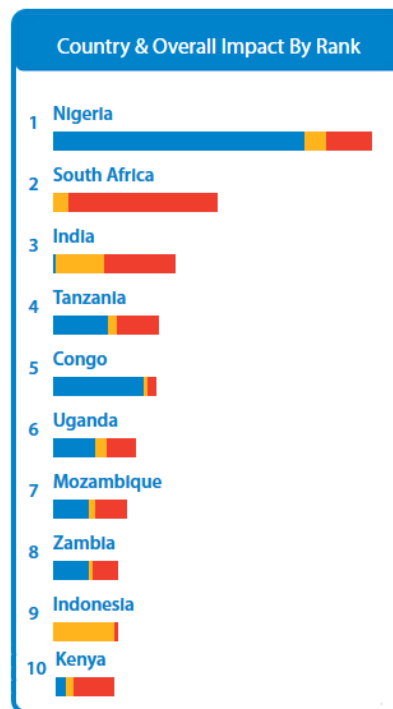


## The Global Health Impact Country Index

There are many multi-attribute indicators of countries' levels of wealth, poverty, inequality and development. Some of these indicators, such as the Human Development Index, consider aspects of population health. There are, to our knowledge, no multi-attribute indicators comparing our impact on poor health in these countries even in a single year. This paper presents one such index.

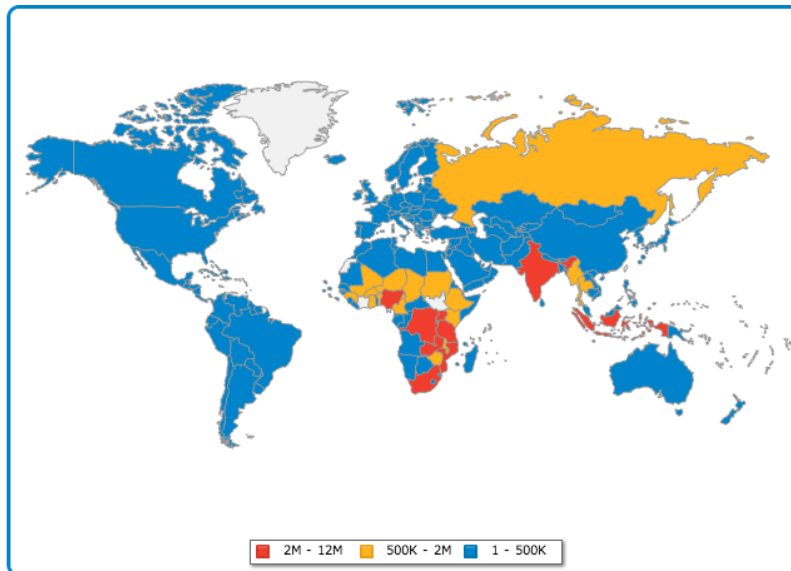
The Global Health Impact index evaluates the impact of drugs for the three big global health diseases: Malaria, tuberculosis (TB), and HIV/AIDS. The Global Fund and the 6<sup>th</sup> Millennium Development Goal focus on combatting these diseases as millions of people are infected with, and die from, malaria, TB, and HIV/AIDS every year. Some of the drugs necessary to address these problems have been around for a long time, others are newer and still expensive. In which countries are these drugs having the most impact? The Global Health Impact index attempts to answer this question (1). Measures of our success in combatting some of the worst global health problems are essential for improving global health (2).

**Figure 1. Top Ranked Countries Graph**



Nigeria is the highest ranked country on the Global Health Impact index. There is a lot of malaria in Nigeria receiving highly effective treatment. There is also some successfully treated malaria and TB. In South Africa, the second highest ranked country, we are having more success in alleviating the burden of HIV/AIDS, but there is a much less severe malaria burden to alleviate.

**Figure 2. Country Impact Scores**



The Global Health Impact index estimates the potential impact of the main malaria, TB, and HIV/AIDS medicines and ranks countries by aggregating drugs' estimated impacts on these diseases within their borders. The estimate of the impact we are having in each country is based on assessments of the need for the drug (in disability adjusted life years -- DALYs -- lost to the disease states it treats), access to the drug (treatment coverage), and drug efficacy (from clinical trial data) in that country. The estimated impact is  $\text{Need} * \text{Access} * \text{Efficacy}$  in each country. Suppose, for instance, 100 DALYs are lost per annum to a disease treatable with a drug that reduces the impact of the disease by 80%, on average. If 50% of the population that needs the drug has access to it, the Index estimates that the drug will avert the loss of 80 DALYs in that country ( $100 * .8 * .5 = 40$ ).

