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PCT Databank: A Tool for Planning, Implementation and Monitoring of Integrated Preventive Chemotherapy for Control of Neglected Tropical Diseases (NTD)

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Abstract

The integration of vertical control programmes of neglected tropical diseases (NTDs) aims at containing operational cost, simplifies the application of the control measures and extends the intervention coverage. The Preventive Chemotherapy and Transmission Control (PCT) Databank was established by the World Health Organization to facilitate the sharing of data among the different partners involved in control activities and collects and compiles historical and current information on disease-specific epidemiological situation, the geographical overlapping of NTDs and the progress of control activities in all the NTD-endemic countries. The summary of country-specific epidemiological maps and the progress of control activities is available online as the online PCT Databank and Country Profiles. The annual progress of preventive chemotherapy (PC) interventions targeting at specific NTDs is also annually reported in the Weekly Epidemiological Record (WER). In this paper, we elucidated the methodology of data collection, compilation and mapping to establish the PCT Databank and presented the key features of the associated three online outputs, i.e. the online PCT Databank, the Country Profile and the WER.

Introduction

The neglected tropical diseases (NTDs) are a group of tropical diseases that afflicts more than 1 billion people throughout the world, mostly those living in poor settings where proper sanitation and access to adequate health services are lacking. The large majority of the NTD burden results from helminth infection, including lymphatic filariasis (LF), schistosomiasis, soil-transmitted helminthiasis (STH) and onchocerciasis.¹ In addition, trachoma is the leading cause of infectious blindness in the world.² Yet, low-cost, safe and effective drugs are available to alleviate that burden and provide better quality of life for people in poor settings. The World Health Organization (WHO) therefore recommends preventive chemotherapy (PC) as the health intervention against helminthiasis and trachoma, aiming at reduction of morbidity through regular administration of anthelmintics and drugs to at-risk population.³

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The greatest challenge is to extend regular anthelmintic drug coverage to reach all individuals at risk of helminth and trachoma infection. Since helminth and trachoma infection shares several common features as described below, the emphasis has been on the integration of vertical NTD control programmes with the coordinated use of the available drugs rather than drug treatment based on diagnosis.³ First of all, helminth infection and trachoma are present over more or less the same geographical areas. Highest prevalence is typically found in areas of rural poverty, and affected populations are frequently polyparasitized.⁴ Secondly, despite the scale of the population at risk of NTDs throughout the world, the resources available for control and elimination of NTDs are limited and thus need to be used efficiently.⁵ Thirdly, many of the anthelmintics allow simultaneous treatment of several diseases. Benefits of integration are not limited to cost containment. The coordinated use of drugs might reduce the chance of the emergence of drug-resistance.⁶ Linking vertical NTD programmes potentially allow a fast-moving programme to trigger acceleration of a slow-moving programmes. Bringing greater outcome with the same input will give an exceptional appeal not only to donors but also to those who suffer from NTDs.

The collection and compilation of historical and current information on disease-specific epidemiological situation and the progress of control activities in the NTD-endemic countries is essential for the integration of different NTD control programmes. The former will demonstrate the spatial distribution of targeted diseases and highlight areas where NTDs overlap and therefore PC delivery might be combined. The latter will help policy makers, programme managers and donors to identify the gaps in terms of the progress of PC activities and financial resources, and also to evaluate the current activities. To this end, the WHO has developed the Preventive Chemotherapy and Transmission control (PCT) databank where all the available information on endemicity and progress of PC interventions in each country is deposited. Based on the data in the PCT Databank, three types of on-line outputs are presently available:

- the PCT Databank,⁷
- the Country Profiles⁸ and
- the Weekly Epidemiological Record (WER).⁸

The PCT Databank is a web-based database, which presents historical data reported to the WHO on progress of PC implementation. The Country Profiles provide the most recent epidemiological and implementation data available in the PCT Databank in each NTD-endemic country, including the disease-specific endemicity maps and the PC strategy maps, for operational purpose. The WER is the WHO periodical that has been published for the rapid and accurate dissemination of epidemiological information. The annual progress of PC interventions of specific NTDs are reported annually.

The present paper elucidates the methodology of data collection and compilation to establish the PCT Databank, and present the key features and the direction for operational use of the online PCT Databank, the Country Profiles and the WER.

Methods

Data collection

1) Epidemiological data—In order to demonstrate the spatial distribution of each disease throughout the country, the most recent epidemiological data is compiled by the NTD control programme managers in each country. Table 1 lists the disease-specific epidemiological indicators that are collected in order to map the spatial distribution of each disease and determine the recommended PC strategy by implementation unit (IU). An IU is the designated level of the administrative unit in a country in which the decision has been made to implement any of the different types of PC.⁹ Usually this corresponds to second-level administrative unit (or district) but can be much larger for diseases not focally transmitted, like STH.

