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REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

Implementing Integrated Vector Management in humanitarian emergencies

One day workshop

Tuesday, July 19, 2016

Hotel Intercontinental

Bangkok, Thailand

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IVM WORKSHOP AGENDA

1. Introduction to VBD & Humanitarian emergencies
2. Overview of common VBD and vectors
3. Overview of vector control tools
4. Integrated Vector Management (IVM) and its application to vector control in complex settings
5. Examples of IVM programs in humanitarian settings
6. Programme design scenarios
7. Discussion and conclusions

HUMANITARIAN EMERGENCIES

A humanitarian emergency is an event or series of events that represents a critical threat to the health, safety, security or wellbeing of a community or other large group of people, usually over a wide area.

- Natural disasters (tsunami, earthquake, flooding, drought, epidemics)
- Man-made emergencies – conflict
- Humanitarian emergencies may have the compound effects of both man-made and natural disasters. This can be mass population movement coupled with several humanitarian needs (food, shelter)

VBD IN HUMANITARIAN EMERGENCIES

Populations most affected by humanitarian crises are often those with the *greatest disease burden* leading to increased death and illness in many emergencies

Example: South Sudan – violent conflict and mass displacement have lead to increases in already high levels of malaria, fly-borne diseases and visceral leishmaniasis.

- Flooding
- Drought
- Earthquakes
- Volcanoes

Haiti Earthquake, 2010


Aceh, Indonesia – tsunami Dec 2004


NE Kenya/Somalia Flooding
1997, 2006, 2008, 2011/12

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TROPICAL DISEASES

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TOP KILLERS IN HUMANITARIAN CRISES

- Diarrhoeal diseases (water & VBD)
- Malaria (VBD)
- Measles
- Pneumonia
- Malnutrition

Other parasitic and viral disease may predominate in certain regions and change over time.

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VULNERABILITIES IN EMERGENCIES

- Increased exposure due to lack of shelter (increased exposure to vectors)
- Reduced access to healthcare services
- Poor sanitation (increasing human/fly contact)

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VULNERABILITY IN EMERGENCIES

- Crowding of infected and susceptible hosts where competent vector is present
- Proximity to flood waters / breeding sites (increasing insect contact)
- Poor nutrition & multiple infections, decreasing capacity of immune system

VULNERABILITIES IN EMERGENCIES

RESULTS IN:

- Increase in VBD morbidity and mortality
- Persistence of VBD for months and years after
- Burden of diseases increase if left uncontrolled. (death is not always the end result e.g. leishmaniasis)

VBD should have attention at the beginning, even if they are not immediately a threat

VBD IN HUMANITARIAN EMERGENCIES

Examples:

- *Natural disasters including Cyclone Nargis in Myanmar and the Haiti earthquake have resulted in increases in both dengue and malaria vectors.*

- *Increasing violence in the Middle East has caused the largest human displacement in decades. A consequence of this tragedy has been the re-emergence of cutaneous leishmaniasis*

VBD OF IMPORTANCE

- Malaria (Africa, Asia, Caribbean)
- Dengue (Asia, Caribbean, Africa)
- Leishmaniasis (Middle East)
- Other VBD will depend on the local setting e.g. Lymphatic Filariasis, Yellow Fever, Sleeping sickness, Viral haemorrhagic Fevers (Lassa, CCHF, RVF), Japanese Encephalitis, Tick-borne Relapsing Fever, Zika, Trachoma

HUMANITARIAN RESPONSE STRUCTURE

Cluster approach

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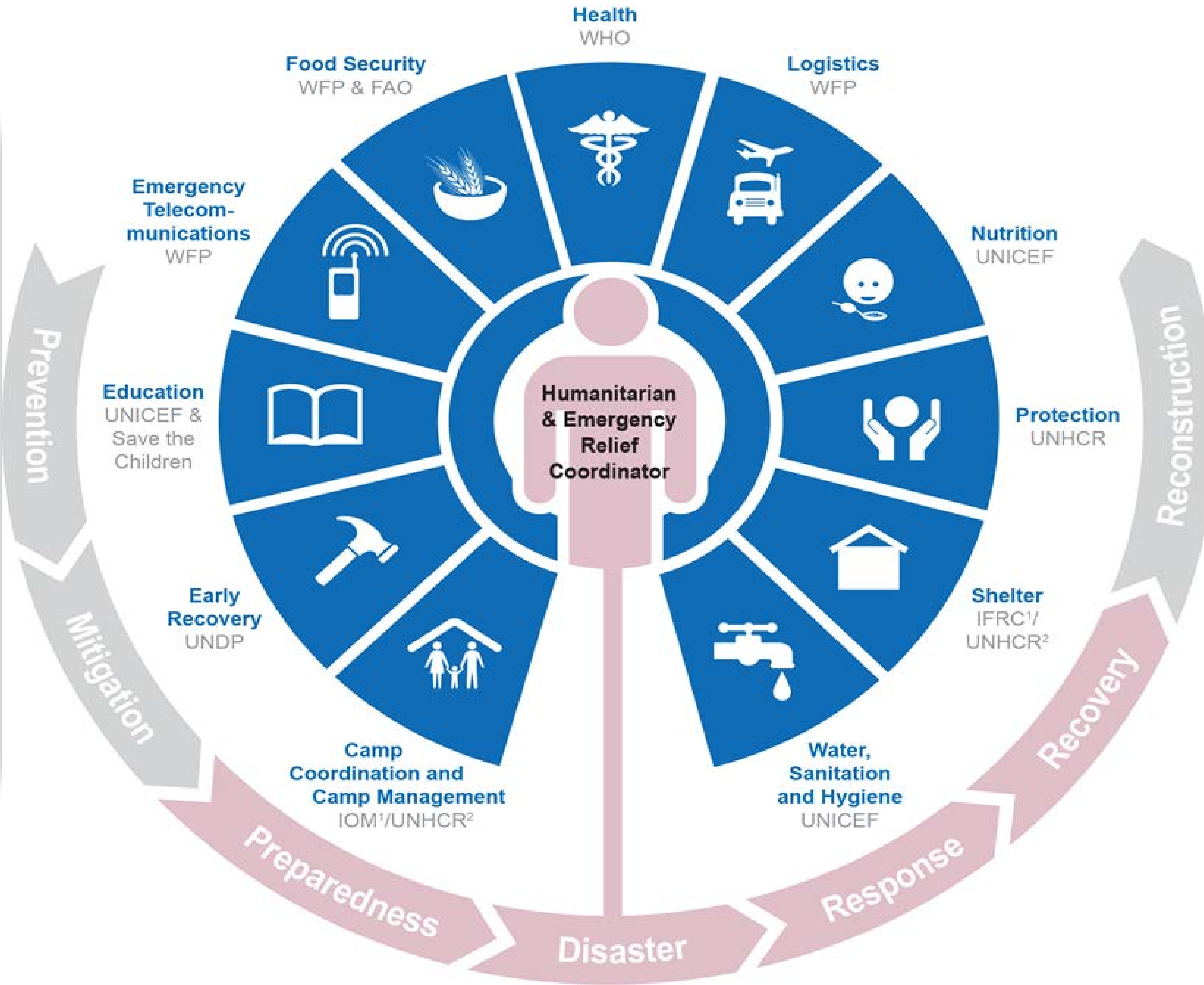

Health
WHO
Logistics
WFP
Nutrition
UNICEF
Protection
UNHCR
Shelter
IFRC[1]/
UNHCR[2]
Water, Sanitation and Hygiene
UNICEF
Camp Coordination and Camp Management
IOM[1]/UNHCR[2]
Early Recovery
UNDP
Education
UNICEF & Save the Children
Emergency Telecom-munications
WFP
Food Security
WFP & FAO
Humanitarian & Emergency Relief Coordinator
Prevention
Mitigation
Preparedness
Disaster
Response
Recovery
Reconstruction

HUMANITARIAN CLUSTER APPROACH

- There are currently eleven clusters led by WHO
- Clusters provide a clear point of contact and leadership for specific activities during humanitarian response

Infectious diseases fall under the health cluster

CLUSTER APPROACH

Vector control does not fall into one cluster

- It crosscuts WASH, shelter and camp management, NFI and the Health Cluster

- Coordination between the different actors is important to ensure vector control tools are appropriately selected and used.

