

Research proposal

Title: Can we do it? A systematic and reproducible survey of research professionals on the perceived feasibility of and obstacles to eliminating neglected tropical diseases¹ and malaria using a “wisdom of crowds” approach

Acronym: CWDI

PI and co-PI: Elisa Sicuri (PI), Celine Aerts, Joe Brew

Areas and/or Programs in which the proposal is framed:

Neglected Tropical Diseases, Malaria

Summary

Background

The wisdom of crowds: Patients often ask for a “second opinion”, a request which implicitly recognizes two important truths: (1) that an expert can sometimes be wrong and (2) that the combined opinions of multiple experts can better approximate the truth than the opinion of only one. As Sir Francis Galton demonstrated in his famous ox-weight experiment published in *Nature*², averaging the opinions of many is more accurate than taking the opinion of any *single* expert, since the biases of diverse viewpoints can be complementary and symbiotic..

The value of forecasting: In regards to disease eradication, proponents point to the potential ongoing returns on investment to future generations. But **economically**, the “expected value” of an investment in a binary scenario (eradication or not) is a function of the *probability* of the scenario’s occurrence, and the temporal *lag* of that occurrence. Therefore, knowing the likelihood and time-frame of eradication of NTDs and malaria is essential for making sound investments in health.

Why this study: Assessing likelihood and time-frame of eradication is too important of a task to be left to individuals or small panels and committees. It requires the “wisdom of crowds.” Measuring consensus and discord among disease-specific researchers from a variety of disciplines can serve as a barometer of (informed) opinion, both guiding resources and identifying areas of concern.

Objectives

In a systematic survey of experts in the fields of neglected tropical diseases and malaria, we will query perceptions regarding the feasibility and time-frame of eradication, as well as the perceived gaps and chief areas that need attention in order for eradication to occur. We will report on aggregate results, and our analysis will be broken down by disease, researcher academic discipline, impact and years of experience.

Our **principal** objective is to measure the perceived likelihood/feasibility and time-frame of eradication of certain neglected tropical diseases and malaria among those who are professional researchers of those respective diseases, at a larger scale than any previous study. Our **secondary** objective is to examine the relationship between the perceived likelihood/feasibility of eradication of diseases with the respective attention allotted to them in both the popular and academic literature. Our **tertiary** objective is to establish which specific areas of knowledge are lacking through an examination of researcher characteristics (academic discipline, geography, etc.) insofar as those characteristics are associated with differential perceptions regarding time-to-eradication.

1 For the purposes of this project, the specific NTDs under consideration are Leishmaniasis, Human African Trypanosomiasis, Lymphatic filariasis, Chagas, Schistosomiasis, and Oncocerciasis.

2 Galton oversaw an exercise in which 800 fair-goers guessed (for a prize) the weight of an ox. Though the guesses were very diverse, the average of all guesses (1207 pounds) was astonishingly close to the true weight (1198 pounds). Galton declared victory for the “wisdom of crowds”, noting that “the result is... more creditable to the trust-worthiness of a democratic judgment than might have been expected.” Galton, Francis. *The Wisdom of Crowds*. Nature (1907), No. 1949, Vol. 75, 450-451.

Methods and Design

We will “webscrape” from PubMed the authors, abstracts, and journal information of all articles related to disease X using standardized search terms. We will then send emails to all first, last, and corresponding authors (whose addresses can be located), asking 2 simple questions:

1. In your opinion, how many years will it be until disease X is eradicated? (0-99+)
2. Please rank the following ten areas in order of where attention is most needed in order to achieve eradication (10 = attention most needed; 1 = attention least needed).³

These questions can also be answered via an online survey: <http://goo.gl/forms/lb80lwgwQY>

We will then compile a database which links researcher meta-information (% and number of publications in top-decile journals, publication quantity, geography of institution, geography of research focus, gender, academic discipline) with their surveyed attitudes regarding eradication (years-to-eradication and ordered ranking of factors).

The design of this study is typical, but this study is noteworthy in two areas: (1) its scale (by using automated web-scraping, emailing, and surveying, we will reach the maximum number of experts), and (2) its democratic approach (we assume that the more experts' opinions reflected, the closer we are to approximating the “truth”). Our results will be of value not only to the scientific community, but also to policy-makers and public health practitioners. By gauging and synthesizing the “wisdom of (informed) crowds”, we aim to establish a barometer of scientific opinion in a manner that is fully reproducible.