Data sources include the followings in the order of priority: (1) the data presented in official publications of the national government, such as Ministry of Health reports, in-country reports, health facility records/statistics, or the national action plan for helminthiasis control and trachoma elimination; (2) the data published recently in scientific literature, academic thesis or non-governmental organizations (NGO) reports; and (3) the historical data published in scientific literature, academic thesis or NGO reports where the scale of improvement of environmental condition and progress of the disease control activities are assumed to be limited since the time of the survey. Especially in the third case, the quality of the data is evaluated basing the judgment on the quality of the report that should include the area of data collection, the methods used and the samples investigated. Only the data from reports that are considered of high quality are included in the databank.

When none of the above-mentioned data is available, the IU is classified as "no-data". In order to progressively improve the quality of the epidemiological data, and to fill the information of the "no data" areas, the historical data on epidemiology from the literature, are complemented with all the survey results that are conducted every year in each country.

2) Population requiring PC—The population requiring PC is calculated for each disease taking into consideration the areas where the disease is transmitted and the age groups recommended for treatment. This information is derived from the most recent census to which the annual growth rate of the specific country is applied.

3) Implementation data—In order to identify the organizations/institutes that are carrying out mass drug administration (MDA), the types of the drugs distributed and their scale and location of the MDA activities, the Joint Reporting Form (JRF) was developed. 10JRF is designed to compile the existing disease-specific reporting forms into a single excel file, in order to provide national health authorities and data managers with a standardized tool to address the reporting challenges, facilitate integration and thereby further contribute to improving overall programme management. The programme managers in each country summarizes all the necessary information in the JRF from health facility records/statistics.

4) Data flow—The new epidemiological data and the JRF are transmitted through the data managers in the WHO Regional Office to the data manager in the WHO Headquarter (Figure 1). All the received data are validated at each step in terms of correctness of formula that were used for estimation of various indicators and sources of the data. The data is entered at the WHO Headquarter in the PCT Databank using the Microsoft Access.

Data analysis

Disease-specific *epidemiological data* is used to calculate the indicators listed in Table 1 for each IU. If more than one source of data is available in an IU the average of the different surveys is used. For each country, disease-specific maps are produced based on the level of endemicity in each IU, using the geographic information system software (ArcGIS). Subsequently, all the disease-specific data are combined, and in reference to the PC algorithm for coordinated implementation of PC interventions, the recommended intervention strategy (i.e. combination of drugs and frequencies of PC) is determined for each IU.

The *implementation data* of each country is summarized to present the national-scale coverage of a series of disease-specific indicators as listed in Table 2. Geographical coverage is a proportion (%) of IUs covered by PC in a country. National coverage is a proportion (%) of the population requiring PC for each disease in the country that have been treated.

Data validation

Prior to publication by WHO/PCT, all the results of the data analysis are sent back to the Ministry of Health through the WHO Regional Offices and WHO Country Offices for approval. This step is not only to double-check the correctness of the data but also is to assure the ownership of the dataset by each national government.

Results

PCT Databank

The online PCT Databank is a web-based interactive databank presenting the historical disease-specific progress of PC implementation by country as reported to the WHO. The data can be searched for by region, country, reporting year or disease-specific indicators as in Table 2. Currently there are three modules covering LF, schistosomiasis and STH, and the development of a new module for trachoma is ongoing. Onchocerciasis data is provided separately by the African Programme for Onchocerciasis Control (APOC)¹¹ and the Onchocerciasis Elimination Program for the Americas (OEPA).¹²

Country Profile

The Country Profile is a 6-page annual report that provides the summary of the most recent data available on PCT Databank regarding epidemiological information on targeted diseases, in relation to progress of PC implementation in each country. In order to facilitate comparison among countries, the Country Profiles are produced in a standardized format which includes:

- 1) basic country data, listing demographic details such as total population, population of preschool children, school-aged children and women of child-bearing age (female aged 15 to 49 years) (extracted from the United Nations (UN) Population Statistics), estimated population requiring PC for each PC disease (extracted from various sources), development status (from UN classification), income status (from World Bank classification), and school enrolment data (from UNESCO Institute of Statistics data) and summary of situation analysis (i.e. endemicity status, disease distribution, mapping status and implementation status) for each PC disease;
- 2) epidemiological maps showing IU-level disease endemicity of LF and onchocerciasis, and prevalence of schistosomiasis, STH and trachoma;
- 3) PC action maps showing the recommended PC strategy by IU, based on the PC algorithm;
- 4) Summary of PC implementation (population targeted and treated, geographical and national coverage);
- 5) Charts showing historical progress of the population treated and the national coverage by disease;
- 6) Monitored decline of disease endemicity (in sentinel sites and periodic surveys).