PRINCIPAL VBD CONTROL MEASURES

- **Camp organisation & Shelter**– adequate numbers of shelters and sufficient space between them, adequately ventilated, insect-proofed and sited away from standing water, close enough to water and sanitation facilities
- **Water, sanitation, hygiene (WASH)** – sufficient quantities of safe water and adequate sanitation facilities and hygiene promotion

PRINCIPAL CONTROL MEASURES

- Health education and social mobilisation – develop messages to ensure the effective implementation of the above preventive measures.
- Environmental sanitation and safe waste management and vector control
- Food security, nutrition and food assistance – access to adequate food and management of malnutrition

OVERVIEW VECTOR BORNE DISEASES

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VECTOR BORNE DISEASES

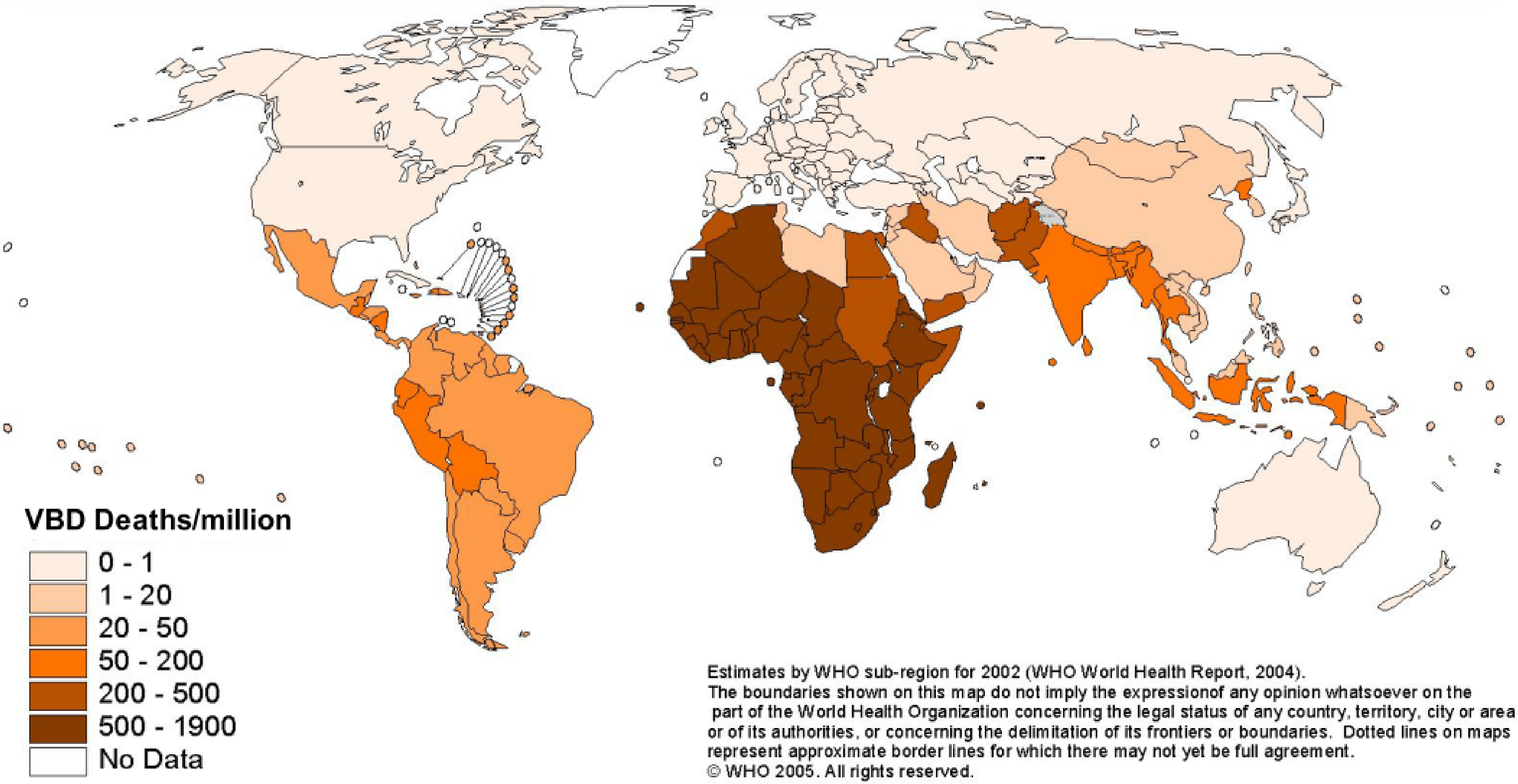
A vector-borne disease is caused by a **pathogenic microorganism transmitted by an arthropod or other agent.** Transmission requires at least **three** different living organisms:

- *Pathogenic agent* (virus, protozoa, bacteria, or helminth)
- *Vector* (arthropods such as ticks or mosquitoes)
- *Host*

VECTOR BORNE DISEASES

- Nearly **half the world's population** is infected with or at risk for VBDs.
- Distribution of VBDs is disproportionate **mainly in developing countries in the tropics.**
- Weather affects vector population dynamics and transmission: **temperature and humidity**
- **Natural disasters, mass population movements** result in changes which **can increase disease transmission**

DISTRIBUTION OF DEATH FROM VBD



Estimates by WHO sub-region for 2002 (WHO World Health Report, 2004).
The boundaries shown on this map do not imply the expressionof any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

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VECTORS

- <u>Mosquitoes</u>
  - *Anopheles* transmit malaria, arboviruses
  - *Culex* transmit filariasis, arboviruses
  - *Aedes* transmit filariasis, dengue, Zika, Chikyngunya, Yellow Fever
- <u>Tsetse Flies</u>
  - Transmit African Sleeping sickness
- <u>Sandflies</u>
  - Transmit Leishmaniasis

Vectors

- Black Flies
  - Transmit onchocerciasis
- Water Snails
  - Carry schistosomiasis

- Flies
  - Transmit trachoma, cholera, myiasis, Loa Loa

- Body Lice
  - Transmit typhus, louse-relapsing fever

Vectors

- Ticks
  - Transmit bacterial (relapsing fever borreliosis)
- Fleas
  - Transmit bacteria (plague, rickettsia)
- Rodents
  - Transmit hantavirus
- Rats
  - Transmit Lassa Fever, Leptospirosis

VECTOR BEHAVIOUR – WHAT TO ASK

- Where do they breed?
- When do they breed?
- Duration of lifecycle
- What do they eat?
- When do they eat?
- Where do they eat?
- Where do they rest?
- How far do they fly?

