

A conversation with Dr. Antonio Montresor, May 14, 2019

Participants

- Dr. Antonio Montresor – Focal point, Soil-transmitted helminths, Department of Control of Neglected Tropical Diseases, World Health Organization
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Note: These notes were compiled by GiveWell and give an overview of the major points made by Dr. Montresor.

Summary

GiveWell spoke with Dr. Montresor of the World Health Organization (WHO) as part of a review of its process for adjusting worm intensity when calculating the cost-effectiveness of charities' deworming programs.¹ Conversation topics included WHO's classification of worm intensity, the impact of worm intensity on morbidity, techniques for modeling the cost-effectiveness of deworming programs, and government ownership of deworming programs.

WHO classification of worm intensity

WHO's system for classifying the intensity of intestinal worm infections is as follows (only for soil-transmitted helminths):

- ***Ascaris lumbricoides*** – Light-intensity, moderate-intensity, and heavy-intensity *Ascaris lumbricoides* infections are defined respectively as: 1-4,999 eggs per gram (epg), 5,000-49,999 epg, and greater than 50,000 epg. The level of 50,000 epg and above corresponds with vitamin A deficiency and a high possibility of intestinal obstruction (resulting in death in the absence of surgery). In the past, heavy-intensity *Ascaris lumbricoides* caused significant death among young children, although control programs have now made death a rare outcome.
- ***Trichuris trichiura* (whipworm)** – Light-intensity, moderate-intensity, and heavy-intensity *Trichuris trichiura* infections are defined respectively as: 1-999 epg, 1,000-9,999 epg, and greater than 10,000 epg. The level of 10,000 epg and above corresponds with significant blood loss, resulting in anemia, as well as *Trichuris* dysentery syndrome (now a rare outcome due to control programs).
- **Hookworm** – Light-intensity, moderate-intensity, and heavy-intensity hookworm infections are defined respectively as: 1-1,999 epg, 2,000-3,999 epg, and greater than 4,000 epg. These categories correspond with the degree of blood loss resulting from a hookworm infection.

¹ E.g. [here](#).

WHO's classification of worm intensity was established in the 1980s to 1990s. Modifications have been attempted in the past; however, the classification system has been maintained in order to measure progress on reducing worm burden (i.e. comparing current levels with past levels).

Impact of worm intensity on morbidity

The intensity of an intestinal worm infection corresponds directly with the level of morbidity caused by the infection. Light-intensity infections cause a minor amount of blood loss that can be compensated for by the human body. However, heavy-intensity infections cause a monthly level of blood loss similar to a woman experiencing menstruation, which is difficult for the body to remedy (particularly among individuals with poor diet).

If, after deworming intervention in an area, only infections of light intensity are identified, it can be assumed that the morbidity caused by STH is no longer present in the area.

Dr. Montresor compared the impact of worm intensity on morbidity to the effect of a hammer blow on a finger: the relationship between the power of the blow and the damage to the finger is non-linear, from almost nothing from a light blow to hematoma and to fracture from a heavy blow.

Relevance for GiveWell

Due to the differences in morbidity caused by different classes of worm intensity, Dr. Montresor believes that GiveWell should focus on the prevalence of moderate-intensity and heavy-intensity infections when making decisions on where to intervene. For example, in a case where "area A" includes a large total number of infections and high average intensity and "area B" includes a smaller number of infections but higher number of moderate-intensity and heavy-intensity infections, "area B" should be viewed as in more urgent need of deworming.

Furthermore, within a particular intensity class, infections from all worm species should be viewed as equally harmful, since WHO classification already incorporates the differences in morbidity caused by different worm species.

Techniques for modeling the cost-effectiveness of deworming programs

Predictive modeling of infection intensity

WHO's Department of Control of Neglected Tropical Diseases has developed a predictive model enabling an estimation of moderate-intensity and heavy-intensity worm prevalence based on the total worm prevalence in a given area. GiveWell can utilize this model to more precisely estimate the cost-effectiveness of deworming programs in areas where granular data on infection intensity is unavailable. However, the model may not produce accurate results when analyzing areas where prior deworming has occurred.

Counterfactual analysis

An evaluation of a deworming program's cost-effectiveness should incorporate the counterfactual outcome that would occur if the program were interrupted. For example, if a program ceases operations in a particular area, worm burden in that area may return to higher levels if sanitation levels have not improved.

*All GiveWell conversations are available at
<http://www.givewell.org/research/conversations>*