Evaluation criteria

1. What are the ethical considerations that need to be addressed and how will they be addressed?

We will not be collecting personal health information, or any biological samples. Nor will we be dealing in any way, shape or form with health outcomes or treatment data.

We will only contact researchers whose information is publicly available online.

The only potential area of “sensitive” information pertains to the disclosure of researchers' opinions. However, we will state clearly in both the “invitation to participate” email as well as in the online survey form that results will be made fully public; researchers who choose not to participate are free to do so, and will not be contacted thereafter.

2. List the ethics committees (both human and/or animal) which either have reviewed or will review this proposal

None. Given the nature of this study, no human/animal ethics committees' review is necessary.

3. Describe the expertise required for the project and which member(s) of the research team will provide each area of expertise

Area expertise in malaria: Elisa Sicuri and Joe Brew

Area expertise in NTDs: Elisa Sicuri and Celine Aerts

Computer programming (web-scraping, mail merge, data management): Joe Brew

4. How does the proposal fit in with ISGlobal's scientific agenda?

ISGlobal is a thought leader in the areas of both malaria and NTDs (research programmes in Chagas, and, increasingly, leishmaniasis) as well as their corresponding eradication movements. By using modern, technologically-oriented means to establish a “barometer” of international researcher consensus on the perceived feasibility and time-frame of eradication, ISGlobal would cement its position at the center of the ongoing international dialogue on the subject. Furthermore, given ISGlobal's stake in eradication campaigns, the results of this study could (a) inform which disciplines and diseases have the most “research gaps” to be filled in

³ The ten options are: (1) Resources for research, (2) Resources for public health, (3) Partnerships, (4) Creation/improvement of pharmaceuticals, (5) Creation/improvement of vaccines, (6) Awareness and education, (7) Health systems infrastructure, (8) Knowledge sharing and translation, (9) Scaled up interventions, (10) International coordination.

order to achieve eradication, (b) identify areas of consensus and discord between different disciplines, (c) provide (crowd-informed) estimates of the timeline to eradication.

Budget estimation and expected source of funding for this study

None! Given that this topic is directly relevant to the PhD-specific research of the two co-Pis (Celine Aerts and Joe Brew), no project-specific funding is required.

Other comments

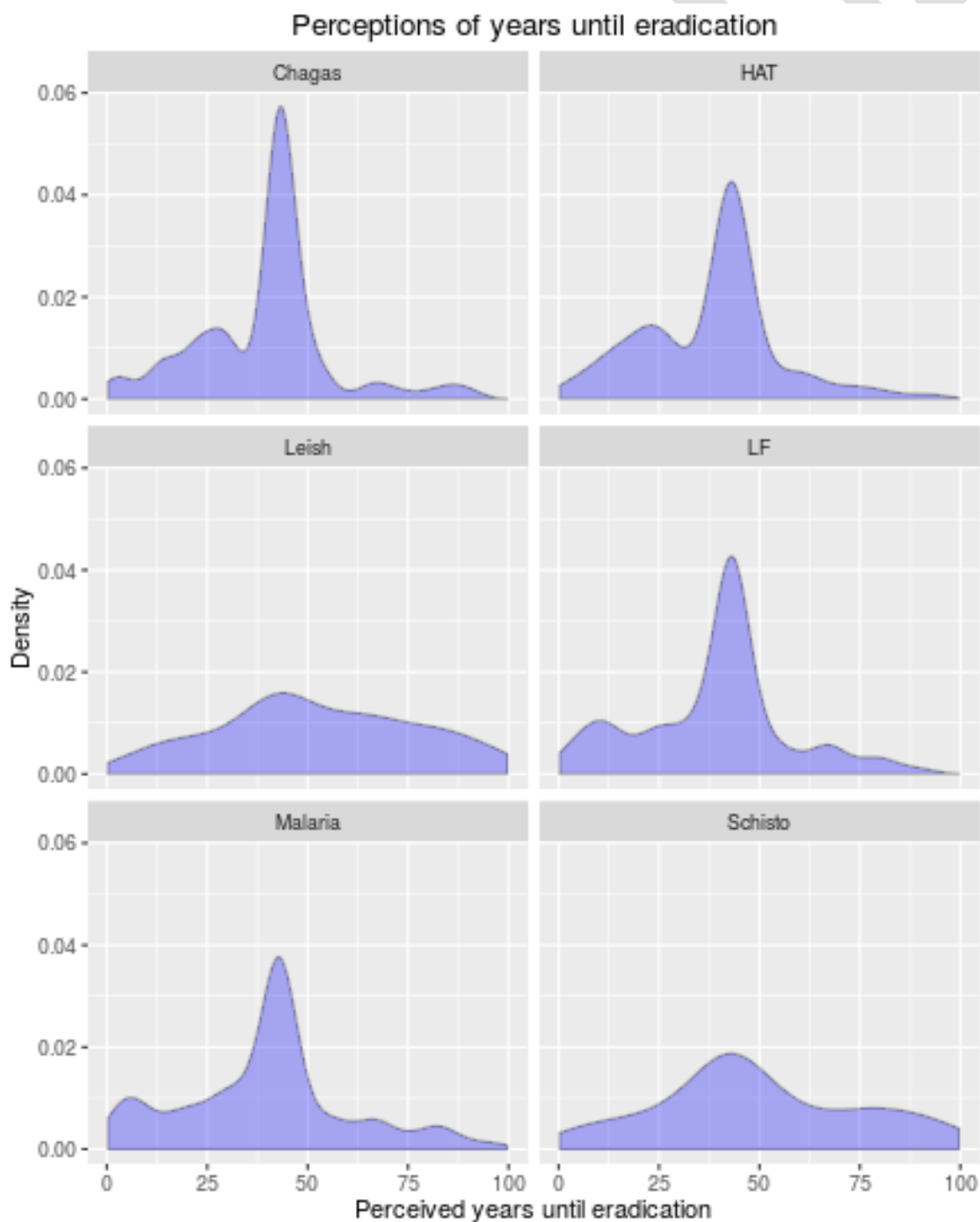
- Have all co-investigators read and approved this proposal? YES
- Do you expect to handle samples of human origin in the study? NO
- Do you expect to handle personal information in the study? NO.