VECTOR BEHAVIOUR - MOSQUITOES

	Anopheles	Aedes	Culex
Breeding Site	Rainwater / swamps. Brakish water (dpending on species)	Dark background container with clean non-polluted water	Polluted vegtative water
Biting Time	Dusk to Dawn	Day Time biters 1-2 hrs after sunrise 1-2 hrs before sunset	Dusk to Dawn
Biting preference	Anthropophilic and Zoophilic depending on species	anthropophilic	Anthropophilic and zoophilic
Biting location	Bites indoors	Bites primarily outside	Both inside and outside
Resting location	Rests indoors	Rests ioutdoors dark corners,shade, away from indoor light	Rests indoors and outdoors in dark areas
Flight Distance	2 km or more	50-300 m from breeding source	2 km or more
Life Span	10 -30 days	20-30 days	20-30 days

VBD CONTROL IN EMERGENCIES

- **Rapid assessments** – identify diseases threats to affected population as well as those with epidemic potential
- **Prevention activities** – vector control, fly control, WASH activities, mass drug administration
- **Surveillance** – determine incidence of disease, monitor on-going changes in disease transmission.

  - the surveillance system should be robust enough to detect outbreaks of VBD and whether response activities are having an impact

VBD CONTROL IN EMERGENCIES

- **Outbreak control** –sudden or unexpected increases in transmission. Requires adequate preparedness, monitoring and provision of stockpiles for response activities
- **Case management** - diagnostic & treatment services are important aspects of disease control *but for this workshop we are focusing on vector control*

SURVEYS

Used when the local VBD situation is not clear or there is no data available

Clinical surveys can:

- Identify population groups most at risk of specific VBDs
- Estimate the proportion of the population infected with the diseases

ENTOMOLOGICAL SURVEYS

- *Larval surveys* to identify the hotspots for transmission and repeat to monitor impact of interventions
- *Adult vector catches* before intervention, repeating post campaign to determine impact
- *Insecticide susceptibility*
- *Human biting rate & vector infection rate* can also be used

VECTOR BORNE DISEASES & INTEGRATED VECTOR MANAGEMENT

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WHO progress towards an (IVM) approach

- Early 1980s: integrated vector control (IVC)

  - "utilization of all appropriate, safe and compatible means of control to bring about an effective degree of vector suppression in a cost-effective manner" (WHO 1983)

WHO progress towards an (IVM) approach

Early 1990s:

- selective vector control (SVC)

  - "application of targeted, site specific & cost-effective activities to reduce malaria morbidity and mortality" (WHO 1992, 1995)

- comprehensive vector control (CVC)

  - "control of the vectors of two or more co-prevalent diseases through a unified managerial structure using similar or different methods"

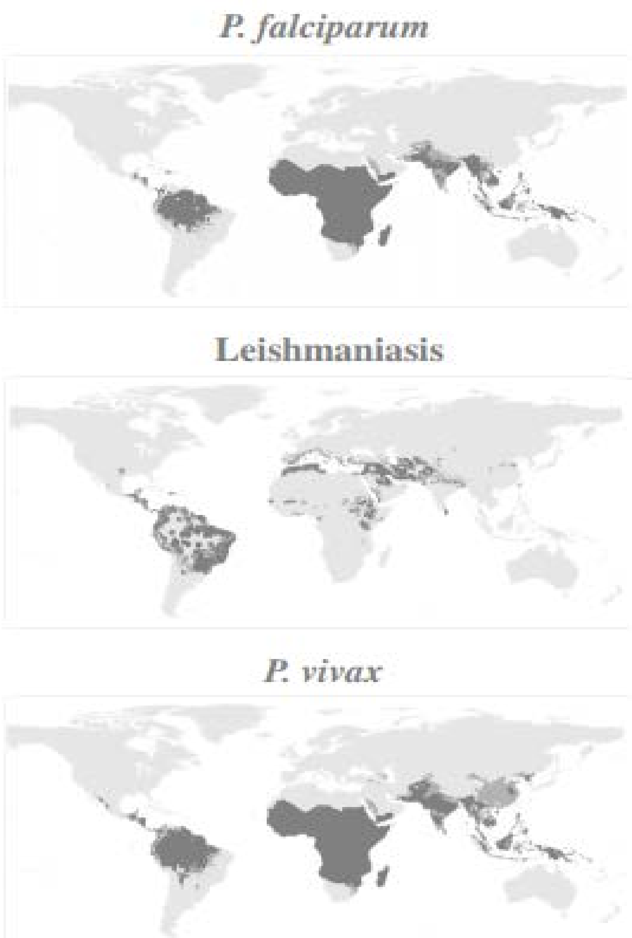
IVM DEFINITION (WHO)

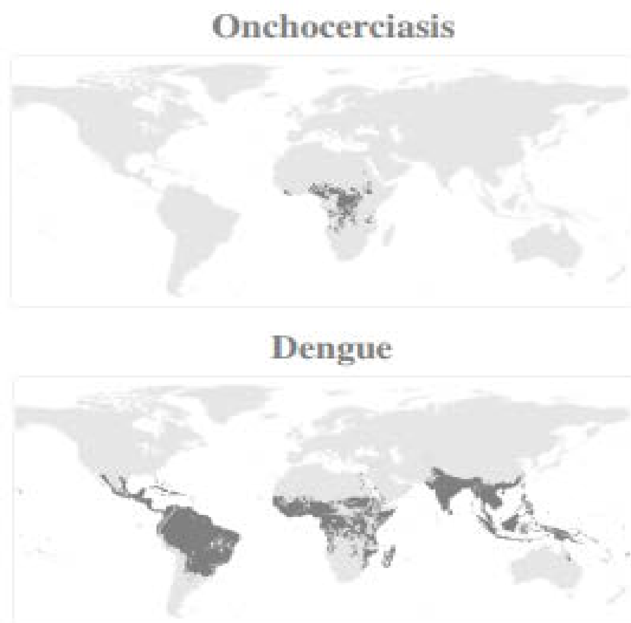
Integrated Vector Management (IVM)

“IVM is a rational decision-making process for the optimal use of resources for vector control.

The approach seeks to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control” (WHO 2007)

