

LONG LASTING INSECTICIDE TREATED NETS (LNs)

and

DISTRIBUTION STRATEGIES



**REDUCING DEATHS AND SUFFERING
FROM TROPICAL DISEASES**



What is an LN?

- Nets that have been treated with insecticide in the factory during production, either coated or incorporated into the fibers.
- Residual insecticide will continue to be effective for a period of 3 to 5 years
- LNs do not need to be retreated
- LNs are proven to withstand 20 washes before the insecticide becomes ineffective
- Physical Durability of the LN is variable depending upon living conditions and type of LN – from a few weeks to years.



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Why Nets?

- Easily available tool in some settings for malaria LF/Liesh prevention
- Perceived to be most easy to use component of IVM
- Can be effective for > 1 year in some settings
- Once distributed can be carried with families if they move



Some documented facts

IF used properly:

- Individual protective effect
- Reduction in malaria vector population
- Reduction in all-cause mortality in infants
- Reduction in health facility visits by sick children
- Reduction in maternal & placental malaria
- Reduction in maternal anemia and LBW
- Community/ Mass effect

<http://www.who.int/malaria/publications/atoz/9789241548656/en>

AMP
BCC Workshop
Bamako September 2010



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Conditions for desired impact

- Higher quality LLINs with dual AI
- Higher density LLINs >100d
- Timeliness
- Access
- Suitable shelter types
- Adherence: appropriate usage
- Well designed and implemented IEC / BCC



Challenges

- Ownership does not guarantee use
- IEC essential
- Intense support for behaviour change needed
- Set up cost/ lead time/ logistics
- Politics
- Fit to shelter
- Commonly misused/ resold
- Not always prioritised for/ by the most vulnerable
- Durability?
- Relies on people sleeping at night, and largely sleeping indoors



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Good condition after 5 years – development context



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Poor condition after 9 months – unstable IDP context



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A Door on the Darfur border



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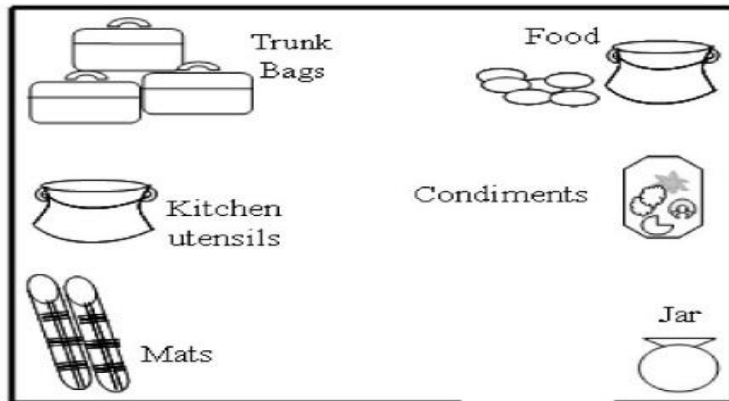
Decreased motivation in the use of insecticide-treated nets in a malaria endemic area in Burkina Faso

- The **motivation for the use of nets decreased after less than a year**
- Inhabitants' **conception of malaria** and the **inconvenience of using bednets** in small houses were the major reasons.
- Acceptance that ITNs were useful in reducing malaria was moderated by the fact that **mosquitoes were considered to be only one of several factors which caused malaria**
- The appropriate and routine use of ITNs was adversely affected by the **functional organization of the houses, which changed as between day and night**
- ITNs were not used when the perceived benefits of reduction in mosquito nuisance and of malaria were considered **not to be worth the inconvenience of daily use**