Weekly Epidemiological Record

The Weekly Epidemiological Record (WER) is an electronic periodical published by the WHO in order to disseminate the accurate and up-to-date epidemiological information on cases and outbreaks of diseases of public health importance. The annual progress summary of PC interventions of LF, STH and schistosomiasis are reported annually.

Discussion

Commitment has been increasingly made by various donors and partners to support the control and elimination of NTDs.¹³ Nonetheless, the reality is that the currently available resource is still far less, given the substantial number of people infected by NTDs and the poor economic situation of the people who typically suffer from NTDs.⁵ Cost-effectiveness and efficiency of control activities are essential to reach with PC interventions, as many people at risk of suffering from NTDs as possible. One of the presently most appealing approaches is the "integration" of the vertical NTD control programmes.¹⁴ The "integration" among disease-specific programmes can occur in varying components of the control programmes, from distribution of drugs, management of the control programmes, collection of monitoring data, organization of training activities, health education and social mobilization. Whatever components of the programme be integrated, comprehending the entity of overlapping of different diseases at district level and the progress of ongoing control activities in each country is essential to plan the programme activities in the coordinated manner. The establishment of the PCT Databank and the three outputs, i.e. the online PCT Databank, the Country Profiles and the WER, were developed in order to fulfill this practical need.

We are confident that the PCT Databank will help policy makers and donors understand the global scale of morbidity due to NTDs and the degree of regional differences in distribution of diseases and progress of control activities. In addition, this will guide them to identify the priorities in resource mobilization and to set the regional as well as global strategy for scale-up of the NTD control and elimination programmes. The online PCT Databank allows demonstration of the country-level progress of the disease-specific programmes to donor communities to be used in advocacy for continued funding¹⁵, and to national programme managers for evaluation of the programme ongoing. An example of the use of the PCT Databank for policy makers is combining the data of country-level LF and STH endemicity. This will enable identification of the countries where distribution of albendazole through the GPELF can simultaneously be effective on deworming of STH and thus additional deworming is unnecessary and where MDA of albendazole is needed outside the GPELF for STH deworming (in preparation).

The "integration" is not limited to across-disease, but can also occur between the NTD control activity and other health interventions such as immunization campaigns¹⁶, distribution of mosquito nets¹⁷ and school health programmes.^{18,19,20} When combined with the coverage data of different health intervention programmes, the PCT Databank might allow comparison of current coverage of deworming and other health interventions by country, indicating the best "integration" opportunities for rapid and efficient scale-up of the PC interventions. For example, the Expanded Program on Immunization (EPI) has achieved at least 75% national coverage in over 90% of the 130 STH-endemic countries in the world as of 2010.²¹ This implies a high potential to increase the national coverage of deworming for pre-SAC and WCBA if the integration of EPI and STH deworming activities is realized. In this sense, the PCT Databank might provide a platform, where the data owned by each national government is presented, to promote inter-sectoral and inter-agency collaboration towards improvement of health status and quality of life of those who potentially suffer from NTDs.

In the national scale, the epidemiological maps and the PC strategy maps in the Country Profiles allow the national programme managers to determine how disease-specific control activities can be integrated at district or province level and how limited resources can be best utilized to produce the maximum outcome. These will serve as a background information in developing the national action plan for integrated NTD control and in conducting the financial planning of the integrated programme. In this way, resource gaps will be identified and resource mobilization will be facilitated.

The process of developing the PCT Databank presented a number of limitations and challenges to be overcome. First of all, the PCT Databank deposits the data that is cleared and shared by the national government of the NTD-endemic countries since we strongly believe the importance of the ownership of the epidemiological and implementation data as well as the NTD control programme itself by the national government. However, there are often cases where implementing agencies do not report their deworming activities to the national government. For instance, a research group in a university might carry out an epidemiological survey, which involves stool examination of a group of people and distribution of deworming tablets. Under such circumstances, unnecessary treatment of the

people, who have been already dewormed by albendazole though the GPELF, with another round of albendazole distribution for STH deworming could easily occur due to the lack of coordination. In order to avert such avoidable waste of resources, we continue to help strengthening the role of the national government to own, committed to and coordinate the integrated NTD control programme, and similarly encourage all the relevant partners to understand the importance and the need of reporting to the national government.