Mapping the distributions of vector-borne diseases



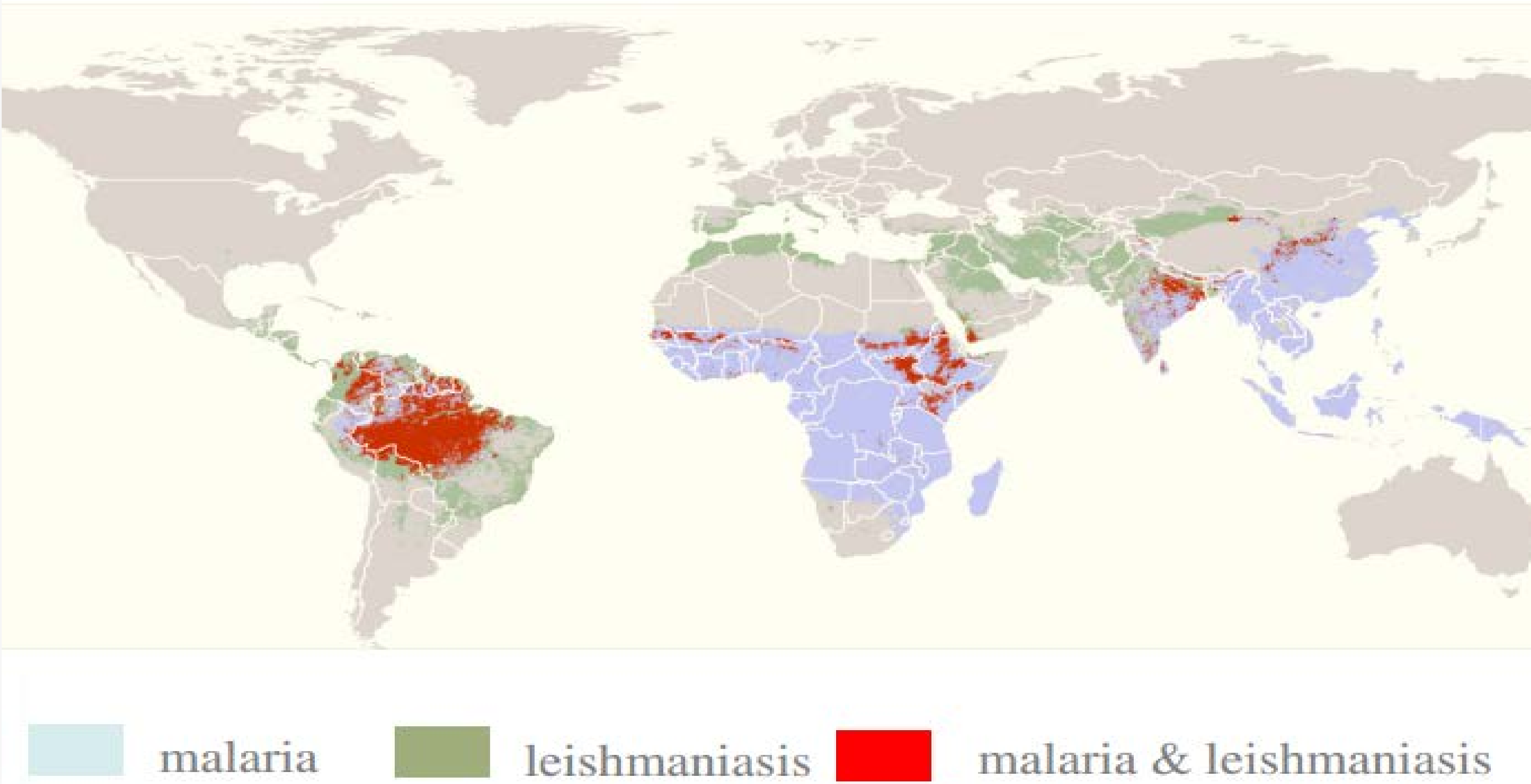


also: **Japanese encephalitis,**

human African trypanosomiasis

& Chagas disease

Areas where malaria and leishmaniasis could be controlled with ITNs



RATIONALE FOR IVM

- Using evidence based strategies will *reduce use of ineffective tools*, improves economic & ecological soundness of interventions, and sustainability
- Collaboration between sectors and programs will allow *cost effective use of resources*
- Integration of *non-chemical and chemical vector control methods*, and integration with other disease control measures. i.e. LLIN + MDAs, chemical larvaciding + domestic waste management.

IMPLEMENTING INTEGRATED VECTOR MANAGEMENT (IVM)

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KEY TO IVM

- *Key to IVM is evidence-based decision making*

  - operational research, entomological & epidemiological surveillance and evaluation. Understanding the vectors present, their habits and the local ecosystem.

- *Entomology prior to operations*

  - includes insecticide resistance monitoring and species differentiation, all of which may impact the choice of methods of vector control.

IVM OPERATIONAL ISSUES

- Effectiveness of insecticide-based vector control is threatened by resistance to the insecticides
  - IRS has three other chemical classes so can be used even when insecticide resistance is becoming a problem, LLINs only have one chemical class
- Under operational conditions, functional survival of tools like LLINs are considerably reduced
  - Using IVM more than one tool for one vector could have added effect on vector reduction.

Operational Framework - IVM

1. *Advocacy, social mobilization*
2. *Collaboration within the health sector & with other sectors*
3. *Integration of non-chemical and chemical vector control*
4. *Evidence-based decision making*
5. *Development of adequate human resources*

IVM - SITUATIONAL ANALYSIS

Focus on the vector(s) that spread the disease:

- *Initial assessment*: Outbreak response/rapid surveys/Baseline surveys
- *Vector analysis*: behaviour-feeding and resting habit)
- *Literature review:* National documents, pubmed
- *What is in place:* Surveillance, vector control tools delivered / planned for, human resources.

IVM IMPLEMENTATION

Deciding which tool(s) to use:

- *Tools in use already and their coverage/effectiveness*
- *Insecticide resistance*
- *Community acceptability*
- *Available funding*
- *Targeted beneficiaries*
- *Seasonality of disease transmission*
- *Which tools can arrive in time?*
- *Shipped easily*
- *Nationally approved*

WHEN TO INTEGRATE

Determine if vector control/prevention efforts will be helpful:

- If cases have been transported into the area then treatment should be sufficient to reduce disease burden
- Better to get high coverage of one vector control tool than sub-optimum levels of two tools
- Integration should not be done for the sake of it. There has to be a justification.

VECTOR CONTROL TOOLS

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VECTOR CONTROL TOOLS

Vectors in emergencies can be controlled through:

- Appropriate site selection and provision of shelter
- Water supply, excreta disposal, solid waste management, drainage
- Community behaviour change
- Family and individual protection, and effective protection of food stores.
- Use of chemical controls

VECTOR CONTROL TOOLS

- LLIN (Long lasting insecticidal nets)
- IRS (Indoor residual spraying)
- Larval source management
  - –Environmental management/ habitat modification
  - –Larvaciding (chemical or biological)
- Fogging/ultra-low volume spraying
- Insecticide treated materials
- Waste management

LONG LASTING INSECTICIDAL NETS AND DISTRIBUTION STRATEGIES

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WHAT IS AN LLIN?

- Nets that have been treated with insecticide (pyrethroid) during production, either coated or incorporated into the fibers.
- Residual insecticide will continue to be effective for min 3 years
- LLINs do not need to be retreated
- LLINs are proven to withstand 20 washes
- Physical Durability of the LLIN is variable depending upon living conditions and fabric of LLIN (polyethylene, polyester, polypropylene)

VECTORS TARGETED BY LLINS

- *Anopheles* – Malaria, Lymphatic filariasis
- *Phlebotamous* (Sandfly) – Leishmaniasis
- *Culex* – Lymphatic Filariasis, Japanese Encephalitis

- *Aedes* – (in certain contexts) Dengue, Zika, CHK

WHY LLINS?

- Easily available tool for malaria prevention
- Perceived to be most easy to use component of IVM
- Can be effective for up to 3 years
- Once distributed can be carried with families

WHOPES RECOMMENDED LLINS

WHO recommended long-lasting insecticidal nets

Product name	*Product type*	*Status of WHO recommendation*	*Status of publication of WHO specification*
DawaPlus 2.0	Deltamethrin coated on polyester	Interim	Published
Duranet	Alpha-cypermethrin incorporated into polyethylene	Full	Published
Interceptor	Alpha-cypermethrin coated on polyester	Full	Published
LifeNet	Deltamethrin incorporated into polypropylene	Interim	Published
MAGNet	Alpha-cypermethrin incorporated into polyethylene	Full	Published
MiraNet	Alpha-cypermethrin incorporated into polyethylene	Interim	Published
Olyset Net	Permethrin incorporated into polyethylene	Full	Published
Olyset Plus	Permethrin and PBO incorporated into polyethylene	Interim	Published
Panda Net 2.0	Deltamethrin incorporated into polyethylene	Interim	Published
PermaNet 2.0	Deltamethrin coated on polyester	Full	Published
PermaNet 3.0	Combination of deltamethrin coated on polyester with strengthened border (side panels), and deltamethrin and PBO incorporated into polyethylene (roof)	Interim	Published
Royal Sentry	Alpha-cypermethrin incorporated into polyethylene	Full	Published
SafeNet	Alpha-cypermethrin coated on polyester	Full	Published
Veeralin	Alpha-cypermethrin and PBO incorporated into polyethylene	Interim	Published
Yahe	Deltamethrin coated on polyester	Interim	Published
Yorkool	Deltamethrin coated on polyester	Full	Published