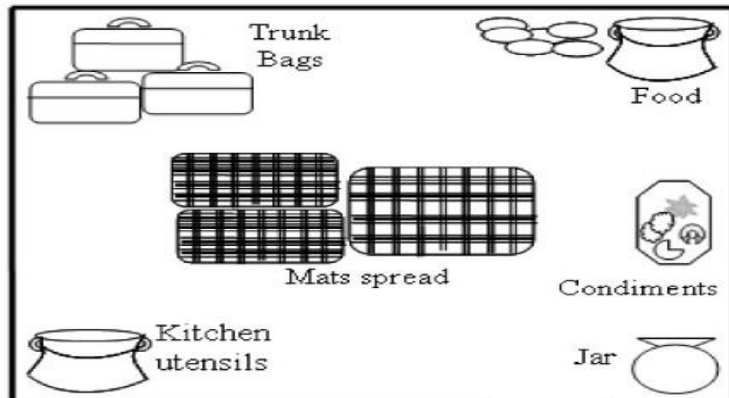
Sleeping Spaces and Net Hanging

House with single room

Space organization during the day

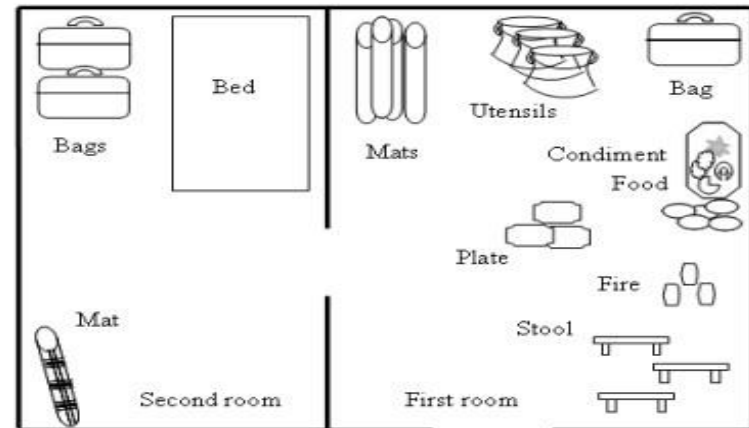


Space organization during the night

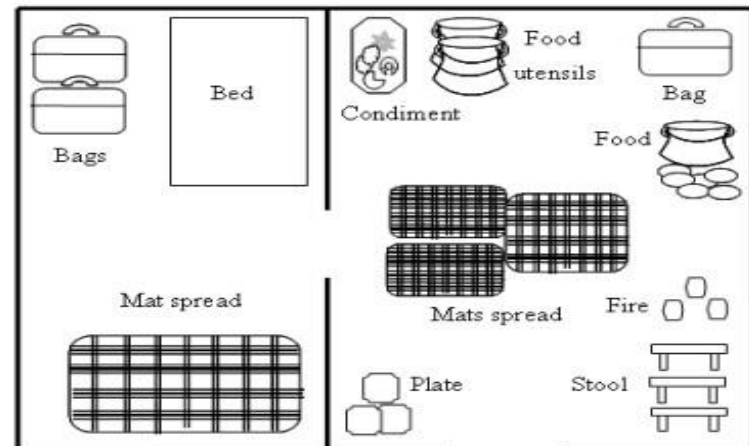


House with two rooms

Space organization during the day



Space organization during the night



LN Distribution

- *It is (relatively) easy to physically distribute LNs. However, for LNs to achieve their potential for malaria prevention, impact is determined by the recipients behaviour:*
- LNs must be kept and not sold (might people need more money for food? Is there a local market for LNs?)
- LNs must be used for sleeping under
- Those most vulnerable to malaria should be the ones prioritised to sleep under the LNs
- They must be hung correctly without gaps, and maintained without holes etc.



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New York Times – A Tragic Choice

Sun protection



MENTOR
Ijara, Kenya
2011



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Screening and curtains

Red Cross, Cross River State Nigeria,
2010



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Red Cross,
DRC, 2010



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Which LN to use?

- Decision is rarely purely operational
- Know your shelter type and stability of the target population - key
- Know if the target families sleep indoors or outside
- Know if children or adults sleep in other structures (kitchens)
- Do you need a demuria or a standard new LLIN
- The characteristics of nets vary widely in terms of material, pesticide and incorporation technology
- Know your population - field test different nets. Which nets are going to be best retained and utilised for their proper use?
- Ensure your net choice has an AI that still kills insects
- What will you use in the months it takes to receive LLINs?




