Pediatric Infectious Disease Society of the Philippines
23rd Annual Convention
“Pediatric Infectious Disease Scenarios...Providing Practical Solutions”

WINNING THE WAR AGAINST WORMS

Vicente Belizario, Jr., MD, MTM&H
Department of Health and University of the Philippines Manila
Neglected Tropical Diseases (NTDs): Infectious Diseases of Poverty

- Group of 17 diseases which prevail in tropical areas
- Mostly ancient diseases
- Affect more than one billion people, primarily poor populations
- Cost developing economies billions of dollars every year (WHO, 2015)

- NTDs included in the Sustainable Development Goals (SDGs)
NTDs and Poverty

- NTDs closely linked to poverty and contribute to further poverty (Gazinelli et al., 2012)
- Costs entailed by NTDs may permanently worsen family’s economic status (Aangaard-Hansen & Chaignant, 2010)

<table>
<thead>
<tr>
<th>HIGH COSTS OF DENGUE FEVER, LEISHMANIASIS</th>
<th>NTDs &amp; HIGH INCIDENCE OF INCOME POVERTY</th>
<th>POVERTY &amp; POOR LIVING CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clusters of households in underprivileged areas having high rates of dengue fever and leishmaniasis; High health costs affecting families in Thailand and Bangladesh (Alvar et al., 2006; Anderson et al., 2007)</td>
<td>Presence of more NTDs in Philippine provinces over the last 5 years associated with higher incidence of income poverty (Philippine Human Development Network, 2014)</td>
<td>Poor families living in degraded and high-risk environments lacking housing, water and sanitation, result in close contact with pathogens (United Nations, 2010; Gazinelli et al., 2012)</td>
</tr>
</tbody>
</table>
ASEAN Countries and NTD Endemicity

13 NTDs endemic in ASEAN Region

HELMINTHS
- Cysticercosis/taeniasis
- Echinococcosis
- Foodborne trematodiases
- Lymphatic filariasis
- Schistosomiasis
- Soil-transmitted helminthiases

PROTOZOA
- Leismaniasis

BACTERIA
- Buruli ulcer
- Leprosy
- Trachoma
- Yaws

VIRUS
- Dengue
- Rabies

( WHO, 2013; Hotez et al., 2015)
ASEAN Countries and NTD Burden

<table>
<thead>
<tr>
<th>ASEAN Country</th>
<th>Number of NTD cases in the Southeast Asian Region (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei</td>
<td>Soil-transmitted helminthiases (STH), 2010: 126.7 (Pullan et al., 2014)</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Dengue fever, 2010: 68.2 (Bhatt et al., 2013)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Liver fluke infection, 2005: 9.3 (Furst et al., 2012)</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>Intestinal fluke infection, 2005: 3.4 (Furst et al., 2012)</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Schistosomiasis, 2012: 1.0 (WHO, 2014)</td>
</tr>
<tr>
<td>Myanmar</td>
<td>Leprosy, 2012: 0.02 (WHO, 2012)</td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td></td>
</tr>
<tr>
<td>Vietnam</td>
<td></td>
</tr>
</tbody>
</table>
Soil-transmitted Helminthiasis (STH)
Ascaris, Trichuris, and hookworm infections

Transmission
- Ingestion of eggs from contaminated soil
- Skin penetration by larvae from the soil
- Poor environmental sanitation and poor personal hygiene-major factors for exposure (Continuing open defecation)

Populations at-risk
- Preschool-age children (PSAC)
- School-age children (SAC)
- Women of childbearing age (WCBA)
- Other high risk occupations

(WHO, 2012; CDC, 2013)
Morbidity caused by STH

- Malnutrition
  - Stunting - 30% prevalence among Filipinos 0 to 10 years old
  - Anemia - 39.4% among Filipinos 6 months to 1 year old (FNRI, 2013)
- Poor cognitive development and school performance
- Heavy intensity STH infections (~10M *Ascaris* eggs/day) result in greater morbidity and complications including intestinal obstruction, and dysentery syndromes (Bethony, 2006)

Intestinal obstruction and perforation
Burden of STH in the Philippines

We are not meeting global targets!

Sentinel Surveillance Data
(Cumulative prevalence of STH)
Preschool-age children (PSAC) 43.7%
  Heavy intensity 22.4%
School-age children (SAC) 44.7%
  Heavy intensity 19.7%
Adolescent females (AF) 30.4%
  Heavy intensity 7.9%
Pregnant women (PW) 31.5%
  Heavy intensity 10.2%

WHO Targets
CP <20%
Heavy <1%

STH in Neg Occ
PSAC - 67.1%, H 45.2%
SAC - 60.9%, H 35.0%

STH in Leyte
AF - 61.8%, H 22.6%
PW - 75.8%, H 39.6%

(Belizario et al., 2013; Belizario et al., 2015)
Burden of STH in the Philippines
We are not meeting global targets!

