Neglected Tropical Diseases: the challenges of elimination in a changing world

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Liverpool School of Tropical Medicine
Apparently there are only three diseases on that planet!
The “chronic pandemic” that just won’t go away - Lancet 2015

1. Dracunculiasis
2. Lymphatic Filariasis
3. Onchocerciasis
4. Schistosomiasis
5. Soil-Transmitted Helminths
6. Taeniasis/Cysticercosis
7. Human echinococcosis
8. Blinding trachoma
9. Fascioliasis
10. Yaws
11. Dengue
12. Rabies
13. Leishmaniasis
14. Human African Trypanosomiasis
15. Leprosy
16. Buruli ulcer
17. Chagas diseases
18. Snake bite/Podoconiosis
19. Mycetoma
20. Scabies
A proxy for poverty and disadvantage

Affect populations with low visibility and little political voice

Do not travel widely

Cause stigma and discrimination, especially of girls and women

Have an important impact on morbidity and mortality

Are relatively neglected by research

Can be controlled, prevented and possibly eliminated using effective and feasible solutions
Reduced Performance in education
Educational Disruption - Children become carers
Reduced/no ability to access/afford education

Reduced agricultural productivity
Inability to harvest - Loss of cash crops fall back into staples
Reduced nutritional status

Direct cost of medical care
Appropriate/Inappropriate
Medical poverty trap
Permanent poverty as no earned income

Complete dependence on community
Reduced longevity
Burden on carers and loss of carer income

Disablement
Deformity and stigma
Reduced social/Marital prospects

Disablement
Deformity and stigma
Reduced social/Marital prospects

Blindness

Deformity

Stigma
“Only 0.6% of overseas development assistance for health is allocated to neglected tropical diseases, despite such diseases affecting at least 1 billion people.”
<table>
<thead>
<tr>
<th><strong>Control</strong></th>
<th>Reduction of disease incidence, prevalence, morbidity or mortality to a locally acceptable level as a result of deliberate efforts; continued intervention. Effective control may lead to reduction of transmission and burden of disease such that a specific disease may cease to be of public health importance (<strong>elimination as a public health problem</strong>) – is to be quantified if set as a target) or even to zero incidence of that specific disease, leading to <strong>elimination</strong>.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elimination of disease</strong></td>
<td>Reduction to zero of the incidence of a specified disease in a defined geographical area as a result of deliberate efforts; continued intervention measures are required.</td>
</tr>
<tr>
<td><strong>Elimination of infection</strong></td>
<td>Reduction to zero of the incidence of infection caused by a specified agent in a defined geographical area as a result of deliberate efforts; continued measures to prevent the re-establishment of transmission are required.</td>
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<tr>
<td><strong>Eradication</strong></td>
<td>Permanent reduction to zero of the worldwide incidence of <strong>infection</strong> caused by a <strong>specific agent</strong> as a result of deliberate efforts; intervention measures are no longer needed.</td>
</tr>
<tr>
<td><strong>Extinction</strong></td>
<td>The specific infectious agent on longer exists in nature or the laboratory.</td>
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The dichotomy
Neglected tropical diseases: progress towards addressing the chronic pandemic

David H Molyneux, Lorenzo Savioli, Dirk Engels

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SCOPING REVIEW

The cross-cutting contribution of the end of neglected tropical diseases to the sustainable development goals

Mathieu Bangert, David H. Molyneux, Steve W. Lindsay, Christopher Fitzpatrick and Dirk Engels
Research Focus

Disease eradication, elimination and control: the need for accurate and consistent usage

David H. Molyneux\textsuperscript{1}, Donald R. Hopkins\textsuperscript{2} and Nevio Zagaria\textsuperscript{3}

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\textsuperscript{2}The Carter Center, One Copenhill, Atlanta, GA 30307, USA
\textsuperscript{3}Strategy Development and Monitoring for Eradication and Elimination (CPE/CEE), World Health Organization, CH-1211 Geneva 27, Switzerland
Weekly epidemiological record
Relevé épidémiologique hebdomadaire

17 APRIL 2015, 90th YEAR / 17 AVRIL 2015, 90e ANNÉE
No. 16, 2015, 90, 161–168
http://www.who.int/wer

Contents
161 Eradication of yaws in India

Sommaire
161 Éradication du pian en Inde
WHO Global Smallpox Reward Poster 1978

REWARD - RECOMPENSE

$1000

Smallpox Variola OCPA Vinuela Smittkoppar

The World Health Organization offers US $1000 to the first person reporting an active smallpox case resulting from human-to-human transmission and confirmed by laboratory tests. Valid until global eradication is certified.