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PQT/VC Ref Number	Product Name	Applicant	Product Type	Active Ingredient/Synergist	Date of Prequalification
006-001	DuraNet LN	Shobikaa Impex Private Limited	ITN	Alpha-cypermethrin	7 Dec, 2017
006-003	DuraNet Plus	Shobikaa Impex Private Limited	ITN	Alpha-cypermethrin, Piperonyl Butoxide (PBO)	13 Aug, 2020
P-00320	GreenNet	Shobikaa Impex Private Limited	ITN	Deltamethrin	16 Aug, 2024
002-001	Interceptor	BASF AGRO B.V. Arnhem (NL) Freienbach Branch	ITN	Alpha-cypermethrin	8 Dec, 2017
002-002	Interceptor G2	BASF AGRO B.V. Arnhem (NL) Freienbach Branch	ITN	Alpha-cypermethrin, Chlorfenapyr	29 Jan, 2018
014-001	MAGNet	V.K.A. Polymers Pvt. Ltd	ITN	Alpha-cypermethrin	19 Feb, 2018
009-001	MiraNet	AtoZ Group Limited	ITN	Alpha-cypermethrin	21 Feb, 2018
001-004	OLYSET Net	Sumitomo Chemical Co., Ltd	ITN	Permethrin	7 Dec, 2017
001-005	OLYSET PLUS	Sumitomo Chemical Co., Ltd	ITN	Permethrin, Piperonyl Butoxide (PBO)	29 Jan, 2018
026-001	Panda Net 2.0	Life Ideas Biotechnology Co. Ltd	ITN	Deltamethrin	3 May, 2018
005-001	PermaNet 2.0	Vestergaard Sari	ITN	Deltamethrin	8 Dec, 2017
005-002	PermaNet 3.0	Vestergaard Sari	ITN	Deltamethrin, Piperonyl Butoxide (PBO)	29 Jan, 2018
P-03228	PermaNet Dual	Vestergaard Sari	ITN	Chlorfenapyr, Deltamethrin	17 Mar, 2023
P-12406	PRONet Duo	V.K.A. Polymers Pvt. Ltd	ITN	Bifenthrin, Chlorfenapyr	12 Mar, 2025
036-002	Reliefnet Reverte	Real Relief Health ApS	ITN	Deltamethrin	25 Jan, 2021
P-00211	Royal Guard	Mainpol GmbH	ITN	Alpha-cypermethrin, Pyriproxyfen	29 Mar, 2019
P-00210	Royal Sentry 2.0	Mainpol GmbH	ITN	Alpha-cypermethrin	6 Feb, 2019
018-001	SafeNet	Mainpol GmbH	ITN	Alpha-cypermethrin	19 Feb, 2018
P-09284	SAFENET PLUS	Mainpol GmbH	ITN	Alpha-cypermethrin, Piperonyl Butoxide (PBO)	9 Jan, 2024
P-00223	Tsara Boost	PPP Hollandi DMCC	ITN	Deltamethrin, Piperonyl Butoxide (PBO)	29 Jan, 2018
P-00226	Tsara Plus	PPP Hollandi DMCC	ITN	Deltamethrin, Piperonyl Butoxide (PBO)	29 Jan, 2018
P-00225	Tsara Soft	PPP Hollandi DMCC	ITN	Deltamethrin	9 Oct, 2020
P-13227	UNET G1 LN	Sino Africa Medical Devices Company Ltd	ITN	Deltamethrin	19 Mar, 2025
P-13228	UNET G3 LN	Sino Africa Medical Devices Company Ltd	ITN	Deltamethrin, Piperonyl Butoxide (PBO)	19 Mar, 2025
P-13229	UNET G5 LN	Sino Africa Medical Devices Company Ltd	ITN	Alpha-cypermethrin, Chlorfenapyr	19 Mar, 2025


PQT/VC Ref Number	Product Name	Applicant	Product Type	Active Ingredient/Synergist	Date of Prequalification
014-002	VEERALIN	V.K.A. Polymers Pvt. Ltd	ITN	Alpha-cypermethrin, Piperonyl Butoxide (PBO)	29 Jan, 2018
P-04983	YAHE 4.0	Fujian Yamei Industry & Trade Co. Ltd	ITN	Alpha-cypermethrin, Piperonyl Butoxide (PBO)	11 Nov, 2024
015-001	Yahe LN	Fujian Yamei Industry & Trade Co. Ltd	ITN	Deltamethrin	19 Feb, 2018
P-11664	Yorkool G1 LN	Tianjin Yorkool International Trading Co., Ltd	ITN	Deltamethrin	17 Apr, 2024
021-003	Yorkool G3 LN	Tianjin Yorkool International Trading Co., Ltd	ITN	Deltamethrin, Piperonyl Butoxide (PBO)	18 Apr, 2023
P-12507	Yorkool G5 LN	Tianjin Yorkool International Trading Co., Ltd	ITN	Alpha-cypermethrin, Chlorfenapyr	16 Sep, 2024





