The Republic of Uganda

National Malaria Control Department

GUIDELINES FOR LONG-LASTING INSECTICIDAL NETS CARE, REPURPOSING AND DISPOSAL

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Guidelines for Long-Lasting Insecticidal Nets (LLINs) care, repurposing and disposal in Uganda

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FOREWORD

Long-lasting, insecticide-treated bed nets (LLINs) are an important public health tool for malaria prevention recommended by World Health Organization (WHO) and adopted by most countries for malaria control and elimination. There is overwhelming evidence that use of LLINs is highly cost effective and a sustainable method for protection against malaria and has contributed significantly to reduced malaria morbidity and mortality. In Uganda LLINs utilization has increased as a result of scale up strategies which include periodic mass distribution campaigns and continuous distribution approaches through social marketing, vouchers and a variety of other channels.

With the introduction of universal coverage strategies and the ongoing distribution and sale of LLINs, more people have access to and are using LLINs. Older nets accumulate in households as they are replaced with new nets, and given the lack of environmentally sustainable disposal options, households are instead repurposing the old nets. Households have demonstrated countless ways to repurpose an old net, including protecting seedlings, creating screening for window and doors, tethering domestic animals, rearing poultry, or using under a mattress as pest control. There is a growing demand for guidance on what to do with old or worn-out LLINs throughout their life cycle.

The Ministry of health encourages beneficial and neutral repurposing of inactive nets. Beneficial repurposing includes using old or inactive nets as curtains, patches for holes in viable nets, stuffing eaves, and constructing window or door screening. Neutral repurposing of nets involves use of inactive nets for household uses that do not prevent mosquito bites such as use for covering latrines, protecting seedlings, fencing, transporting and storing crops, screening of poultry or animal enclosures, soccer goals, tearing into strips for tying objects, and other household uses.

Currently, LLINs and the vast majority of their packaging (bags and baling materials) are made of non-biodegradable plastics. The large-scale deployment of LLINs has given rise to questions on the most appropriate and cost-effective way to deal with the plastic wastes that result. Here we provide a guide for care, repurposing and disposal of LLINs. This document will serve as a reference document for the National Malaria Control Division (NMCD) and implementing partners with clear recommendations on LLIN care, repurposing, and disposal.

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Director General Health Services

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Dr. Patrick Tusiime

Commissioner National Disease Control

DEFINITIONS

Active LLIN	A LLIN that is still in use by a household to protect a sleeping space, this is determined by the household.
Beneficial repurposing of LLINs	The use of inactive LLINs for purposes other than for sleeping under to protect oneself against malaria infection. It is considered beneficial because the LLIN material continues to act as a barrier against mosquitoes. Examples of beneficial repurposing include using old or inactive LLINs as curtains, patches for holes in viable LLINs, stuffing eaves, and constructing window or door screening.
Caring for LLINs	Refers to actions intended to prevent damage to LLINs for example, by handling LLINs carefully, keeping them away from sources of damage including sharp objects, fire, direct sunlight, detergents, and excessive washing.
Disposal of LLINs	The action or process of getting rid of LLIN packaging or LLINs that are no longer used for any purpose
Inactive LLIN (expired net)	A LLIN that is no longer used by a household to protect a sleeping space for whatever reason, including that it could be torn, dirty or no longer needed. Inactive could also refer to a presumed lack of insecticide if the owner no longer perceives the net to be killing insects. This is determined by the household and does not necessarily reflect quantitative thresholds of efficacy or packaging expiration date. Perceptions of whether a LLIN is inactive vary among settings and between households.
Insecticide-treated net (ITN)	A net that repels, prevents blood feeding, and/or kills mosquitoes after contact due to the presence of insecticide on the netting material. Insecticide-treated nets are either conventionally treated nets or long-lasting insecticidal nets.
LLIN ownership	Having possession of a LLIN, whether or not it is used.
LLIN use	Sleeping under a LLIN at night. As an indicator this is usually measured through surveys asking, for example, whether a specific person slept under a LLIN ‘the previous night’
LLIN access	A person is said to have access to a LLIN if there is a LLIN available for that person to sleep under every night. Whether or not the person does sleep under the LLIN is an issue of use, not an issue of access.
LLIN ownership	Having possession of a LLIN, whether or not it is used
Long-lasting insecticidal net(LLIN)	A factory-treated mosquito net with insecticide incorporated into or bound around the fibers, or a mosquito net treated with a long-lasting insecticidal treatment kit, that retains its biological activity for at least 20 WHO standard washes under laboratory conditions and 3 years of recommended use under field conditions without re-treatment.
Misuse of LLINs	The use of an active LLIN for purposes other than its intended use as a bed net to protect against malaria infection. Misuse of LLINs is not acceptable under any circumstances and not only defeats the public health purpose of providing protection from malaria, but can also have negative environmental outcomes.