PSAC in Masbate, 2015
- In 4 municipalities where Community-Led Total Sanitation (CLTS) is implemented
  - STH in 72.3%
  - H 100% in 3 barangays
- In 6 out of 7 barangays declared as Open Defecation Free (ODF)
  - STH in >50%
  - H 40.8%

**WHO Targets**
- CP <20%
- Heavy <1%

Map of Masbate province showing the selected municipalities: Aroroy (red), Cawayan (yellow), Milagros (blue) and Monreal (green).
Strategies for Control of STH: WASH+D

**Water**
Improving access to safe water for handwashing and hygiene

(WHO, 2012)

**Sanitation**
Improving quality of and access to sanitation facilities, and achieving Zero Open Defecation (ZOD) through Community-led Total Sanitation (CLTS)

(DOH NSSP, 2010)

**Hygiene**
Reduces transmission and reinfection by encouraging healthy behavior

(WHO, 2015)

**Deworming**
Periodic treatment with anthelminthics (mass drug administration/MDA) without previous individual diagnosis to all at-risk people living in endemic areas for morbidity control

(WHO, 2012)
Interventions to overcome NTDs

1. Preventive chemotherapy
2. Intensified case detection and case management
3. Vector and intermediate host control
4. Veterinary public health at the human-animal interface
5. Provision of safe water, sanitation, and hygiene (WASH)
6. Strengthening capacity to control NTDs

(WHO, 2012)
Preventive Chemotherapy (PC)

- Use of anthelminthics, either alone or in combination for morbidity control
- Mass drug administration (MDA)
  - Deworming in an eligible population even without the benefit of diagnostic examination (WHO, 2006)
- Target coverage:
  - WHO - 75% of PSAC and SAC (WHO, 2012)
  - Integrated Helminth Control Program (IHCP) of Department of Health (DOH): 85% of SAC (DOH, 2006)
- Harmonized schedule of biannual deworming in PSAC and SAC in the Philippines - January and July (DOH, 2015)
Anthelmintics are safe for Children

- Albendazole (400 mg) and Mebendazole (500 mg) highly recommended (WHO, 2015)
- Listed in Philippine National Drug Formulary
- Helminths immobilized through inhibitory effect on tubulin polymerization which results in the loss of cytoplasmic microtubules (DrugBank, 2015)
- Drugs have excellent safety record
- Adverse events minimal and transient (e.g. allergy, mild abdominal pain, diarrhea) (WHO, 2015)
Benefits of PC/MDA (Benefits > Risks)

- **Physical growth**
  - Significant weight gain
  - Increase in height (*Alderman et al.*, 2006)

- **Learning and education**
  - Increase in school participation/attendance (*Miguel and Kremer*, 2004)
  - Improvements in cognitive scores (*Bundy*, 1992; *Grigorenko et al.*, 2007)

- **Long term benefits**
  - Reduction in work days lost to illness
  - Increase in hours worked
  - Improvement in wage earnings (*Human Development Network*, 2013)

- **Other ancillary benefits** - reduced burden of TB and malaria (*WHO*, 2006)
## Generally Low Deworming Coverage in SAC the Philippines

<table>
<thead>
<tr>
<th>Country</th>
<th>MDA coverage (%)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PSAC</td>
<td>SAC</td>
<td>PSAC</td>
<td>SAC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2006</td>
<td>2014</td>
<td>2006</td>
<td>2014</td>
</tr>
<tr>
<td>Cambodia</td>
<td>100.00</td>
<td>104.95</td>
<td>79.16</td>
<td>90.16</td>
<td></td>
</tr>
<tr>
<td>Lao PDR</td>
<td>55.74</td>
<td>57.19</td>
<td>61.61</td>
<td>33.09</td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td>82.76</td>
<td>90.15</td>
<td>31.54</td>
<td>16.48</td>
<td></td>
</tr>
</tbody>
</table>

( WHO PCT Databank, 2015)

- **WHO Target - 75%**
- **DOH Target - 85%**
Reasons for Refusal to be Dewormed

- Lack of parent’s permit
- Child has been dewormed
- “Wala namang lumabas” (after last deworming)
- “Side effects” (worm passing out through the mouth, abdominal pain, etc.)
- “Bawal sa relihiyon”
- “Kulto…”
- “May Pedia kami…”
- “Sabi ng Pedia…”
- “Umuulan”(???)
- “Bilog ang buwan”(???)
War on Worms (WOW): Operations Research Towards Policy Formulation

- Aims to increase MDA coverage to reduce prevalence and intensity of helminth infections through advocacy, capacity building, social mobilization, multisectoral collaboration, monitoring and evaluation
- Promotes school-based, teacher-assisted approach for MDA
- Provided basis for National School Deworming Day (NSDD) and other policies aimed at improving STH control
WOW Highlights

