Developing Tools for Optimizing School-Based Deworming in the Context of Integrated Neglected Tropical Disease Control

End-user survey of functions and applications

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Background

Information on the geographical distribution of neglected tropical diseases (NTDs) can help countries plan and implement effective control programmes. Data obtained from NTD surveys can be mapped to identify priority areas for control and estimate treatment needs. However, national programmes often lack the technical capacity to map and analyse survey data and existing mapping tools developed by WHO and partners are sparsely used in countries. Funding from the Bill & Melinda Gates Foundation is supporting the development of a global, open access data platform and spatial planning tool for school-based deworming and neglected tropical disease (NTD).

Several NTD data and mapping platforms currently exist, each with different functionality and scope. A recent state-of-the-art review has reviewed the functionalities offered by currently existing web mapping platforms, including NTD, non-NTD, and non-health platforms[1]. This work also reviewed available web mapping tools (proprietary as well as free and open source software) that are most appropriate to meeting the needs of the Gates Foundation-funded project and are capable of addressing important functionalities.

An additional consideration in the development of a mapping tools are the requirements of potential end-users, including national NTD staff and NTD experts from international organizations. Therefore, to better understand users' needs and perceptions on the importance of possible functions and uses of a mapping tool, we conducted a need assessment among participants attending key NTD control workshops and meetings.

Methods

Potential mapping tool functions and their main applications were identified from the review of existing platforms[1] and expert opinion. A simple questionnaire was developed that asked participants about potential functions of a mapping tool and its main applications and asked to rate these as follows: very important; important; neutral; less important; or least important. The questionnaire was piloted in Kenya and the final version was distributed during the following meetings:

- *Meeting to finalize National Neglected Tropical Diseases (NTD) master plans and annual plans for 2012 in the WHO African Region*, Harare, Zimbabwe, 19-23 March 2012 (WHO, Regional Office for Africa).

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[1] Avia-GIS and Global Atlas of Helminth Infection (2012). *Developing tools for optimizing school-based deworming in the context of integrated neglected tropical disease control. Functional requirements and technical options for an open access data platform*. Avia-GIS.

- *Training Workshop on the New Guidance on Monitoring and Evaluation of Lymphatic Filariasis Elimination Programmes*, Manila Philippines, 29-31 May 2012 (WHO Regional Office for the Western Pacific)
- *Development of a guide for integrated mapping of NTDs in the Africa Region, Regional Stakeholders' Consultative Meeting on Neglected Tropical Diseases*, Accra, Ghana, 25-27 June 2012 (WHO, Regional Office for Africa).
- *Training Workshop on the New Guidance on Monitoring and Evaluation of Lymphatic Filariasis Elimination Programmes*, Nadi Fiji, 17-19 July 2012 (WHO Regional Office for the Western Pacific)
- *Regional Capacity building workshop on Transmission Assessment survey (TAS) in Lymphatic Filariasis elimination programme in the South East Asia Region*, Pondicherry, India, 10-13 July 2013 (WHO, Regional Office for South-East Asia)
- *Development of a guide for integrated mapping of NTDs in the Africa Region*, Lusaka, Zambia, 22-24 October 2012 (WHO, Regional Office for Africa).
- *Children Without Worms Soil-Transmitted Helminthiasis Control, Technical Assistance Workshop for the Western Pacific Region - Manila, Philippines, May 27-28, 2012*
- *Children Without Worms Soil-Transmitted Helminthiasis Control, Technical Assistance Workshop for the South East Asia Region - Dhaka, Bangladesh, September 25-27, 2012*

The questionnaire is available via Survey Monkey: www.surveymonkey.com/s/CCH6ZRS.

Results

Survey participants

In total, 105 individuals completed the questionnaire. Participants came from 45 countries, with half working in the Africa region (Table 1). Seventy percent of participants worked for national governments and 47 percent worked either as NTD programme manager, a programme director, NTD monitoring and evaluation (M&E) manager or NTD data manager. Participants were involved in a variety of NTD control programmes including STHs, schistosomiasis, lymphatic filariasis, dracunculiasis, trachoma, yaws, rabies and leprosy.

Table 1: Characteristics of survey participants (n=105)

Characteristic	% participants
WHO Region	
Africa	50
Southeast Asia	23
Western Pacific	20
Other	7
Institution	
Government	70
Academic	10
NGO	10
Others	10
Position	
NTD programme coordinator	30
Programme director (other)	10
M&E manager	4
Data manager	3
Others	53

Importance of NTD mapping tool functions

The survey contained questions about twelve potential mapping tool functions that were rated by the participants. The details of questions and ratings are provided in A1 in the appendix.