World Health Organization
Prequalification of Medical Products
 WHO Medicines, Vaccines and Immunisation
 Services, Vector Control


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Vector Control Products

Vector Control Product List
 Displaying: 26 - 31 of 31
[Download list as CSV file](#)

Product Type

ITN

PQT/VC Ref Number

Title

Applicant

- Any -

Active Ingredient/Synergist

- Any -

Apply

About Vector Control Products Prequalification

What We Do

Documents A-Z

List of Prequalified Vector Control Products

31 WHO has recommended 31 different ITNs

So how do you choose for humanitarian crises?

The better of the LLINs:

Interceptor G2

Product Identification

Product Type:	ITN
PQT/VC Ref Number:	002-002
Applicant:	BASF AGRO B.V. Arnhem (NL) Freienbach Branch
Active Ingredient/Synergist:	Alpha-cypermethrin Chlorfenapyr
Concentration:	75D - 3.2 g/kg (100 mg/m2) Alpha-cypermethrin; 6.4 g/kg (200 mg/m2) Chlorfenapyr 100D - 2.4 g/kg (100 mg/m2) Alpha-cypermethrin; 4.8 g/kg (200 mg/m2) Chlorfenapyr

Formulation Type:	Long-lasting insecticidal net (LN)
Supporting WHO Recommendations:	ITN - Pyrethroid and chlorfenapyr

Prequalification Status

Status of Prequalification:	Active
Date of Prequalification:	29 January, 2018
Basis of Listing:	Prequalified (Converted)

Supporting Documents

WHO Specification

Alpha-cypermethrin+ Chlorfenapyr Coated LN 2019 [WHOVC-SP_Alpha-cypermethrin+Chlorfenapyr_Coated LN_2019.pdf](#)

WHOPAR

WHOPAR Part 4 - Safety [002-002-part-4v1.pdf](#)

WHO Public Assessment Reports for vector control products may contain multiple parts.

- Letter of Prequalification
- Executive Summary
- Decision Document
- Change Assessment
- Declaration of Labelling*

PermaNet Dual

Product Identification

Product Type:	ITN
PQT/VC Ref Number:	P-03228
Applicant:	Vestergaard Sarl
Active Ingredient/Synergist:	Chlorfenapyr Deltamethrin
Concentration:	100D - 2.1 g/kg (84 mg/m2) Deltamethrin; 5.0 g/kg (200 mg/m2) Chlorfenapyr

Formulation Type:	Long-lasting insecticidal net (LN)
Supporting WHO Recommendations:	ITN - Pyrethroid and chlorfenapyr

Prequalification Status

Status of Prequalification:	Active
Date of Prequalification:	17 March, 2023
Basis of Listing:	Prequalified by WHO

Supporting Documents

WHOPAR

Letter of Prequalification [P-03228 - part1v1 - 20230317 LOP \(PermaNet Dual PQ-VCP-2021-0138\)-Rev1-Signed.pdf](#)

WHOPAR Part 2 - Executive Summary [P-03228 - part2v4.pdf](#)

WHOPAR Part 3 - Quality [P-03228 - part3v5.pdf](#)

WHOPAR Part 4 - Safety [P-03228 - part4v2.pdf](#)

WHOPAR Part 5 - Efficacy [P-03228 - part5v4.pdf](#)

WHO Public Assessment Reports for vector control products may contain multiple parts.

- Letter of Prequalification
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PBO LNs – for shorter term protection needs

OLYSET PLUS

Product Identification

Product Type:	ITN
PQT/VC Ref Number:	001-005
Applicant:	Sumitomo Chemical Co., Ltd
Additional Manufacturers	
AtoZ Group Limited	
Active Ingredient/Synergist:	Permethrin Piperonyl Butoxide (PBO)
Concentration:	150D - 20 g/kg (800 mg/m ²) Permethrin; 10 g/kg (400 mg/m ²) PBO
Formulation Type:	Long-lasting insecticidal net (LN)
Supporting WHO Recommendations:	ITN - Pyrethroid and PBO

Prequalification Status

Status of Prequalification:	Active
Date of Prequalification:	29 January, 2018
Basis of Listing:	Prequalified (Converted)