L'Organisation mondiale de la Santé offre une récompense de US $1000 à la première personne qui signalera un cas d'homme à homme résultant d'une transmission d'un être humain à un autre et confirmé en laboratoire. Valide jusqu'à la confirmation de l'éradication mondiale.
International Task Force for Disease Eradication-1993

- Dracunculiasis
- Polio
- Cysticercosis
- Rubella
- Lymphatic Filariasis
- Mumps

Declared as eradicable
Box 1. Criteria for targeting a disease for eradication

Criteria developed by the International Task Force for Disease Eradication and modified by the Dahlem conference [5,12].

**Biological and technical feasibility**
- Natural history of biological agent
- Non-human reservoir
- Effective intervention tool
- Effective delivery strategy
- Simple and practical diagnostic
- Sensitive surveillance
- Field-proven strategies

**Costs and benefits**
- Cases averted per year
- Coincident benefits
- Intangible benefits
- Estimated annual direct global savings
- Estimated total external financing

**Societal and political consideration**
- Political commitment (endemic and/or industrialized countries)
- Social support (endemic and/or industrialized countries)
- Disease burden in politically unstable areas
- Core partnerships and advocates
- Technical consensus
- Donor base (number of donors of US$ 1 million or more)
Basic steps for consideration of elimination campaigns

• Is there a public health problem?
• Is there a coherent strategy which can be implemented?
• Is the science robust?
• Is there a viable constituency/alliance of partners to assist countries?
• Is there a commitment from countries to implement?
When is an NTD recognized as a Public health problem

• Public health problem of scale based on prevalence, incidence, morbidity and mortality

• Burden of Disease measured in Disability Adjusted Life Years (DALYs) measures of morbidity, disability and mortality

• Role of advocacy in highlighting problem - Jimmy Carter, Yakubu Gowon, Bill Gates
What are first steps in establishing a programme

- Define the extent of the public health problem
- Assess the scientific feasibility of intervention
- Need for World Health Organization resolutions to encourage Member States to engage
- Create a constituency of partners (NGDOs) advocates and donors
- Are the interventions available—donations, epidemiological data (mapping)
Sanofi Aventis
Support for drugs for sleeping sickness, leishmaniasis treatment

Pfizer
Azithromycin for trachoma 120 million doses

Sanofi Aventis
Support for drugs for sleeping sickness, leishmaniasis treatment

Merck & Co Inc
“Mectizan for as long as needed” for onchocerciasis and filariasis in Africa

Merck Serono
Donation of 250 m tablets annually of praziquantel (100 m treatments)

Novartis
Continuing commitment to MDT for leprosy; triclabendazole for fascioliasis

GlaxoSmithKline
Albendazole for lymphatic filariasis at least to 2020 and for deworming

Johnson & Johnson
Mebendazole for intestinal worms

Eisai
Provision of DEC for filariasis

Gilead
Ambisome for visceral leishmaniasis
Global Alliance for the Elimination of Lymphatic Filariasis
Guinea Worm, Dracunculiasis—the painful reality
“the disease of the empty granary”
Guinea Worm Eradication—the essential components

Surveillance—regular reporting from health facilities

Clean water provision and borehole maintenance

Filtering potentially contaminated water

Temephos to kill copepods in water bodies

Health Education/Community and Media

Case containment Stop any case contaminating water source

Monetary Reward in place/intense surveillance

Rumour registers/follow up within 24 hours
Significant declines in annual number of new dracunculiasis cases and villages reporting cases worldwide, 1989-2016

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Sensitization and Reward for Guinea Worm
“Peculiar epidemiology” in Chad
Yobe shuts schools after deadly attack

• Attackers will go to hell – Jonathan
• 40 ‘insurgents’ killed in Borno

The school closure is to give time for improved safety measures.

From Hamisa Kubir Matazu (Sokoto), Isaako Wali & Yusari A. Hassan (Lagos)

Secondary schools in Yobe State have been shut until a new academic session begins in September following the school attack that left dozens of student dead in Potiskum local government area on Saturday.

Governor Daima Gudanu, who ordered the closure yesterday said it was to give authorities time to figure out how to better protect the lives of students and teachers.

In the pre-dawn attack on Government Secondary School, Maradi, gunmen set fire to buildings and then opened fire, killing students, leaving more than 20 students and a teacher dead.

Gudanu yesterday condemned “the wanton terrorist and bloodshed murderer”, saying it was heinous, criminal, “cruel and devoid of any shred of humanity.”

The closure of all secondary schools effective today “is to allow the state government in collaboration with the Joint Security Task Force (JTF) and community leaders to evaluate and evolve better and additional strategies that would ensure the safety and security of students and their teachers,” a statement by the government’s spokesman.

