

When developing strategies for improving health in poor countries, resources are always limited. Policy makers must attempt to prioritize “cost-effectiveness” when 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 straightforward, estimating cost-effectiveness may be quite challenging. The Vaccine Introduction Cost Effectiveness (VICE) calculator was developed to simplify the estimation of cost-effectiveness of oral cholera vaccine (OCV) in various settings.

Cost-effectiveness is a measure of how much money is required to achieve certain health outcomes. Generally, this is expressed as the dollars needed to prevent a case or to avert a death. To account for both disabilities and deaths, health program planners also often use another measure -- the number of dollars needed to avert a Disability Adjusted Life Year (DALY).

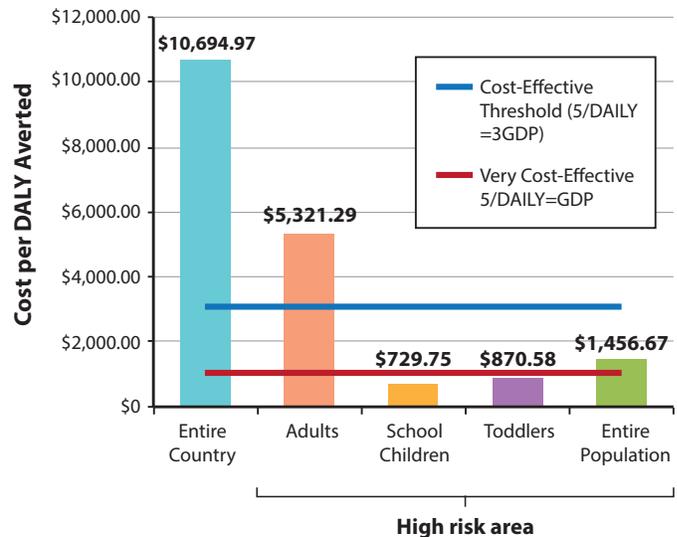
Intuitively, one understands that when a disease is very common and causes large numbers of deaths, an effective and inexpensive vaccine will be cost-effective. However, as disease incidence or case fatality rates decrease, while vaccine costs remain constant, the cost-effectiveness of that vaccine will decrease. It will also decrease if the vaccine is expensive or if vaccine efficacy is poor. However, calculating cost-effectiveness requires more than intuition; it needs to be estimated in an objective and systematic manner.

For this reason, the VICE calculator was developed. It is a user-friendly Excel-based tool that calculates cost-effectiveness using variables that influence the cost-effectiveness of the vaccine, such as case fatality rate.

To use the VICE calculator, a user will enter values for each variable, and the outputs – in terms of cost-per-case averted, cost-per-death averted and cost-per-DALY averted – are automatically calculated and shown on tables and graphs. The tool also allows for comparing the cost-effectiveness of vaccine given to multiple groups expected to have different disease 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.”<sup>1</sup> The horizontal blue lines on the example VICE calculator graph below show these two bench marks. The vertical bars illustrate the cost-per-DALY averted by administering the vaccine to different groups.

In the example shown, vaccinating the entire country (the first bar), would not be cost-effective. However, cost-effectiveness changes when focusing on a specific high risk area. While vaccinating adults in the high-risk area (the second bar) would not be considered cost-effective, vaccinating school children or toddlers (the third and fourth bars) in this area would be very cost-effective. Finally, if administered to the total population in the high-risk area (the last bar), the vaccine would be considered cost-effective, but not very cost-effective.



By using the VICE calculator and changing different variables, one notes that the cost-effectiveness of vaccination improves only slightly with an increase in vaccine efficacy, but it increases substantially if

<sup>1</sup> Cost-effectiveness thresholds, 2015. World Health Organization. <http://www.who.int/bulletin/volumes/93/2/14-138206/en/>.

the vaccine is given to populations with a very high incidence or a high case fatality rate. Since cholera incidence can vary significantly across places or risk groups, and vaccination costs may also vary, the cost-effectiveness of cholera vaccination can change substantially, depending on the specific situation and the strategy used for the vaccination campaign. The VICE calculator can be used to highlight these important nuances and advocate to decision-makers and program planners for optimal use of OCV.

Although VICE was developed specifically for oral cholera vaccine, it may be useful for other health interventions as well. The VICE calculator and instruction manual can be found in the [StopCholera Toolkit](#). We trust you will find it to be useful in deciding how best to target OCV to groups that will benefit the most.