Supporting Documents

WHO Specification

Permethrin (40 60 cis trans isomer ratio)+ Piperonyl Butoxide Incorporated LN 2013
[WHOVC-SP_Permethrin \(40 60 cis trans isomer ratio\)+Piperonyl Butoxide_Incorporated LN_2013.pdf](#)

Other Documents

001-005 Statement of Conversion and Letter of Prequalification [lop-and-soc-for-olyset-plus.pdf](#)
PPQC2020-024 Change Assessment Olyset Plus Long-term community studies
[20241010-ppqc2020-024-who-public-assessment-report-olyset-plus-change-assessment.pdf](#)

Links

[Report of the 15th WHOPES Working Group meeting](#)

PermaNet 3.0

Product Identification

Product Type:	ITN
PQT/VC Ref Number:	005-002
Applicant:	Vestergaard Sarl
Active Ingredient/Synergist:	Deltamethrin Piperonyl Butoxide (PBO)
Concentration:	Roof 100D - 4.0 g/kg (120 mg/m ²) Deltamethrin; 25.0 g/kg (800 mg/m ²) PBO Sides 100D - 2.1 g/kg (84 mg/m ²) Deltamethrin; 150D - 2.1 g/kg (84 mg/m ²) Deltamethrin
Formulation Type:	Long-lasting insecticidal net (LN)
Supporting WHO Recommendations:	ITN - Pyrethroid and PBO

Prequalification Status

Status of Prequalification:	Active
Date of Prequalification:	29 January, 2018
Basis of Listing:	Prequalified (Converted)

Supporting Documents

WHO Specification

Deltamethrin Coated LN 2020 [WHOVC-SP_Deltamethrin_Coated LN_2020.pdf](#)

WHO Specification

Deltamethrin+ Piperonyl Butoxide Incorporated LN 2019 [WHOVC-SP_Deltamethrin+Piperonyl Butoxide_Incorporated LN_2019.pdf](#)

Other Documents

PPQC2020-010 Change Assessment PermaNet 3.0 Long-term community studies
[PPQC2020-010 Change Assessment PermaNet 3.0 Long-term community studies assessment_0.pdf](#)
PQC-VCP-2022-0006 Change Assessment PermaNet 3.0 Barrier [PQC-VCP-2022-0006 Change Assessment PermaNet 3.0 Barrier.pdf](#)
PPQC2020-008 Change Assessment Roof Fabric Weight [20200615 PPQC \(PermaNet 3.0_005-002_PPQC2020-008\).pdf](#)
005-002 Statement of Conversion and Letter of Prequalification [WHOVC-SOC-LOP-005-002.pdf](#)

Links

[Report of the 12th WHOPES Working Group meeting](#)



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Running a distribution campaign



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Workplan for LN campaigns

1. Assessment
2. Coordination
3. Selection and Training of Workers
4. Transportation and Storage
5. Household survey
6. Mobilisation and Awareness (IEC / BCC)
7. Distribution/ waste management
8. Continued BCC
9. Supervision and Monitoring



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Assessment

- HF malaria case data or rapid parasitaemia cross sectional survey or fever surveys
- Ento data to know if your vectors are nocturnal indoor biting (ie are LNs useful or should it be IVM)
- With village leaders and HWs assess # LNs needed and distribution strategy
- Demographics: Population, HH, Children <5, pregnant women
- House/shelter/structure characteristics
- Sleeping patterns (#persons / sleeping surface)
- Are LNs in the community? What is coverage? When were they distributed? What condition are they in?



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Who is your target population, and why?

- Are you doing a targeted distribution to pregnant women at the antenatal clinics (ANC)?
- Are you covering children under 5 in a vaccination campaign?
- Everyone?
- Refugee/ host population only?



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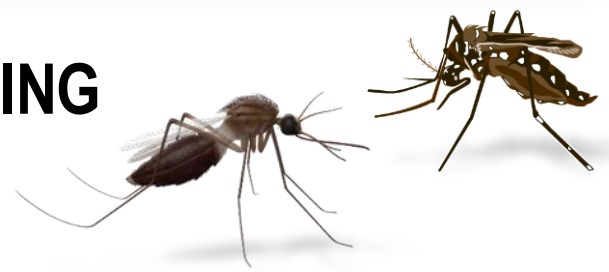


Coordination

- What is the NMCP malaria strategy/ policy in the area?
- What activities are they and other organisations planning?
- *What is their definition of Universal Coverage?*
- Do they have an emergency response plan?
- Insecticide resistance?