PHOTO: Hamisa Kubir Matazu
Risk and overview
The final challenges: the uphill battle of the last mile

- Access to endemic villages and surveillance in Mali due to insecurity; remoteness of endemic areas of Ethiopia
- The dilemma of the dogs and potential wild reservoirs (wild cat and baboons) in Chad and Ethiopia
- Risk to formerly certified countries- CAR, Niger, Nigeria, Cameroon
- Maintain surveillance, reward system, response to rumours in post certification countries; link to polio
- Introduce Global Reward as in smallpox
- Certify DR Congo and Angola
- Maintain advocacy- President Carter
Lymphatic Filariasis-2000-2015
Public Health achievements

• Over 6.2 BILLION Treatments
• 556 million treatments in 2015
• 96.71 million LF cases (hydrocele, lymphedema) have been prevented or cured
• Global prevalence of LF fallen by 59%, from 3.55% to 1.47%
  • 314 million no longer require treatment
  • $100 billion in economic losses averted
““Achieving elimination as a public health problem is not an end in itself” said Dr Jonathan King, scientist and focal point for lymphatic filariasis elimination at WHO’s Department of Control of Neglected Tropical Diseases. “Continued surveillance is crucial as is the integration of morbidity management and disability prevention activities into public health systems as part of continued care to alleviate the suffering of people affected by this disease”.

China, Korea, Tonga, Cambodia, Cook Islands, Niue, Marshall Islands, Vanuatu, Sri Lanka, Maldives, Togo, Malawi

“Eliminated as a public health problem”
Onchocerciasis Programme Objectives

The Onchocerciasis Control Programme in West Africa (OCP)

“the control of onchocerciasis as a problem of public health importance and as an impediment to socio-economic development”

African Programme for Onchocerciasis Control (APOC)

“the control of onchocerciasis to a point where it is no longer a disease of public health importance through establishment of sustainable delivery mechanisms”

Changed in 2009 to “Elimination of onchocerciasis in Africa”

OEPA

“regional elimination of onchocerciasis

Colombia, Ecuador and Mexico verified free of transmission
Achievements of OCP and APOC

OCP
• Infections and eye lesions prevented in 40m people in 11 countries
• 600,000 cases of blindness prevented
• Economic rate of return 20%

APOC
• 100 plus million people under regular drug treatment annually
• 1 million DALYs per year averted in 19 countries
• 146,000 communities engaged
• 899,000 community distributors trained
• >500,000 cases of blindness prevented
• Economic rate of return 17%
• US$7 per DALY averted
Feasibility of Onchocerciasis Elimination with Ivermectin Treatment in Endemic Foci in Africa: First Evidence from Studies in Mali and Senegal

Lamine Diawara¹, Mamadou O. Traoré², Alioune Badji¹, Yiriba Bissan³, Konimba Doumbia², Soula F. Goita², Lassana Konaté⁴, Kalifa Mounkoro², Moussa D. Sarr¹, Amadou F. Seck¹, Laurent Toé³, Seyni Touré¹, Jan H. F. Remme⁵*

¹ Ministère de la Santé et de la Prévention Médicale, Dakar, Senegal, 2 Direction Nationale de la Santé, Bamako, Mali, 3 Multi-disease Surveillance Centre, Ouagadougou, Burkina Faso, 4 Université Cheikh Anta Diop, Dakar, Senegal, 5 Consultant, Omex, France
River Blindness in the Americas

- Colombia, Ecuador, Mexico and Guatemala verified free of transmission but….
• Consistent use of terminology
• Eradication is zero incidence globally of infectious agent NOT DISEASE
• Eradication and elimination is long term commitment
• Elimination is a regional/geographic context rather than global
• Expect surprises-biological, socio-geographic, political, resource constraints, conflict
• Islands and isolated foci are easy
• WHO leadership, Partnerships, Alliances and Advocacy essential
• Operational/implementation research essential but don’t expect “magic bullets”
The new bottom billion

• The "bottom billion" were people living in the poorest countries (fragile and failed states)
• The "new bottom billion" are the poorest people living in middle-income countries
What can learning from NTDs bring to the post 2015 agenda

- See NTDs through lens of poverty, equity and gender, human rights, universal access to essential medicines-markers of poverty index
- Innovation-progress dependent on non-technical innovation-
- Time scale to new product development is decades-low expectations for any magic bullet
- Importance of advocacy and linking to other diseases-malaria, HIV, polio
- Economic case-best buy, numbers treated, essential drugs, universal health coverage
- Expected the unexpected-always surprises