DISTRIBUTION CAMPAIGNS

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LLIN CAMPAIGN PLANNING

1. Assessment
2. Coordination – Macroplan / Microplans
3. Selection and Training of Workers
4. Transportation / Storage / Security
5. Household remuneration
6. Mobilisation and Awareness (IEC / BCC)
7. Distribution/ waste management
8. Continued BCC
9. Supervision and Monitoring (durability, coverage, usage)

LOGISTICS

TYPES OF DISTRIBUTIONS

1. Non Food Items (NFI) / Airdrops
2. Continuous distribution (EPI/ANC/School/Community
3. Universal Coverage Fixed point vs Mobile vs Door to door
4. Integrated distribution
5. Targeted distribution (populations, age groups)
6. *Subsidised sale (NON EMERGENCY)*
7. *Commercial market (NON EMERGENCY)*

CONDITIONS FOR IMPACT

- Good coverage and continuous distribution
- Appropriate usage
- Care and Repair

LLIN CHALLENGES

- Ownership does not guarantee use
- Intense support for behavior change needed
- Distribution costs / lead time of LLIN / logistics
- Fit to shelter
- Commonly misused / resold
- Not always prioritized for/ by the most vulnerable
- Relies on people sleeping largely indoors at night
- Using LLINs for political influence

Good condition after
2 years

Poor condition after
9 months

INDOOR RESIDUAL SPRAYING (IRS)

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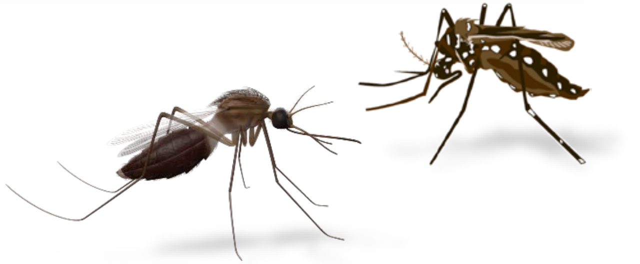
VECTORS TARGETED

- *Anopheles*
- *Phlebotamous* Sand-fly
- Fleas (IRS on floors and rodent holes)
- Flies

IRS IS EFFECTIVE IF

- IRS is done in communities affected by vectors that rest indoors, (e.g. *anopheles gambiae*)
- The insecticide is effective against the vector
- The target population lives in shelters made of materials appropriate for spraying
- The spray equipment meets WHO standards
- Application of insecticide is done properly



IRS IS EFFECTIVE IF

- At least 85% of surfaces are sprayed to assure that the majority of mosquitoes are exposed to the insecticide
- At least 85% of walls (2 metres high) are sprayed with insecticide before the high transmission period (rainy season)

ADVANTAGES OF IRS

- Anything people sleep in (huts, hospitals, plastic shelters, transit halls, latrines) can be sprayed
- Operationally feasible
- Cannot be looted or sold once applied
- Community coverage effect over 85%
- Can be used where there is insecticide resistance to pyrethroids

DISADVANTAGES OF IRS

- Time, Logistics, Material resources/cost
- Access during emergencies can be difficult
- People absent from homes
- Dependent on skilled teams
- Safety for handlers/sprayers
- Impact variable depending on shelter materials
- Fear of chemicals in communities
- Field supervision & monitoring

THESE CAN BE OVERCOME!!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UNS

INSECTICIDE SELECTION

- Only WHOPES recommended insecticides.
- Insecticide and formulations are registered in the country, unless you have specific permission in writing from the host government/authority.
- Resistance to the insecticides.
- Check suitability for the application intended
- Availability
- Cost

WHOPES APPROVED INSECTICIDES - IRS

Insecticide compounds and formulations[1]	Class group[2]	Dosage (g a.i./m^2)	Mode of action	Duration of effective action (months)
DDT WP	OC	1-2	contact	>6
Malathion WP	OP	2	contact	2–3
Fenitrothion WP	OP	2	contact & airborne	3–6
Pirimiphos-methyl WP, EC	OP	1-2	contact & airborne	2–3
Pirimiphos-methyl CS	OP	1	contact & airborne	4–6
Bendiocarb WP, WP-SB	C	0.1–0.4	contact & airborne	2–6
Propoxur WP	C	1–2	contact & airborne	3–6
Alpha-cypermethrin WP, SC	PY	0.02–0.03	contact	4–6
Alpha-cypermethrin WG-SB	PY	0.02–0.03	contact	up to 4
Bifenthrin WP	PY	0.025–0.05	contact	3–6
Cyfluthrin WP	PY	0.02–0.05	contact	3–6
Deltamethrin SC-PE	PY	0.02–0.025	contact	6
Deltamethrin WP, WG, WG-SB	PY	0.02–0.025	contact	3–6
Etofenprox WP	PY	0.1–0.3	contact	3–6
Lambda-cyhalothrin WP, CS	PY	0.02–0.03	contact	3–6

Updated March 2015

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INSECTICIDE TREATED PLASTIC SHEETING (ITPS)

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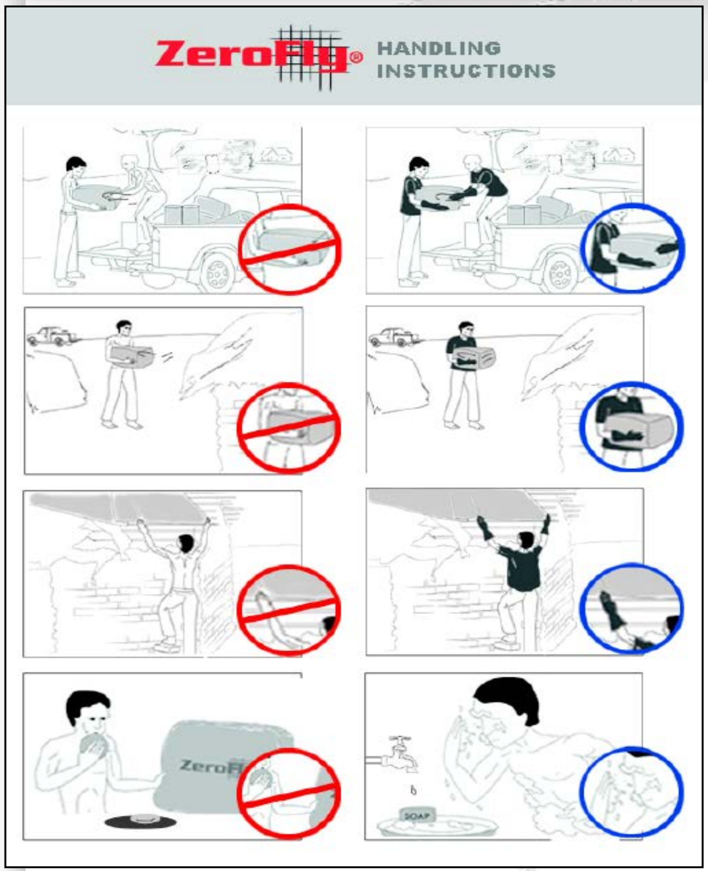
Insecticide Treated Plastic Sheeting (ITPS)

Dual purpose tool to:

- Save delivery time
- Reduce dependency on specialised control teams
- Improve acceptability and compliance and target whole household (like IRS)
- Long lasting
- Cost effective: shelter & vector control