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Household survey

- Survey or registration?
- Ideally would inform number of LNs procured
- Health Card/ ID
- Coupon
- Minimal information required
- Can be integrated with other door to door campaigns



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Training of distribution staff



- Often overlooked/underfunded
- All administrative levels involved



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Logistics



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Transportation & Storage

- When is your distribution - have the LNs been ordered - what is lead time on availability in country?
- If not in country, where will LNs be coming from?
- Air shipment is very expensive so sea freight is standard, but allow several months?
- Which LNs registered already for use in the country by the MoH, or not?
- Do you need to loan from the MoH?
- Do you need a MoH letter for tax free import of LNs for customs clearance?



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Logistics



- Transport plan
- Road state, convoy security
- Paper trail
- Storage? Volume
- Pre-positioning
- End point and last mile security



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Logistics - Reaching Every Community



Storage



- Avoid direct sunlight
- Are they secure?
- Raised?



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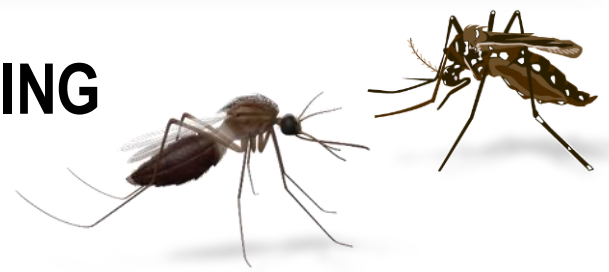


Ways to Distribute LNs

- **HOW MANY WAYS CAN YOU THINK OF?**
- **WHICH METHODS HAVE YOU USED?**
- **WHICH METHODS DO YOU THINK ACHIEVE THE BEST IMPACT?**



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Types of distributions

1. Non Food Items (NFI)
2. Routine distribution
3. Fixed point vs Mobile vs Door to door
4. Integrated distribution
5. Targeted distribution (populations, age groups)
6. Universal Coverage
7. Subsidised sale
8. Commercial market



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LN's Emergency kit distributions: (Non-food items– NFIs)

- This has happened in many emergencies as LNs are included in many UN emergency family kits with no education and treated as a non food item and not as a PUBLIC HEALTH TOOL
- LNs are delivered with no IEC, cannot be tracked to a family or household
- Abuse and resale rates are generally expected to be very high!
- Was it the right tool for that stage in the emergency? Was the cost benefit right for its distribution based on its usage and Public Health impact?



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LN's Emergency kit distributions: (Non-food items – NFIs)

In Burma after Cyclone Nargis, over 800,000 LN's were distributed as non food items as part of emergency survival kits.

No one knows how many were actually RECEIVED or how many were USED

Many witnessed piles trodden into the ground, never to be used.



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Routine distribution

- Good where everyone has access to a health facility
- Useful to encourage pregnant women and young children to be prioritised for net use
- Health facility has reliable supplies?
- Free or subsidised?
- Difficult to get high coverage



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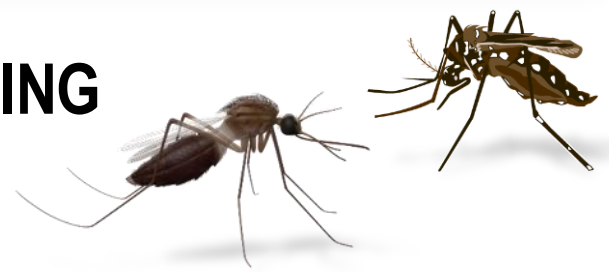