- Demonstrated the feasibility of school-based teacher-assisted MDA for STH in Binan, Laguna (2000)
- Provided evidence for DOH to cover cost of anthelmintics for all PSAC and SAC in the Philippines
- No further significant reduction in STH prevalence after two years of biannual MDA in Western Visayas due to continuing challenges in WASH (2009) – *Reinfection, reinfection!*
- Six months after treatment, *Ascaris*, *Trichuris*, and hookworm infections could reach 68%, 67%, and 55% of its pretreatment levels, respectively, due to reinfection (Jia *et al.*, 2012)
WOW Highlights

- Expansion of MDA to include secondary students in Guimaras (2013)
- Models for helminth control
  - Municipality – Binan, Laguna
  - City - Cebu City
  - Province – Aklan, Antique, Capiz, Davao del Norte
  - Regional - Western Visayas
- Partnership and collaboration with DOH, DepEd, LGUs, CSOs, communities, sponsors (CSR)
WOW Outcomes

- DOH Integrated Helminth Control Program (DOH, 2006)
- Revised treatment and preventive chemotherapy guidelines of the DOH (DOH, 2006)
- Inclusion of deworming in children 6-14 years old as a requirement for a family’s inclusion in the Pantawid Pamilyang Pilipino Program/Conditional Cash Transfer (DSWD, 2008)
- DepEd Essential Health Care Program (DepEd, 2009)
WOW Outcomes

- Western Visayas Regional Implementation Coordination Team and Regional Development Council resolutions endorsing War on Worms - RDC-VI Resolution No. VI-3 Series of 2012
- Validation of the Modified WHO Praziquantel Dose Pole for mass treatment of Filipino SAC for schistosomiasis (Erfe et al., 2013)
WOW Outcomes

  - Gross underreporting and misdiagnosis of NTDs
  - Lack of comprehensive strategy for specific NTDs such as schistosomiasis
  - School-based mass deworming as “the most cost-effective way to increase school participation” and “one of the most cost-effective ways to improve health”
- Contributed data on STH and schistosomiasis in the Global Atlas of Helminth Infections (GAHI, 2015)
Simultaneous MDA in all public elementary schools nationwide

Experiences from War on Worms provided basis for the NSDD Guidelines - DOH Administrative Order no. 2015-0030 and DepEd Memorandum No. 80 series 2015

Harmonization of schedule of MDA for STH, schistosomiasis, and lymphatic filariasis - DOH Memorandum No. 2015-0399

Achieved 83% MDA coverage with almost 12 million children dewormed nationwide on 27 January 2016
NSDD in Zamboanga (July 2015)

- Adverse events (AEs) concentrated in Zamboanga Region; eighty six children admitted to hospitals (Rappler, 2015)
- Students experienced “stomach ache and vomiting” (CNN, 2015)
- False rumors circulated through text resulted to mass hysteria (PIA, 2016)
- Challenges with health education and promotion
- Impact of AEs minimized through proper communication with community leaders and parents (WHO, 2011)
  - Presence of strict and rigorous protocol on AEs, as done in Kenya, may minimize impact of AEs (Heishman, 2015)
Continuing Challenges

- Helminth control in other populations at-risk (*i.e.* PSAC and WCBA)
- More sensitive laboratory techniques
- Interface with Water, Sanitation and Hygiene (WASH) sector
- Health promotion and education, risk communication (*e.g.* Zamboanga Region during NSDD in July 2015)
- *What does it take to eliminate STH?* – the main research question
Diagnostics - Major Challenges

- Kato-Katz technique - recommended by WHO but not routinely performed (WHO, 1991; 1994)
  - Direct fecal smear commonly performed in rural health units and most hospitals
- Poor sensitivity of Kato-Katz
  - STH - 74-95%, but drops to 53-80% in low intensity settings (Nikolay et al., 2014)
  - Limitation in demonstrating hookworm ova
  - Schistosoma - 51.1% to 59.6% (Zhou et al., 2013; Lin et al., 2008); 10.9% to 22.3% (Belizario et al., 2013)
- Lack of quality assurance for laboratory diagnosis of parasitic infections (Misdiagnosis is common) (Belizario et al., 2014)
- Molecular and serological techniques not readily available
Opportunities

- Inclusion of NTDs and WASH in SDGs
- NTD control contributing to Universal Health Care (UHC)
- Economic growth and more resources for the DOH and health sector
- Intersectoral and interagency collaboration

*This is the moment!*
Summary

- Are we *Winning the War on Worms*?
- STH remains an important public health problem among Filipino children – NTDs, PC, WASH – *for sharing*
- Outputs of WOW disseminated and utilized as basis for policies aimed at improving STH control and public health; continuing challenges to be addressed using multidisciplinary/intersectoral approach
- SDGs, UHC/KP, and economic development provide opportunities in strengthening the national STH control program and other NTD programs
- Research on what it takes for STH elimination
- Onward to *Finishing the War on Worms*
Acknowledgements

Partnerships and collaboration needed more than ever
Thank you