ITPS use in emergencies to date



- 14000 Liberian refugees housed in 2 camps in Sierra Leone (2003-2005/6) (MENTOR/UNHCR)
- 13000 Liberian IDPs housed in 2 camps in Liberia (2003-2005) (IRC & other NGOs)
- Also used by NGOs in Darfur (MSF H) and Haiti (ICRC)
- Tsunami (Indonesia) 120,000 people housed along the Aceh west coast (+ 550,000 under IRS): MENTOR, + 12 NGOs (PCI, IRC, IMC, WV, SCF, etc)
- 100,000 displaced people housed after flooding in Somalia (2011 - MENTOR/ UNICEF)

2006: Earth quake victims protected in Java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ITPS schools and community buildings

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RED
TRO

User acceptability survey

- ITPS proved feasible to use on varied Indonesian shelter/ house designs
- The majority of people built their own shelters after seeing a community model
- 82% said that ITPS had a significant impact on insect of all types
- 94.5% reported no incidence of malaria or dengue whilst living under ITPS
- Minor irritation was noted by 70% (maybe due to not using gloves)
- 73% said they would be happy to live under ITPS again

LARVAL SOURCE MANAGEMENT

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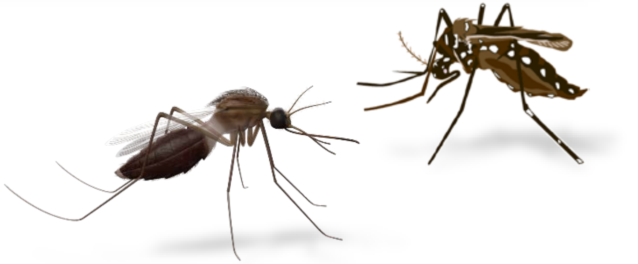
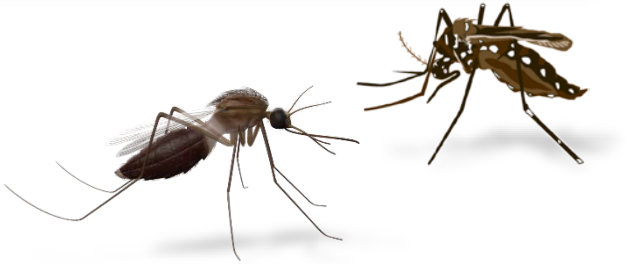


VECTORS TARGETED

Mosquito:

- *Aedes*
- *Culex*
- *Anopheles* (supplementary tool)
- **Black fly** - aerial spraying of rivers and streams using helicopters and airplanes
- **Tsetse fly** - sequential aerosol spraying technique (SAT), ground spraying



LARVICIDING

- **Mosquito larvae** control requires regular application of a larvicide to standing water, where ideally breeding sites are **FEW, FIXED and FINDABLE**

- **Larvicide** such as Temephos, Pyriproxyfen or BTI can be applied to **drinking water sources** either by sand granules or spraying

LARVAL CONTROL

- Larvivorous fish (Gambusia) or Mayfly nymphs, can also be used but only suitable for specific contexts (NOT EMERGENCY)

- In areas where *A. aegypti* breeds in septic tanks or soak-away pits, expanded polystyrene beads can be applied, as long as the sites are not subject to regular flooding

LARVICIDING

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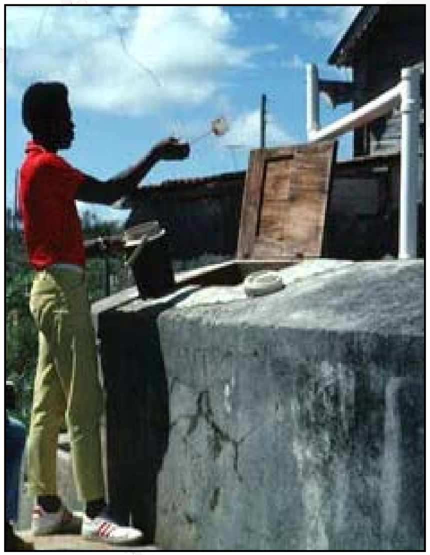
Larvaciding domestic water tanks and storage pots to kill mosquito larvae



REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

LARVICIDING REQUIREMENTS

- Larvicide measurements
- Trained staff
- Spraying equipment / PPE
- Mapping and recording of sites treated
- REQUIRES STRONG COMMUNITY SENSITISATION

WHOPES - Larvicide Compounds & Formulations

Larvicide	Chemical Type	Active Ingredient dosage g/ha	Formulation
B. thurigensis isr. (BTI)	Biopesticide	*	
Diflubenzuron	Insect Growth Regulator (IGR)	25-100	Water-dispersible granules
Methoprene	IGR	20-40	Wettable powder
Pyriproxyfen	IGR	5-10	Granules
Chlorpyrifos	Organophosphate	11-25	Emulsifiable concentrate
Fenthion	Organophosphate	22-112	Emulsifiable concentrate, granules
Pirimphos-methyl	Organophosphate	50-500	Emulsifiable concentrate
Temephos (Abate)	Organophosphate	56-112	Emulsifiable concentrate/ granules

* Open bodies of water 125-750g/ha; 1-5 mg/l for containers

LARVICIDING

Precautions

- Extreme care taken when treating drinking-water to avoid dosages toxic to humans.
- Wear protective gear

LARVICIDING

Treatment cycle

Cycle determined by mosquito species, seasonality of transmission, rainfall patterns, properties of larvicide, and types of breeding site.

- Generally 2-3 treatments/year, carefully spaced between periods of rainfall
- More frequent treatment depending on water quality and exposure to sun.

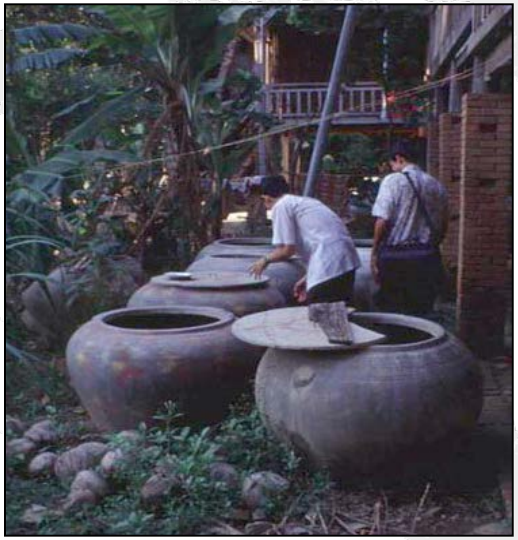
LARVICIDING CHALLENGES

- Larvaciding *large or multiple water bodies is very expensive* and requires many staff for potentially little impact as breeding sites are so numerous
- *Water supplies in emergencies* (particularly acute phases) are rare, highly valued
- *Acceptance issue* with spraying/treating valued water sources

ENVIRONMENTAL CONTROL

- Elimination of mosquito breeding sites
- This is not usually feasible because of human resources needed, the extent of the breeding sites and operational cost
- Some breeding sites may also be the only available water for the population

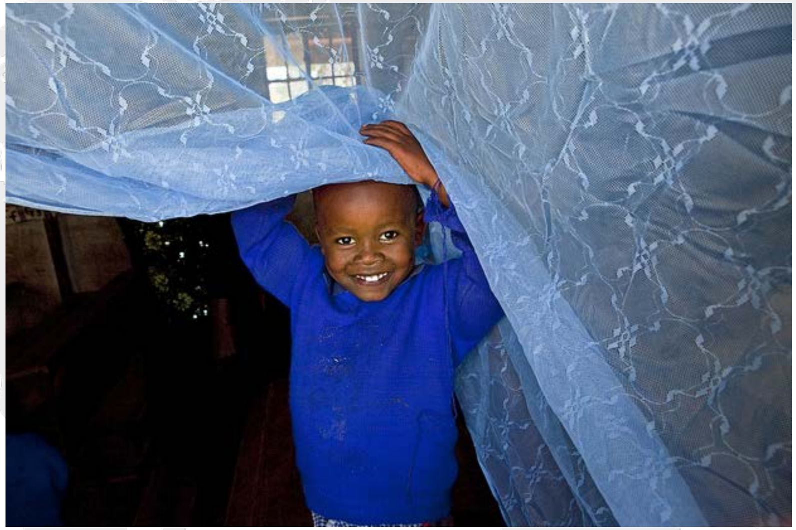
ENVIRONMENTAL CONTROL



Rubbish clearance to remove other vector breeding sites like car tires, old tins etc.