The PCT Databank attempts to facilitate the data flow from villages or communities where diseases are present and drugs are distributed up till the PCT Databank. These data are then made available through the WEB in a very simple form to any local, national or international communities interested in the NTD control/elimination programmes. Though the transition from conventional decentralized and fragmented disease-specific reporting methods might takes time, this centralization of the reporting pathways is believed to be beneficial for sustainability of the NTD control programmes in the long run. The PCT Databank and the data reporting system are still in the course of development, and we welcome any feedback as well as questions in order to continue improvement and build the PC databank that are most comprehensive and operationally useful for all the stakeholders who are involved with control and elimination of NTDs.

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Figure 1.
Schematic diagram of preventive chemotherapy data flow to the PCT Databank

Table 1

Disease-specific epidemiological indicators and mapping protocols

	Indicators	Persons tested	Diagnostic technique	Sampling size	Classification of endemicity	Ref.
LF	LF antigenaemia or MF prevalence	Older SAC or adult population	ICT test or blood films	LQAS surveys with a sample of 250 school children or a sample of 50–100 persons > 15 years in two highly endemic villages	Endemic: LF antigenaemia or MF level ≥ 1%; Non-endemic: LF antigenaemia or MF level < 1%	12,13,35
Onchocerciasis	Prevalence of people with palpable nodules or microfilarial prevalence	>20 years, men	Palpitation of nodules or parasitological examination of skin snip	30–50 men aged 20 years (include women where men do not meet the required number) per community where presence of onchocerciasis is suspected from historical data or medical records	Hyper/meso endemicity: ≥ 20%; Hypo endemicity: <20%	36
STH	Prevalence of STH eggs in stool	SAC	Kato-Katz or sedimentation test	5–10 schools in each ecologically homogeneous zone; 50 children in each school from any of the three upper classes	High risk: ≥ 50%; Moderate risk: 20% and <50%	7
Schistosomiasis	Prevalence of microhaematuria or prevalence of parasite eggs in urine for urinary schistosomiasis; prevalence of parasite eggs in stool for intestinal schistosomiasis	SAS	Dipsticks for microhaematuria or urine filtration for urinary schistosomiasis; kato-katz or sedimentation test for intestinal schistosomiasis	50 children from the upper classes in schools close to the water (lakes, ponds, streams, etc) where presence of schistosomiasis is suspected from historical data or medical records	High risk: ≥ 50% by parasitological methods or ≥ 30% by questionnaire for visible haematuria; Moderate risk: 10% and < 50% by parasitological methods or <30% by questionnaire for visible haematuria; Low risk: <10% by parasitological methods	7
Trachoma ^a	Prevalence of TF in children aged 1–9 years by eyelid examination	1–9 years olds	Clinical examination of eyelids	Sample size = $e \times \frac{d^2 \times b \times (1 - b)}{c^2}$ Where <i>a</i> is the number of 1-9 year old children in the district; <i>b</i> is the expected prevalence of TF in 1–9 year old children; <i>c</i> is the desired precision of the estimate; <i>d</i> is the required alpha risk expressed as the <i>z</i> score for the alpha risk (1.96 for 5% risk); and <i>e</i> is the expected design effect	TF prevalence ≥ 10% at district level; TF prevalence >5% at community level	37

LF: lymphatic filariasis; ICT: immunochromatographic test; LQAS: Lot Quality Assurance Surveys; MF: microfilaria; SAC: school-aged children; STH: soil-transmitted helminthiasis; TF: trachomatous inflammation, follicular.

^aInformation on trachomatous trichiasis is stored in the Preventive Chemotherapy and Transmission Control (PCT) Databank but currently not featured in the PCT relevant outputs.

Table 2

Disease-specific indicators presented in the online PCT Databank (as of 31 March 2011)

	Lymphatic filariasis	Schistosomiasis	Soil-transmitted helminthiasis	Trachoma
Indicator	Region, country	Region, country	Region, country	Region, country
	Reported year	Reported year	Reported year	Reported year
	Population requiring preventive chemotherapy	Population infected	Population requiring preventive chemotherapy ^a	Population living in trachoma endemic areas
	No. of IUs covered	Population requiring preventive chemotherapy	No. of people targeted ^a	No. of people targeted
	No. of people targeted (total pop. of implementation units)	No. of people targeted	Reported no. of people treated ^a	Reported no. of people treated
	Reported no. of people treated	Reported no. of people treated	Programme coverage ^a	Programme coverage
	Geographical coverage	Programme coverage	National coverage ^a	
	Programme coverage	National coverage	Drug used	
	National coverage			
	Mapping status			
	Type of MDA (IVM +ALB;DEC+ALB)			

ALB: albendazole; DEC: diethylcarbamazine citrate; IU: implementation unit; IVM: ivermectin; MDA: mass drug administration.

^a Available by age group (i.e. school-aged children and preschool-aged children).