively high, as was the monetary value attributed to the direct medical benefits.

Specific to country and company

Country-specific factors influence the cost-benefit analysis of vaccination for an individual country.[2] For example, the direct costs of providing an influenza vaccine are dependent not only on the economy of the country (the relative cost of the vaccine), but also on the healthcare delivery system (e.g. whether or not the vaccine can be administered in the workplace, which healthcare professionals have the authority to administer the vaccine). Therefore, country-specific evaluation of the cost benefit of immunising healthy working adults against influenza should be undertaken before a decision about such vaccination is made for a particular country. Various company-specific factors also influence the cost benefit of influenza vaccination in a specific workplace.

Benefits greater in the highly paid

The principle benefit of influenza vaccination in healthy working adults is the prevention of influenza-related absenteeism and loss of productivity.[2] Therefore, it is not surprising that the cost benefit of influenza vaccination is sensitive to the labour costs of the specific workforce. The higher wages paid to workers in a pharmaceutical company in Brazil (in relation to the cost of the vaccine) contribute to vaccination being cost saving in that particular environment.[13]

Thus, the cost benefit of vaccinating working adults depends, at least in part, on the average salary of the targeted workforce.[2] This may lead to employers only offering influenza vaccination to their higher paid employees. Such an approach has obvious ethical concerns. It may also make highly paid employees feel obliged to accept the proffered vaccination or make them feel guilty if they refuse the vaccine, contract influenza and require days off work. The medical and nonmedical costs of such psychosocial problems in employees has not been included in cost-benefit analyses undertaken to date.

Also when impact of influenza is high

The underlying incidence of influenza in the target population and the influenza-related absenteeism profile in that population also influence the cost-effectiveness of influenza vaccination in healthy working adults.[2] If the underlying annual incidence of influenza is sufficiently low, vaccination may not be cost saving from a societal perspective. For example, in the Finnish study the annual incidence of influenza was 1.2% and the B/C ratio was substantially less than 1 (0.07).[8] In contrast, where the annual incidence of influenza was high (e.g. >30%), influenza vaccination was cost-saving (B/C ratio ≥2).[7,9] Similarly, if the annual influenza-related absenteeism is sufficiently low, even when the incidence of influenza is relatively high, influenza vaccination may not be cost-saving from a societal perspective.[10]

Match vaccine to circulating strain

Obviously for influenza vaccination to provide optimal cost benefit, the vaccine must be well matched to the circulating influenza strain.[2] A good match is seen in approximately 90% of seasons.

Extra benefits in some workplaces

Certain occupational groups have a lot of contact with individuals at high-risk of developing influenza-related complications.[2] In workplaces such as hospitals or rest homes, the benefits conferred by influenza vaccination may extend beyond those directly associated with the vaccinated individual. Although studies have been undertaken in such workplaces,[5,8,15] the potential benefits relating to the reduced transmission of influenza to high-risk individuals (such as the elderly or the chronically ill) have not been included in cost-benefit calculations.

Indeed, despite the likely benefits when healthcare workers in direct contact with patients are vaccinated, <10% of such employees in a Canadian teaching hospital agreed to be vaccinated against influenza.[5] The vaccine uptake rate was low even among those healthcare workers who had direct contact with the most frail patients.

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