Figure 1 presents the ratings of possible mapping functions and shows that the majority of functions were rated as "important" to "very important" (Figure 1A). Only the functions "drawing of new objects" and "stand-alone application of the tool" were rated as "neutral" to "important". When considering the average rating and the number of "very important" rates (Figure 1B), three priority groups of functions can be identified as follows:

<u>Highest priority</u>

- overlay different layers of information
- combine different data sources
- draw graphs and tables
- download maps
- navigate to specific areas on the map

Medium priority

- zooming
- input of own data
- emailing of maps

- view source data
- web-based application

Lower priority

- drawing of new objects

- stand-alone application tool

Figure 1. (A) Ratings of mapping tool functions and (B) average ratings. The height of bubbles presents the average rating while the size depends on the number of "very important" rates received. Three priority categories are presented: highest priority (red), medium priority (green), lower priority (blue).

A
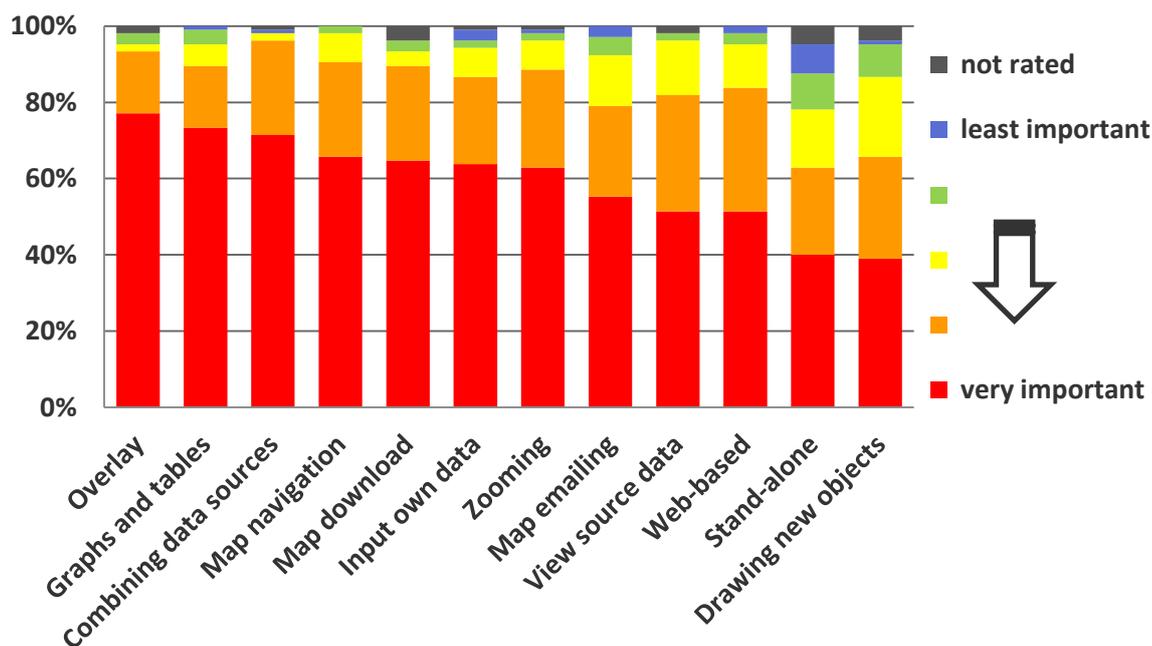
B
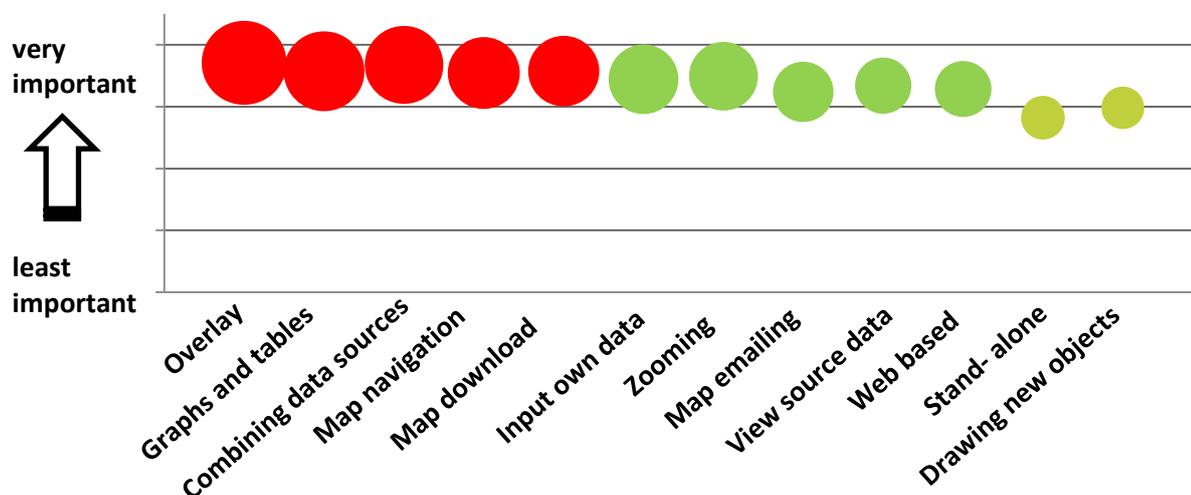
Importance of NTD mapping tool uses

