Commentary: Should programmes for community-level meningococcal vaccination be considered in Australia—an economic evaluation

R Heyderman

The meningococcus, causing meningitis and septicaemia, is a leading infectious cause of childhood death in industrialized countries and results in major epidemics in the countries of the 'Meningitis Belt' of sub-Saharan Africa.\(^1\),\(^2\) Outbreaks of meningococcal infection in Northern Europe, some areas of the United States and more recently New Zealand\(^3\) have heightened the sense of alarm expressed by both the public, the press and the health care professions. This undercurrent has resulted in considerable pressure on national immunization agencies to implement a meningococcal vaccine programme.

In this issue of the *Journal*, Skull et al. from Victoria in Australia, report a sustained increase in the rate of serogroup C meningococcal disease (overall incidence rate of 6/100 000 amongst 15–19 year olds locally compared to 2/100 000 nationally). In their cost-benefit analysis of vaccination with a plain meningococcal serogroup C polysaccharide vaccine, they have focused on a defined population of 15–19 year olds with a particularly high rate of disease (incidence rate 20/100 000 associated with a 24% case-fatality rate). The analysis revealed that the introduction of a vaccine programme would result in a discounted cost per life-year saved of $21,097, with benefits exceeding costs in discounted terms. Skull's calculations suggest that an incidence rate of 14/100 000 of serogroup C disease is required for such an immunisation programme to 'break-even'. Based on their findings the authors advocate introduction of the vaccine into this very specific sub-population. Can this analysis inform national immunization policy, particularly in the light of the new generation...
of polysaccharide-protein conjugate vaccines currently being implemented elsewhere?

Ideally, national recommendations for public health interventions should be based primarily on clinical effectiveness but an analysis of the cost-benefits remains important. A polysaccharide-protein conjugate vaccine against the serogroup C meningococcus was phased into the UK national immunization programme in 1999. Serogroup C causes approximately 35% of meningococcal disease in the UK, the remainder is largely caused by serogroup B. Conjugation of the serogroup C capsular polysaccharide to a protein core such as tetanus toxoid or the non-toxic mutant of diphtheria toxoid (CRM197) has enabled recruitment of T-cell help during the immune response to this vaccine. Unlike its plain polysaccharide predecessors, the vaccine is therefore highly immunogenic in young children, primes for immunological memory, and provides long-lasting protection. Given the marked mucosal immune response to meningococcal group C conjugate vaccination, it is likely that nasopharyngeal colonization by the meningoccus will be reduced, therefore providing a degree of herd immunity not available though vaccination with the plain polysaccharide vaccines. The UK was the first country to introduce a serogroup C meningococcal vaccine into a national immunization programme, and has used immunogenicity rather than efficacy data for licensure. Initially the age groups with the highest incidence (under 5 years) and the greatest burden of mortality (15–17 year olds) were targeted but the plan is to vaccinate all individuals under 25 years of age. The vaccine programme has proved highly effective with dramatic reductions already being seen in the initial target populations. Although there is some concern that the ecological niche left by serogroup C will be occupied by close relatives from a hypervirulent group of strains known as the ET-37 complex (includes some strains of the serogroup B meningococcus), to date there is no evidence for this phenomena occurring. Therefore, like the Haemophilus influenzae type b conjugate vaccine introduced into industrialized countries the mid-1990s, preliminary data from enhanced surveillance in the UK suggests that virtual elimination of meningococcal serogroup C disease is feasible and will represent a significant public health triumph.

Cost-effectiveness studies are underway based on the UK experience. Even if the UK programme does meet the criteria to ‘break-even’ (over 15 million doses given to prevent between 800 and 1600 cases per year), the benefits to society are significant with the potential to eliminate one cause of a disease that effects otherwise healthy productive individuals. In addition, the programme will trumpet the success of immunization in the current climate of public concern for the safety of vaccines such as MMR. In the light of the success of the group C protein-conjugate vaccine, it seems that Skull’s recommendations to introduce the plain polysaccharide vaccine to a highly selected population have been overtaken by events. I suspect that even in an era of competing health care priorities, it is unlikely that either the general population or national immunization authorities will accept their approach. The challenges are now to generate an effective serogroup A-conjugate vaccine for Africa, and in the light of the poor immunogenicity of the serogroup B polysaccharide, design a vaccine based on sub-capssular antigens that protects young children and generates long-lasting immunity.

References