Potential knowledge products (hypothetical)

This section serves to show hypothetical examples of knowledge products related to this project, via charts.

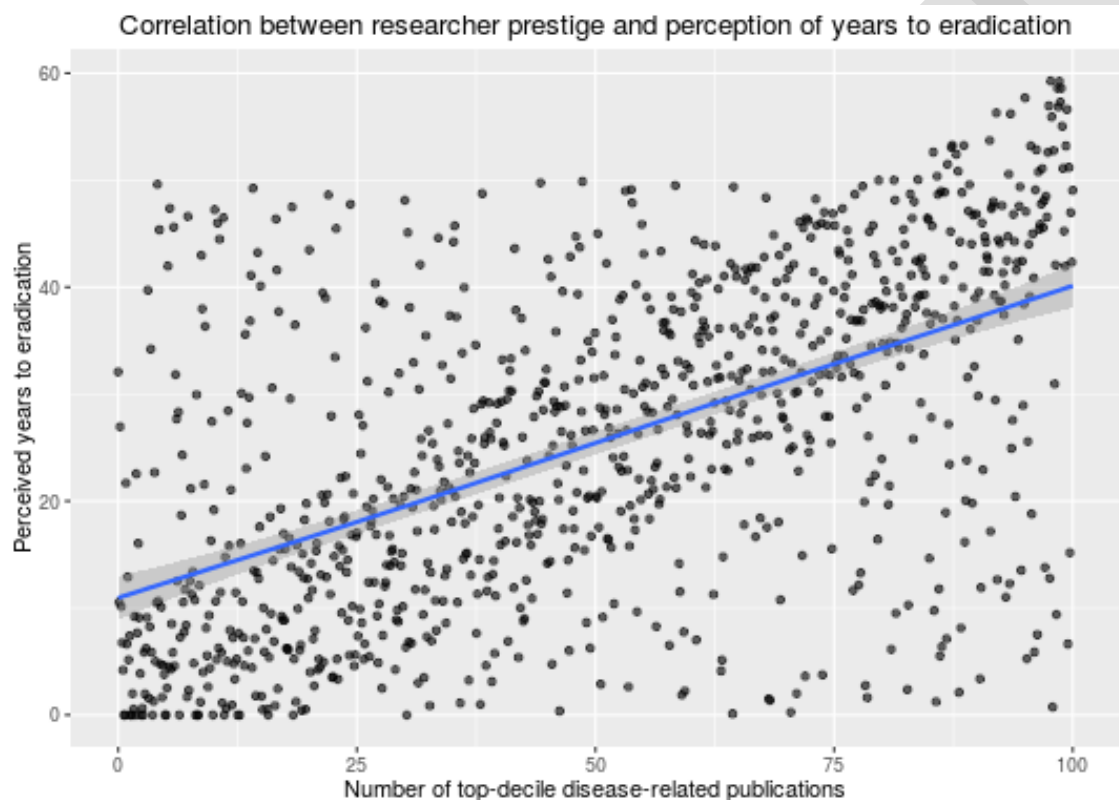
Example 1: Distribution of perceptions of years to eradication for each disease

This chart serves as the main “wisdom of crowds” visualization. It shows both the average amount of time experts from different disciplines believe it will take to achieve eradication for each disease, while also displaying where there is consensus (as indicated by high peaks) versus discord (as indicated by wide, low peaks).