The questionnaire also included eight questions about potential uses of a mapping tool (Figure 2A). All uses were rated as "important" to "very important", with exception of "estimation intervention duration", which was rated "neutral" to "important".

The main mapping tool applications identified as the participants were as follows (Figure 2B):

Highest priority

- ability to identify areas of priority for MDA
- estimation of number of infected people

Medium priority

- estimation of drug needs
- identification of areas for co-implementation

Lower priority

- estimation of benefits
- estimation of frequency of interventions
- estimation of cost-effectiveness
- estimation of duration of interventions

Figure 2. (A) Rating of applications of mapping tool and (B) average ratings. The height of bubbles presents the average rating while the size depends on the number of "very important" rates received. Three priority categories are presented: highest priority (red), medium priority (green), lower priority (blue).

A
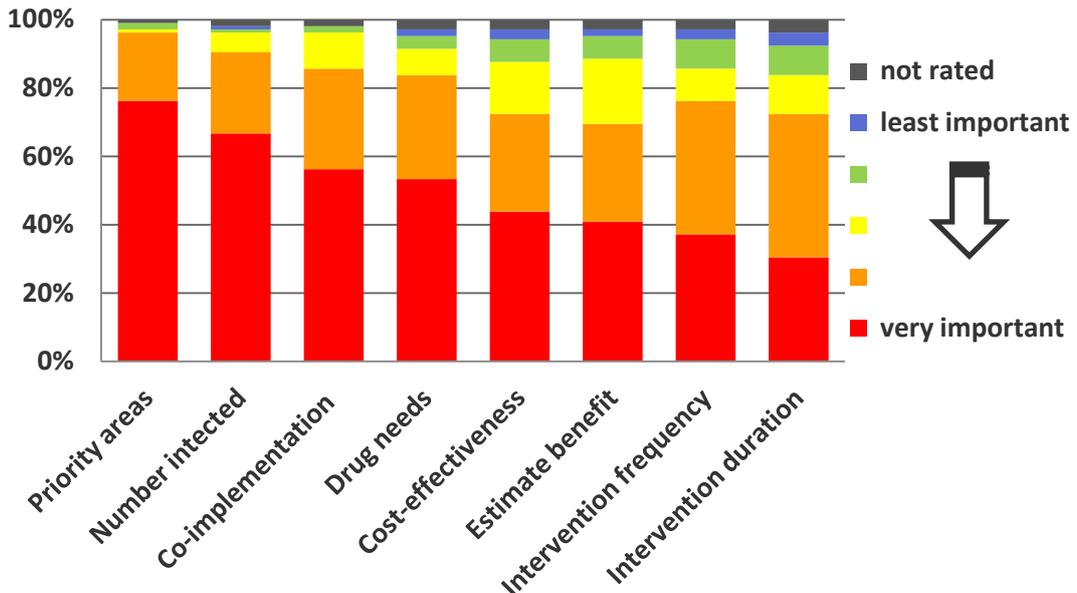
B
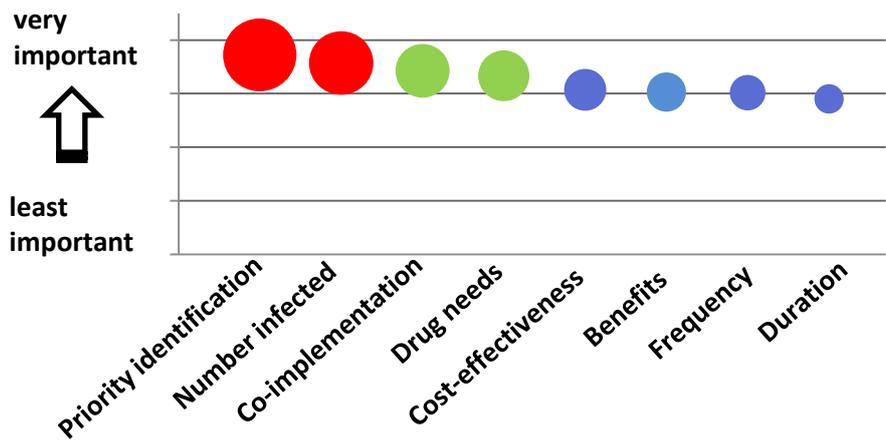
Additional comments of participants