Covering water storage containers

COVERING OF WATER CONTAINERS



Lids, insecticide treated container covers

Supplementary: ITPS or insecticide treated Curtains

ENVIRONMENTAL CONTROL

- Cover all household containers that hold water, if possible with insecticide treated materials
- Clean out smaller water storage containers weekly, and scrub sides
- Remove or destroy debris/waste containers where mosquitoes breed
- Proper waste disposal

FOGGING

REDUCING DEATHS AND SUFFERING FROM
TROPICAL DISEASES

VECTORS TARGETED

- *Aedes* – Dengue, Yellow Fever, Zika, Chikungunya

FOGGING

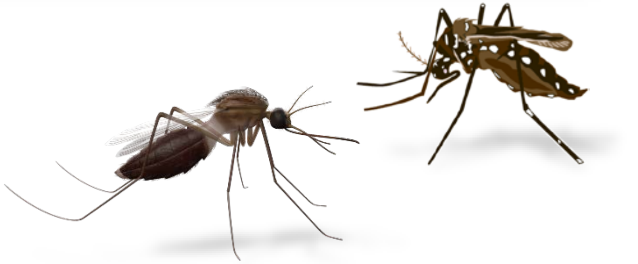
Fogging uses a mix of diesel and an insecticide targeting the adult *aedes vectors*

REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

FOGGING Insecticides & Formulations

Insecticide	Chemical Group	Active Ingredient Dosage g/ha	
		Cold Aerosols	Thermal Fogs
Fenitrithion (II)	Organophosphate	250-300	250-300
Malathion (III)	Organophosphate	112-600	500-600
Cyfluthrin (II)	Pyrethroid	1-2	1-2
α-Cypermethrin (II)	Pyrethroid	1-3	.
Cyphenothrin	Pyrethroid	2-5	5-10
Deltamethrin (II)	Pyrethroid	0.5-1.0	0.5-1.0
D-Phenothrin	Pyrethroid	5-20	.
λ-Cyhalothrin (II)	Pyrethroid	1	1
Permethrin	Pyrethroid	5	10
Pirimiphos-methyl (actelik)	Organophosphate	200-500	200-500
Bendiocarb	Carbamate	200-500	150-400

REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES



FOGGING

- Space sprays applied either as thermal fogs or as ultra-low volume applications in the form of a cold aerosol
- Portable or vehicle-mounted thermal or cold fog generators used for ground application
- Space sprays applied when colder air closer to the ground, (early in the morning or in the evening). With *Aedes* spraying usually outdoors in early morning or late afternoon

FOGGING

Treatment Cycle

- For rapid reduction in vector density space treatment should be carried out every 2–3 days for 10 days.
- Further applications once or twice a week to sustain suppression of the adult vector population

FOGGING

Precautions

- When treatment is carried out with portable equipment, operators should take special safety measures. Protective clothing, face masks, operate the equipment for short periods.
- Fogging in urban areas can be a traffic hazard, and spotted staining of vehicles may result

FOGGING ISSUES

- Expensive as it must be repeated several times at short intervals (3 to 4 times in a week)
- Needs special equipment
- *Aedes* adults re-infest
- Not effective on its own (NEED IVM) larvicide, garbage control

FLY CONTROL

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REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

FLIES IN EMERGENCIES

- Overcrowding, open defecation
- Fecal matter in latrines
- Limited water, sanitation and hygiene
- Numerous breeding sites for flies

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SANITATION

- The first and best method for long-term vector control
- Three areas for control:
  - <u>Preventing access of flies to toilets</u>
  - <u>Destroying other fly breeding sites (managing garbage)</u>
  - <u>Eliminating contact between flies and children, food, and utensils</u>

FLY CONTROL AND LATRINES

Common problems

- Not enough toilets
- Improperly used facilities
- Lack of cover on latrines

Situation of latrines

- At least 6m from living area
- If no latrines are available, establish defecation area 500m away from living area and 30m from water

VIP LATRINES

- Constructed incorporating a tall vertical ventilation pipe topped with a tightly fitting fly screen
- Fecal odours in the VIP latrine exit through ventilation pipe. Flies attracted by odors aggregate around the top of the pipe but screen prevents entrance.
- Flies that manage to enter the pit, ascend the ventilation pipe but are prevented from escaping; desiccate

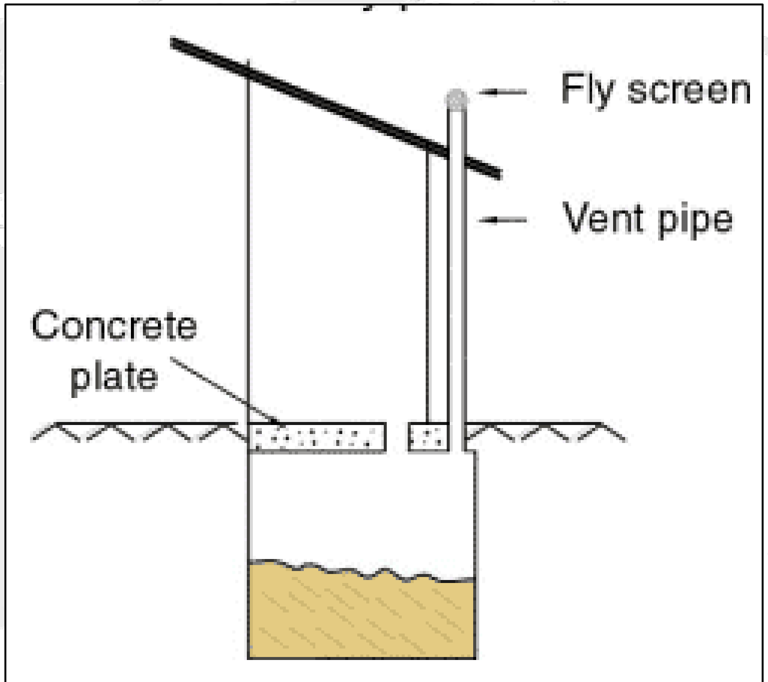

Figure 2.15: Ventilated Pit latrine

VIP LATRINE ADVANTAGES

- Flies and odours are significantly reduced
- Can be built and repaired with locally available materials
- Does not require a constant source of water
- Can be used immediately after construction
- Low (but variable) capital costs depending on materials

VIP LATRINE ISSUES

- There is still a *risk of groundwater contamination*.
- *Sludge requires secondary treatment* & discharge
- Health risks from *flies are not completely removed by ventilation*
- *Pits are susceptible to failure/overflowing* during floods, Stagnant water in pits *may promote insect breeding*
- Manual *emptying of pit poses severe health hazard*

POLYSTYRENE BEADS FOR PIT LATRINES

- Application of expanded polystyrene beads onto water sources and pits
- Polystyrene beads form a floating layer on the water
- A complete layer 1–2 cm thick is sufficient to prevent breeding
- Additional advantage is the suppression of the odour that emerges from the pit.
- The layer of beads reforms after disturbance

POLYSTYRENE BEADS AND PIT LATRINES

- If a pit dries out the beads are buried under faeces, the beads return to the surface when water enters the pit due to their buoyancy .
- The beads will last for several years provided they are not swept away by flooding

MANAGING WASTE

MANAGING WASTE

- *Garbage and organic waste are the perfect breeding grounds* for flies, and must be managed properly for effective control.
- In humanitarian crises, where removal of waste may not be feasible, a recommended method is *disposing of solid waste in a pit* that is positioned away from living areas.

