THE COST-EFFECTIVENESS OF INFLUENZA VACCINATION IN ENGLAND

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Introduction

The primary aim of this study is to compare alternative extensions to the seasonal influenza vaccination programme in England 2005. In particular, we aim at assessing if extending to transmitters (low-risk school aged children) is better than targeting low-risk groups with the highest burden (younger children and adults aged 50 to 64 year).

To achieve this we adapt an age-and risk-group specific transmission-dynamic model of the epidemiology of influenza in the United Kingdom [1], and updated burden of disease estimates by age and risk group[2] . This analysis therefore takes account of the possible direct and indirect effects of vaccination, and up-to-date estimates of disease burden.

Materials and Methods

We utilise the reconstructed epidemic profiles from Baguelin et al. [1] and estimate the number of infections that occurred for each seasonal influenza strain (H3N2, H1N1 and B) by age and risk group during the study period (1995/6 to 2008/9) under the vaccination programme. In addition, we use the same model to estimate the number of infections that would have occurred had the vaccination programme been extended to other (low-risk) age groups . We modelled 7 possible scenarios of extension to low risk individuals in the following age groups (ordered by size): 2-4 years, 50-64 years, 2-16 years, 2-4 & 50-64 years, 2-16 years, 2 -16 & 50-64 years, and 2-64 years.

Coverage is assumed to be 50% in the low-risk groups, and the vaccine to be given in the autumn, in line with the current programme. A recent Cochrane review [3] suggested that vaccine efficacy was 73% in years with well-matched vaccine, and 44% in poor matched years. In addition, a recent analysis by Fleming et al. on seasonal influenza vaccine efficacy [4], suggested that efficacy was lower in the elderly (46%) compared to younger adults (70%). Since all of the studies included in the Cochrane review were performed on healthy young adults, we assumed that efficacy was 70% and 46% in those under (over) 65 years of age respectively in a well-matched year, which was reduced to 42% and 28% in poorly matching years. We assume that children would be immunized with a live attenuated influenza vaccine and that this type of vaccine will produce similar protection that the current trivalent inactivated vaccine in adults.

We performed full economic cost effectiveness analysis alongside probabilistic sensitivity analysis using the applicable distributions for the different parameters .

References

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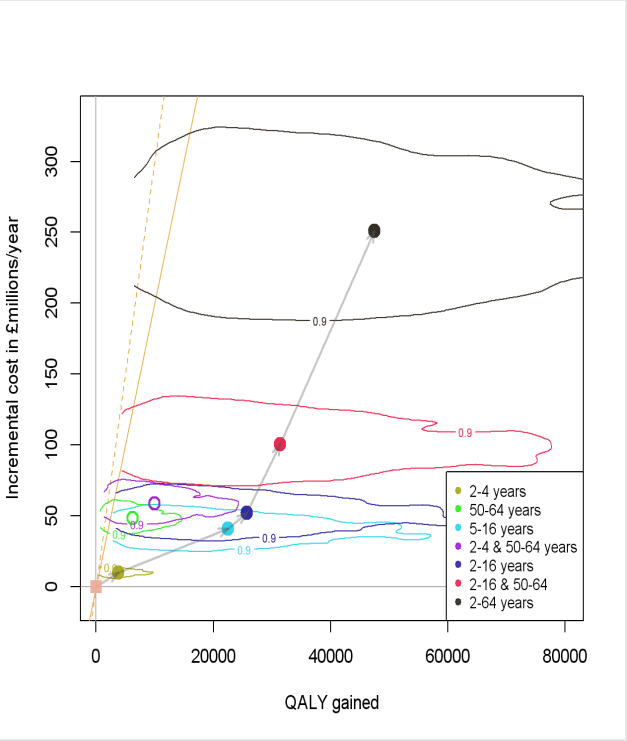
2. Cromer D, van Hoek AJ, Jit M, et al. J. Infect. (2013)
3. Jefferson T, Di Pietrantonj C, Rivetti A, et al. Cochrane Database Syst. Rev. (2010) (7):CD001269.
4. Fleming DM, Andrews NJ, Ellis JS, et al. J. Epidemiol. Community Health (2010)64(12):1062–7.

Results

Compared with no vaccination, the current influenza programme is likely to be cost effective (ICER: 7475 £/QALY, NB: 253 M£ [15; 829]).
Extension to all children is likely to be highly cost-effective, though extending the programme further to older age group has a lower likelihood of being deemed cost-effective. The most cost-effective step is the extension from 2-4 year old to 5-16 year old with an ICER of 1,569 £/QALY. The 2-16 year old scenario extension has an ICER of 1949 £/QALY incremental on the current programme.

Figure 1: Estimated change in costs and QALYs gained over the current strategy, for each of the extensions to the vaccination programme. Each contour line represents 90% CI with the point inside being the mean outcome. The two diagonal lines represent £20,000 (solid) and £30,000 per QALY gained.



Conclusions

Compared with no vaccination the current strategy of vaccinating high risk individuals and those over the age of 65 years against influenza appears likely to be cost-effective. This despite the low level of effectiveness assumed for vaccination of the elderly and the variability from year to year, due to the population dynamics of the various strains of the virus.

The incremental analysis presented here suggests that annual vaccination of all children (2 years to 16 years of age) may well be a cost-effective strategy, but that extending vaccination to other low-risk groups is less certain to be cost effective. The finding that vaccination of low-risk children is likely to be cost-effective is robust to: increasing the level of coverage in the high-risk non elderly population, assumptions regarding the level of coverage that can be achieved in low-risk children and the discount rates.