Participants were also invited to provide additional comments on the functionality and applications of a mapping tool. These comments indicated positive responses to developing a NTD mapping tool and an urgent need of the tool:

> *"Accurate mapping data is critically important to how we strategically implement our program. However, in addition to getting accurate data up front, it is critical to have means to collect current data and be able to update the database and maps in a timely fashion."*

An important issue raised was the potential problem of internet availability or computing capacity that should be taken into account during the development of the tool. Another participant commented on the usefulness of compatibility of the tool with ArcGIS or other standard statistical software to enable easy import and export of the data.

Finally, several participants expressed the wish to receive training in disease mapping and/or to participate in collaborations.

Discussion

The state-of-the-art review undertaken by Avia-GIS identified a number of mandatory functions for a NTD mapping tool, including the possibility to visualize raster and vector data, create a legend, zoom/pan, and get feature information by clicking on the map. Important additional function included the option to add map elements (scale, grid, and locator map), query map attribute data, turn on/off individual layers, display the map full screen, and print/save the map. All of these functions were rated as high or medium priority by users in the current survey. An additional function highly rated by users was the ability to draw graphs and tables, and this function should be investigated further.

Drawing of additional features on the map was on average rated low and taking into account the high computational requirements, this function can for the moment be considered as lower priority for the development of the mapping tool. To enhance functionality, the mapping tool should be compatible with ArcGIS or common statistical software. A web-based format of the mapping was

rated higher than a stand-alone application, but concern was raised that internet availability and therefore a non-web based version would be useful.

Regarding uses of a mapping tool, the identification of MDA priority areas and the estimation of people infected were the highest priority for end-users. These functions are currently available at country level, for example in the Preventive Chemotherapy and Control Databank[2]; however, information at a sub-national level is not currently available. The ability to identify areas co-endemic for multiple NTDs was also rated highly. By contrast, estimation of benefits, cost-effectiveness, duration and frequency of interventions were considered of lower priority. These estimations are likely to require a higher computational effort, and can therefore be considered as lower priority for a first version of the tool.

Acknowledgements

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[2] http://www.who.int/neglected_diseases/preventive_chemotherapy/databank/

Appendix 1. Detailed results from questionnaire survey

Table A1. Detailed survey results

Answer options	very important (1)	important (2)	neutral (3)	less important (4)	least important (5)	average rating	number of ratings
Mapping tool functions							
1) Map navigation: Ability to move to different areas of a map							
	69	26	8	2	0	1.46	105
2) Zooming: Ability to zoom in and out of specific areas							
	66	27	8	2	1	1.51	104
3) Spatial overlay: Ability to overlay different layers of information							
	81	17	2	3	0	1.29	103
4) Drawing new objects: Adding points, lines and polygons on-screen							
	41	28	22	9	1	2.02	101
5) Downloading generated maps: Ability to download on-screen maps as image files							
	68	26	4	3	0	1.43	101
6) Emailing generated maps: Ability to email on-screen maps							
	58	25	14	5	3	1.76	105
7) Combining different sources of data: Integrating disease, population and other data							
	75	26	2	0	1	1.33	104
8) Input own data: Option to include your own data onto the maps							
	67	24	8	2	3	1.56	104
9)View source data: Able to view the data underlying the maps							
	54	32	15	2	0	1.66	103
10) Web-based application: Can be used when connected to the internet, so as to enable regular updates							
	54	34	12	3	2	1.71	105
11) Stand-alone application: Is a stand-alone programme installed on own computer							
	42	24	16	10	8	2.18	100
12) Generate graphs and tables: Convert mapped data into tables and graphs							
	77	17	6	4	1	1.43	105
Mapping tool uses							
13) Identifying priority areas for MDA							
	80	21	1	2	0	1.28	104
14) Estimate the numbers infected with different NTDs							
	70	25	6	1	1	1.43	103
15) Estimate drug needs							
	56	32	8	4	2	1.67	102
16) Identify areas for co-implementation of control, using available data							
	59	31	11	2	0	1.57	103
17) Predict the likely benefit of intervention							
	43	30	20	7	2	1.97	102
18) Estimate the cost-effectiveness of intervention							
	46	30	16	7	3	1.93	102
19) Estimate required frequency of intervention (Explore the consequences of different scenarios)							
	39	41	10	9	3	1.98	102
20) Estimate required duration of intervention (Explore the consequences of different scenarios)							
	32	44	12	9	4	2.10	101