Because the Index is focused on evaluating the global health impacts of key malaria, TB, and HIV/AIDS medicines available in each country in a rigorous way, and not on countries' efforts or policies, countries' scores depend on many other factors besides the nature of country-level health systems. They depend, for instance, on international aid efforts, and what other drugs are already around. That makes the Global Health Impact index a promising basis for incentivizing many organizations (governmental and non-governmental) to address the access to medicines problem and increase our collective global health impact.

Consider a real, but very simple, example of how we calculate one drug's score in one country from the Index (3). DHA-PPQ is the first-line treatment for *Plasmodium falciparum* malaria in Vietnam. So consider how its impact in Vietnam was calculated. Approximately 63,901.40 DALYs were lost to malaria in Vietnam in 2010 (4). About 75% of the malaria in Vietnam was *Plasmodium falciparum* malaria (5). So 75% of the 63,901.40 —or about 47,926.05 —DALYs were lost to *Plasmodium falciparum* malaria. The World Health Organization suggests that DHA-PPQ is 100% effective in Vietnam (6) and we rely on survey data to estimate that treatment coverage for DHA-PPQ in Vietnam is 2.6% (7). The impact of DHA-PPQ in Vietnam, then, is  $\text{DALYs} * \text{Coverage} * \text{Effectiveness}$ . The estimated impact of DHA-PPQ for Vietnam is  $(47,926.05 * 1 * .026) = 1,246.08$  DALYs averted (6,7). A similar process was repeated for every country where DHA-PPQ was a first-line drug. When there were more than one first line drug in a country we split the proportion of *Plasmodium falciparum* DALYS we estimated might be saved equally between the drugs. The models for TB and HIV/AIDS are, however,

much more complicated including different disease states and sub-populations. The interested reader can contact the authors for details.

The model can be improved if better data on need, access, and efficacy becomes available. Nevertheless, the model presented here provides some essential information about global health and highlights the need to improve global disease surveillance mechanisms. Data on efficacy from clinical trials is, for instance, likely to over-estimate drug effectiveness. It is also relatively sparse. Similarly, we are missing treatment percentage data for different drug regimens in many countries and the model obviously inherits any problems with the Global Burden of Disease study.

That said, the Global Health Impact index has the potential to foster great improvements to global health. Such a rating system should be of interest to policy makers, researchers, companies, investors, and consumers (8,9,10). Although data alone will not solve any of the health problems people face, it can be used to help many people secure essential medicines that can save millions of lives every year.

## References and Notes

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3. The Index credits Chongqing Tonghe Pharmaceutical Co. Ltd. for Dihydroartemisinin-Piperaquine because a patent for Dihydroartemisinin-Piperaquine for use in treatment of malaria was first applied for by Chongqing Tonghe Pharmaceutical Co., Ltd in 2000 (US Patent issued 2010). Guogiao, Li and Jianping Song. September 2004. "Composition Containing Artemisinin for Treatment of Malaria." US Patent Number 7851512. Accessed 1 January 2013. <http://www.google.com/patents/US7851512>.
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6. We use 2010 as the base year for the model and use data as close to that year as possible (preferring more recent data to older data other things being equal). We use efficacy data from the following sources (in order of preference): World Health Organization. 2010. Global Report on Antimalarial Efficacy and Drug Resistance: 2000-2010. World Health Organization: Geneva. Accessed 1 January 2013. Available at: <http://www.who.int/malaria/publications/atoz/9789241500470/en/>. World Health Organization. 2012. *World Malaria Report 2012*. World Health Organization: Geneva. Accessed 1 January 2013. Available at: [http://www.who.int/malaria/publications/world\\_malaria\\_report\\_2012/en/](http://www.who.int/malaria/publications/world_malaria_report_2012/en/). When WHO

- data is not available, we have tried to fill in the gaps with a systematic review of clinical trial data. Contact author for details.
7. Treatment percentage data is from DHS and MICS surveys: Children under 5 with fever being treated with anti-malarial drugs, 2007, United Nations Statistics Division. Accessed 1 April 1, 2014. Although researchers must request access to these surveys, some of the data is verifiable online e.g. here <http://www.indexmundi.com/indonesia/malaria-treatment.html>. When country-specific data is not available, the weighted average of treatment coverage in all available countries is used.
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  9. Joseph Dieleman, Case Graves, Tara Templin, Elizabeth Johnson, Ranju Baral, Katherine Leach-Kemon, Annie Haakenstad, and Christopher Murray. 2014. "Global Health Development Assistance Remained Steady in 2013 but Did Not Align with Recipients' Disease Burden," *Health Affairs*: 33:5: 1-9.
  10. Similar indexes have been used for many purposes – from evaluating health programs and policies to incentivizing new innovation. The Access to Medicines Index that looks at companies' access policies is, for instance, used by socially conscious investors. The Access to Medicines Index. 2013. "What is the Index?" Accessed 1 January 2013. Available here: <<http://www.accesstomedicineindex.org/what-index>>.