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CONTACT BETWEEN FLIES AND HUMANS

- Installing screens in eating areas and healthcare
- Fly exclusion from food, food preparation, eating areas
    - *Screening / LLI Curtains*
    - *Proper containers for food*
    - *Fly traps*

FLY TRAPS

- Traps will not stop a large-scale infestation, but should be used in targeted areas, *medical and food facilities*
  - **Light traps** (not to be used near food, as they may cause flies to explode, releasing pathogens)
  - Sticky tape

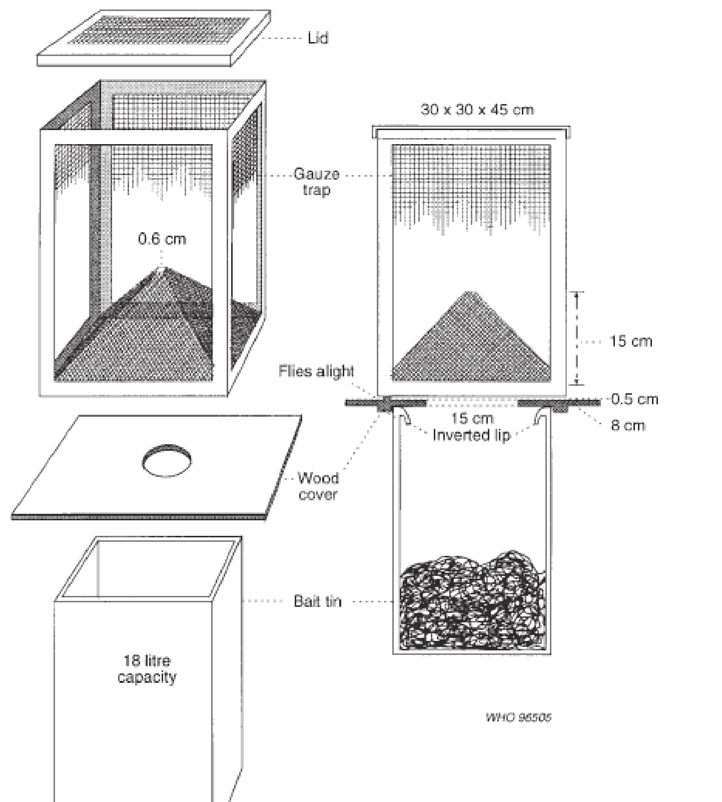
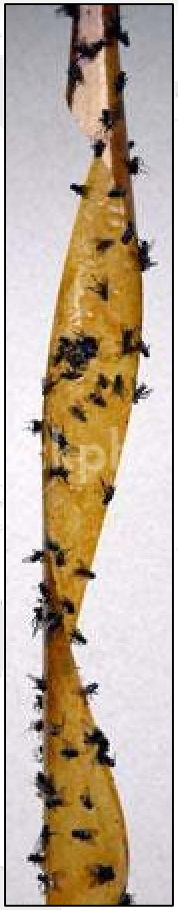


Fig. 6.13
Components of a fly trap (© WHO).

REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

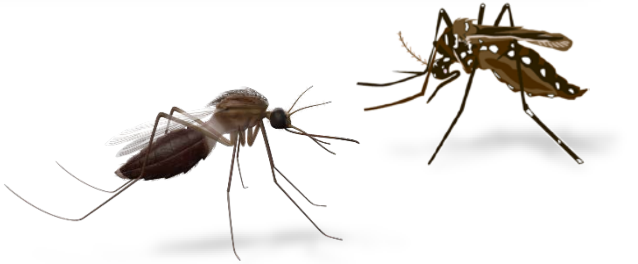
STICKY TRAPS

- Fly Abatement Strips (e.g., Quickstrike®)
- Contain a cardboard strip coated with a sugar mixture containing a pesticide.
- Toxicity to flies occurs rapidly upon ingestion
- Should be protected from moisture and direct sunlight.
- This pile of dead flies seems to be extremely attractive to other flies. Placing strips in a can will increase effectiveness



LIGHT TRAPS

- Light traps fitted with sticky cards available, effective indoors and around food preparation areas to remove flies
- Attract flies to ultraviolet light



CHEMICAL METHODS

Best to be used for short periods, because flies develop insecticide resistance rapidly

- –Zero-Fly tarps (ITPS)
- –Space spraying
- –Treating resting sites with residual chemicals

CHEMICAL METHODS

- Can be used **indoors** (IRS) or **outside**
- **Spraying of VIP latrines**
- Appropriate for immediate, short-term control
  - Reduction in fly population is achieved rapidly and efficiently, but does not last
  - Useful for spraying immediately after dumping of garbage

CHEMICAL METHODS

- A compound that combines high activity on target insects and low activity on mammals is Diflubenzuron (Dimilin®) a Chitin Deposition Inhibitor.
- Diflubenzuron should be applied on the upper layer of the breeding places (faeces) using a knapsack sprayer with hand lance.

REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

INFORMATION, EDUCATION AND COMMUNICATION (IEC)
BEHAVIOUR CHANGE COMMUNICATION (BCC)

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REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

WHY DO WE NEED IT?

REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

DEVELOPING STRATEGIES

An understanding of what people do

- what prevents them from following the desired practices (“barriers”) and
- what facilitates them (“enabling factors”) - is essential before designing a communication intervention

WHAT DO PEOPLE KNOW?

Many misconceptions may exist about health and the causes of disease

Examples: clearing bushes, stepping in urine, nets infested with ghosts, mangoes bring malaria

Give some examples & key messages to tackle them

SUCCESSFUL HEALTH EDUCATION

- DEFINE the objectives for your education
- IDENTIFY the target audience
- DEFINE the desired behaviours you need to achieve in order for your prevention tool/strategy to work
- DEVELOP clear messages
- Coordinate/ Harmonise between partners / agencies

SUCCESSFUL HEALTH EDUCATION

- Use language and methods that are CULTURALLY ACCEPTABLE
- Deliver messages through individuals known and trusted by communities
- Provide training and materials that have been tested and retested

REDUCING DEATHS AND SUFFERING FROM TROPICAL DISEASES

IVM
OPERATIONAL EXPERIENCE

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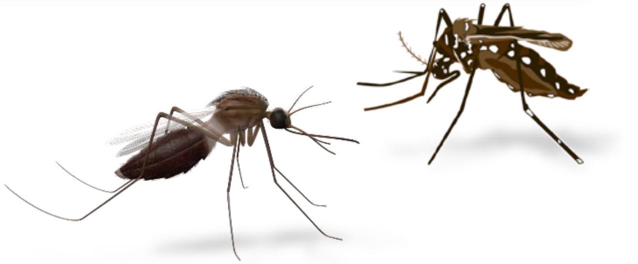
REDUCING DEATHS AND SUFFERING FROM
TROPICAL DISEASES



YOUR EXPERIENCE

- Describe the context
- What vector borne diseases are present?
- What vectors are present?
- What has been done?
- What could be done better, or changed?
- What could be integrated with other agencies/ programmes?