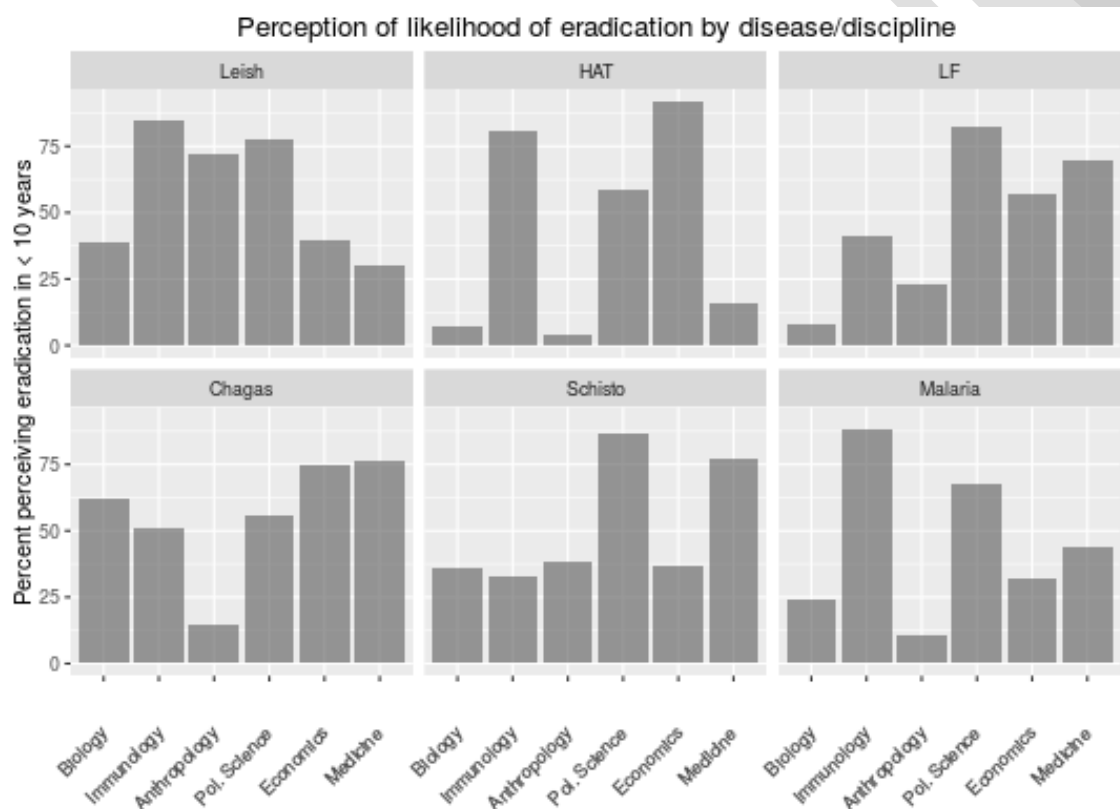
Example 2: The association between researcher “quality” and perception to eradication

The null hypothesis is that there exists no correlation between the “quality” of a researcher and his/her attitude towards eradication. The alternative hypothesis is that there does exist a correlation. In the case of the alternative hypothesis being validated, this would be evidence that expert opinion should potentially be “weighted” for researcher quality.



