Measuring the Cost-Effectiveness of Oral Cholera Vaccines

Introduction to the Vaccine Introduction Cost Effectiveness (VICE) Calculator

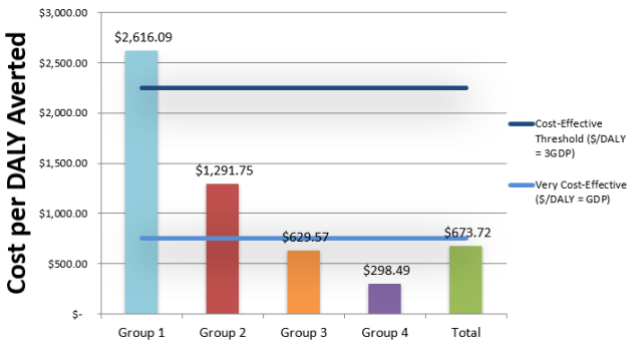
When developing strategies for improving health in poor countries, resources are always limited. Policy makers must attempt to prioritize interventions deemed to be "**cost-effective**" in choosing between different health interventions and activities. Logically, interventions that save the most lives at the lowest cost are preferred, while those that are more costly, or have minimal benefits should not be pursued. While this kind of analysis seems logical, estimating cost-effectiveness may be quite challenging.

Cost-effectiveness is a measure of how much money is required to achieve certain health outcomes. Generally this is expressed as the number of dollars needed to prevent a case or to avert a death. Health planners also often use another measure – the number of dollars needed to avert a "**disability adjusted life year**" or DALY to account for both disabilities and deaths. **The VICE (Vaccine Introduction Cost Effectiveness) calculator** was developed to simplify the estimation of cost-effectiveness of oral cholera vaccines.

Intuitively, one understands that when a disease is very common and is causing large numbers of deaths, an effective and inexpensive vaccine will be cost-effective. However, cost-effectiveness of a vaccine decreases as disease incidence or case fatality rates decrease. It will also decrease if the vaccine is expensive or if the vaccine's efficacy is poor. Estimating cost-effectiveness of a vaccine thus requires more than intuition; it must be done in an objective and systematic manner. This is the reason that the VICE calculator was developed as a user-friendly tool. Although developed specifically for oral cholera vaccine, it may be useful for other health interventions as well.

To use the VICE tool, which uses an Excel platform, the variables that influence cost-effectiveness are entered into the calculator and the outputs – in terms of cost-per-case averted, cost-per-death averted and cost-per-DALY averted – are calculated and shown on tables and graphs that are generated automatically. The tool and the graphs that it produces can be used to compare the cost-effectiveness of vaccination given to different groups with different incidence or case fatality rates.

As a guide, a vaccine is considered "*cost-effective*" if the cost-per-DALY averted is less than three times the per capita gross domestic product (GDP) of the country. If the cost-per-DALY averted is less than the GDP per capita, the vaccine is considered "*very cost-effective*." The lines on the graph below show these bench marks. The vertical bars illustrate the cost-per-DALY averted if the vaccine was given to different groups.



This chart shows the cost effectiveness for four groups who were being considered for vaccination. They differ in the baseline rates of cholera 0.5, 1.0, 2.0 and 4.0 per thousand for groups 1,2,3 and 4 respectively, This assume a single dose protecting for two years with 80% effectiveness. Vaccination of group considered not cost effective, but the other groups are either cost effective or very cost effective.

When changing different variables, one notes that cost-effectiveness improves slightly with an increase in vaccine efficacy, but it increases substantially if the vaccine is given to populations with a high incidence of the disease or a high case fatality rate. Since cholera incidence can vary by several fold from place to place, and vaccination costs can also vary, the cost-effectiveness of cholera vaccination can change significantly, depending on the specific situation.

The VICE calculator and instruction manual are included in the DOVE toolkit and can be found at on the www.stopcholera.org website. We trust that you will find it to be useful in deciding how best to target OCV to groups who will benefit the most.