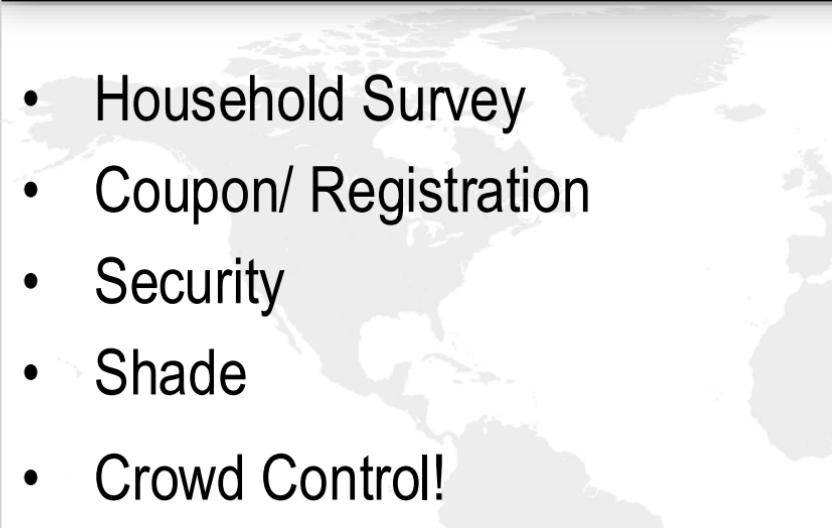
Topping Up LN Coverage

- Even the best programmes require topping up of LNs to replace damaged nets and to cover new born children and newly pregnant women
- Establishing free distribution of LNs to pregnant women on first visit at antenatal clinic or to children under 5 during EPI is a very useful way of topping up coverage
- Antenatal clinic or other health facility distribution models are not a substitute for universal or large scale distributions

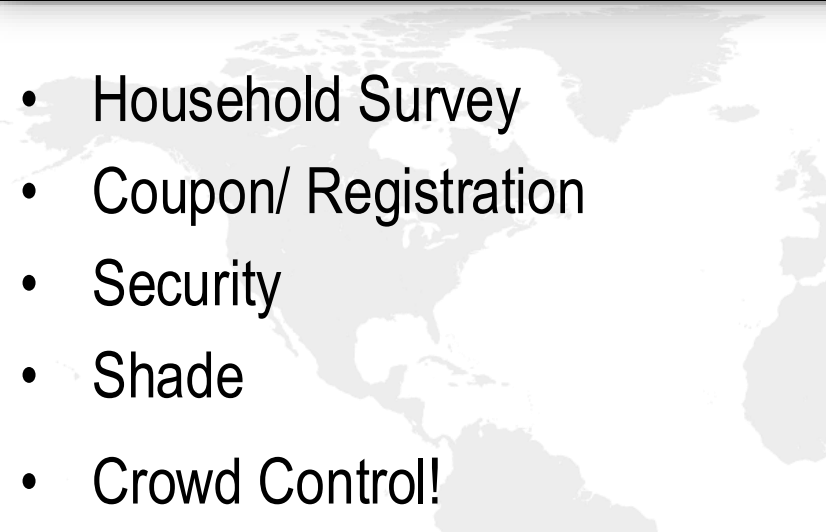


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- Household Survey
- Coupon/ Registration
- Security
- Shade
- Crowd Control!

- 
- Household Survey
 - Coupon/ Registration
 - Security
 - Shade
 - Crowd Control!



Fixed point

- Opening packaging
- Net hanging? How can this be encouraged?
- Waste management



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Door to door



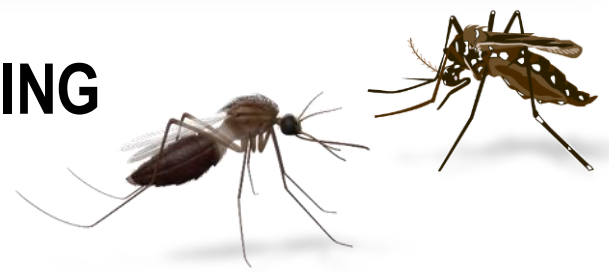
- Time and HR intensive
- HH Survey
- Distribution and Hang Up can be simultaneous
- Number of HH per day?
- Better at achieving sustained net use



It is helpful if LNs are registered to each household, and the family representative should sign for the LN received



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Integrated And Targeted Distributions

- What do you integrate with ?
Measles, polio, Vit A and deworming, ivermectin, praziquantel, yellow fever
- What are the advantages and disadvantages?
- Do you need to reach beyond your target? If so how will you do it?
- Cost shared / politics doubled
- More advantageous for the vaccine/ drug being integrated with
- Targeting your target? Household vs age group



Why integrated mass distributions are challenging

- Time frame for delivery of specific IEC is too short
- Understanding of recipients is reduced
- Vaccination and other tasks which generally take priority in IEC
- LNs often distributed in their packages
- Limited or no household level follow up to check if the nets are hung and to assist where needed



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Universal Coverage

What does it mean?