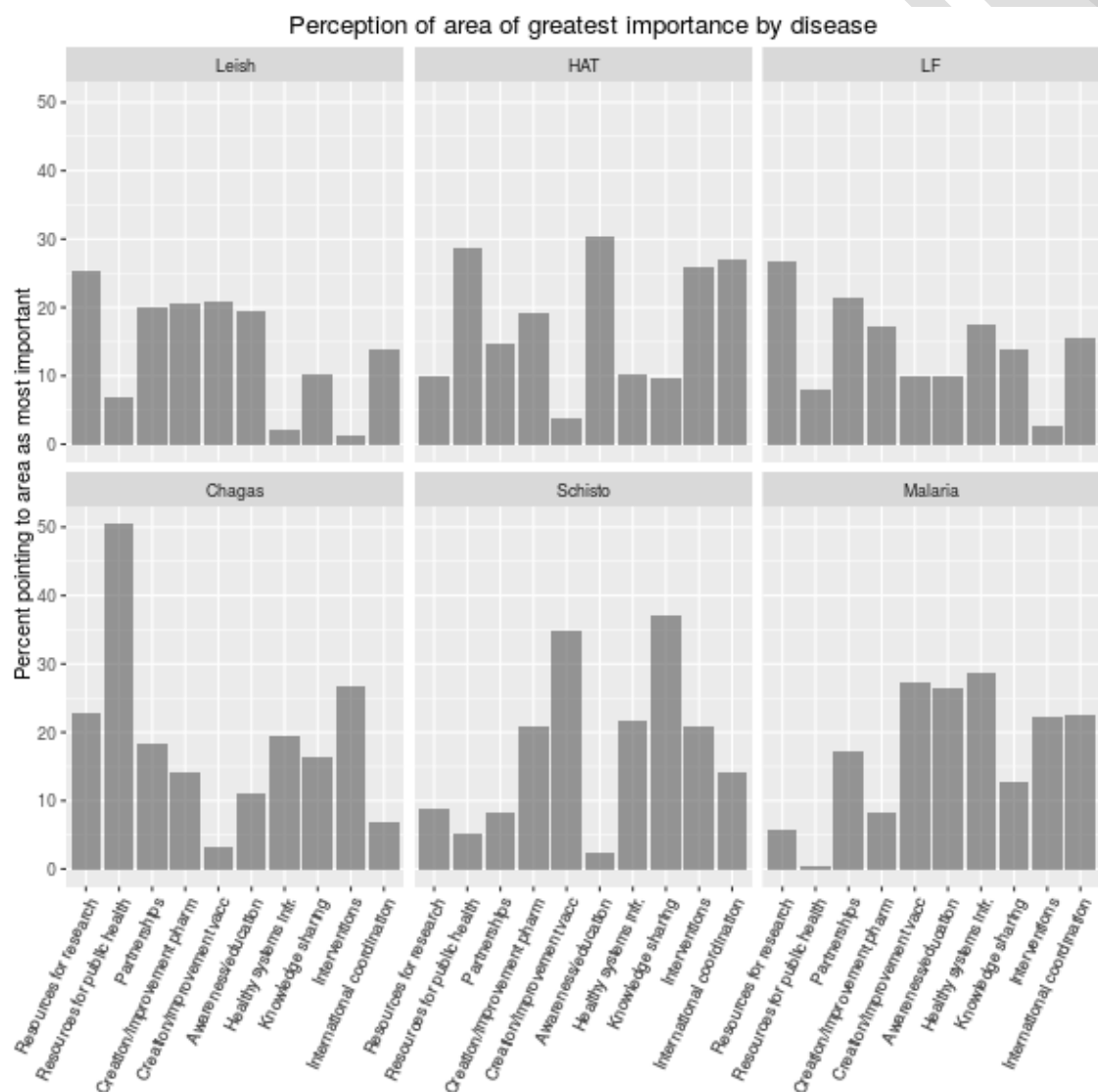
Example 3: Perception of experts of likelihood of short-term eradication by disease and academic discipline

This chart reveals differential perceptions of the likelihood of short-term eradication by academic discipline. This chart is useful in that if differences are found, this could indicate that disciplines with lower “confidence” in short-term eradication reflect areas that require attention (ie, gaps that need to be filled). For example, if for a certain disease experts from biomedical fields saw high likelihood but experts from anthropology saw low likelihood, this would indicate that the challenges to eradication are more anthropological than biomedical.



Example 4: Perception of experts regarding area of greatest importance to eradication by disease

This chart reveals differential perceptions of the area of greatest importance by disease. This chart is useful in that if differences are found, this could indicate that certain areas should receive greatest attention. For example, in the below chart for Chagas, the highest bar is for “resources for public health”, indicating that (unlike with other NTDs) there is near-consensus among experts that “resources for public health” represents the most important area in order to achieve eradication of Chagas.



Example 5: Perception of experts regarding area of greatest importance to eradication by disease and academic discipline

This chart is similar to example 3, but also reflects variation by academic discipline. It indicates, for each disease, how experts of different academic disciplines prioritize different areas of work/research. This is useful in that it indicates the primary concerns of experts from each field, highlighting areas of consensus and discord between diseases and disciplines.