- 1 net for 2 people
- 3 nets per household
- 2 nets per household
- 1.8 people per net
- 1 net per sleeping space?



Is it relevant in crisis settings?



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Quantifying LN Need

What should we be aiming for?

- The 1.8 figure....
- No. households
- Nets per household
- Sleeping spaces

But what about your budget?

Fill in campaigns?



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Information, Education, Communication

.....should commence **weeks** before distribution



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Why do people use nets? Net culture

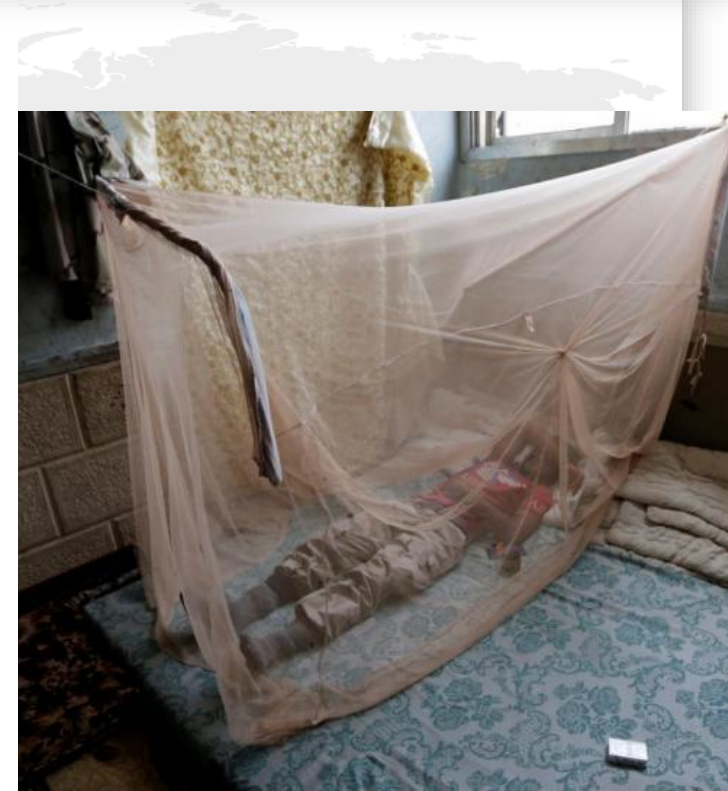


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Key messaging topics for LN distributions

- NOTIFICATION (date, location, what to bring)
- CAUSE OF MALARIA (mosquito, night transmission)
- SEVERITY OF DISEASE (can lead to death)
- VULNERABLE GROUPS (in malaria endemic areas)
- WHY LNs ARE USEFUL (physical barrier, insecticide kills, community effect)
- USAGE (how to hang it, airing, use, sleep every night)
- MAINTENANCE (washing, repairing, replacing)
- SOCIAL NORMING (everyone else is!)
- SECONDARY BENEFIT (saves family money)



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Methods of IEC dissemination



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Waste disposal



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Train LN distribution supervisors in data collection and monitoring



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Evaluating LN retention & utilisation

- However LNs are distributed, coverage and usage rates achieved should be measured and reported
- 3 to 5 months after the distribution a two stage cluster sample survey should be performed
- Determine the % of the population who retained the LNs
- Determine the % of the population who are correctly utilising their LNs (i.e. have them hanging over their sleeping areas) - specify for children under 5 and pregnant women



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RBM core population indicators

- Proportion of households with at least one ITN for every two people
- Proportion of population with access to an ITN in their household
- Numerator: Total number of individuals who could sleep under an ITN if each ITN in the household is used by two people
- Denominator: Total number of individuals who spent the previous night in surveyed households
- Proportion of population who slept under an ITN the previous night
- (supplemental) % of nets used the previous night



REDUCING DEATHS AND SUFFERING
FROM **TROPICAL DISEASES**



LN Impact

Pre and Post LN distribution malaria morbidity and mortality data can be used to show possible impact

- BUT ONLY WHERE LNs ARE THE ONLY PREVENTION TOOL IN USE



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