Neutral Repurposing of LLINs	The use of inactive LLINs for household uses that do not prevent mosquito bites. Examples include covering latrines, protecting seedlings, fencing, transporting and storing crops, screening of poultry or animal enclosures, soccer goals, tearing into strips for tying objects, and other household uses.
New LLIN	A LLIN obtained from the most recent campaign or distribution.
Old LLIN	A LLIN obtained in an earlier distribution or by earlier purchase (e.g. a previous campaign or from an antenatal care visit), which may still be used to protect a sleeping space.
Pyrethroid+PBO combination net	A LLIN consisting of a pyrethroid insecticide and a PBO (Piperonyl Butoxide) synergist. A synergist is a chemical that does not have any insecticidal properties itself, but inhibits enzymes in the mosquito that usually break down the insecticide, thereby enhancing the potency of the insecticide.
Repairing LLINs	Refers to closing holes and tears on LLINs by stitching, patching, tying knots, or any other method.

LIST OF ABBREVIATINS AND ACRONYMS

ACTs	Artemisinin based Combination Therapy
ANC	Antenatal Care
BCC	Behavior Change Communication
DFID	(UK) Department for International Development
DHE	District Health Educator
DHO	District Health Officer
DHS	Demographic and Health Survey
EPI	Expanded Program for Immunization
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HMIS	Health Management Information System
IEC	Information Education Communication
IRS	Indoor Residual Spraying
IVM-TWG	Integrated Vector Management Thematic Working Group
ITN	Insecticide Treated Nets
LLIN	Long-lasting Insecticidal Nets
M&E	Monitoring and Evaluation
MIS	Malaria Indicator Survey
MOH	Ministry of Health
NEMA	National Environment Management Authority
NMCD	National Malaria Control Division
SBC	Social Behavior Change
SMEOR	Surveillance, Monitoring and Evaluation and Operation Research
UCC	Universal Coverage Campaign
VHT	Village Health Team
WHO PQT-VC	WHO Pre-Qualification Team of Vector Control

CHAPTER ONE: INTRODUCTION

1.1. Malaria in Uganda

Malaria is the leading cause of morbidity and mortality in Uganda, accounting for 30-50 percent of outpatient visits at health facilities, 15-20 percent of all hospital admissions, and up to 20 percent of all hospital deaths (27.2 percent of inpatient deaths among children under five years of age)[1]. A significant percentage of malaria deaths occur at home and are not reported by the facility-based Health Management Information System (HMIS)[2].

Malaria is endemic in approximately 95 percent of the country, affecting over 90 percent of the population. The remaining 5 percent of the country consists of unstable and epidemic-prone transmission areas in the highlands of the south- and mid-west, along the eastern border with Rwanda, and the northeastern border with South Sudan[1]. The 2014/15 Malaria Indicator Survey (MIS) report indicated prevalence of malaria parasites in children <5 years of age ranging from <1% in Kampala to 37% in East central region, with a national average of 19%[3].

1.2. Malaria Control interventions in Uganda

Over the last 15 years, malaria control interventions have been scaled-up dramatically across Africa, resulting in an estimated 40% decrease in the incidence of disease due to *P. falciparum* between 2000 and 2015 [4]. In Uganda, coverage of key malaria control strategies, including long-lasting insecticidal nets (LLINs), indoor residual spraying of insecticide (IRS), and treatment of malaria cases with artemisinin-based combination therapy (ACTs), has increased substantially[3]. Use of LLINs is the primary strategy employed for the prevention of malaria in Uganda and other endemic countries throughout the world. The World Health Organization (WHO) recommends universal coverage of populations at risk, defined as one net for every two people to achieve community benefits [5]. In order to achieve and maintain this, WHO recommends that endemic countries should undertake a mix of routine LLIN distribution to highest risk populations through the health system and mass countrywide LLIN distribution at a minimum of interval of every three years [6]. In Uganda, LLINs are the primary vector control intervention, and considerable effort has been made to achieve universal coverage.

The Ministry of Health National Malaria Control Division (NMCD) has pursued multiple strategies to increase ownership and use of nets, including free distribution to pregnant women through antenatal care clinics, provision of subsidized LLINs through the private sector, sale of full-cost LLINs in the commercial sector and free mass distribution campaigns to achieve 100% coverage of all households. The goal of the NMCD is to sustain LLIN utilization by all groups at 85% by 2020 and beyond[1].

1.3. Policy Environment

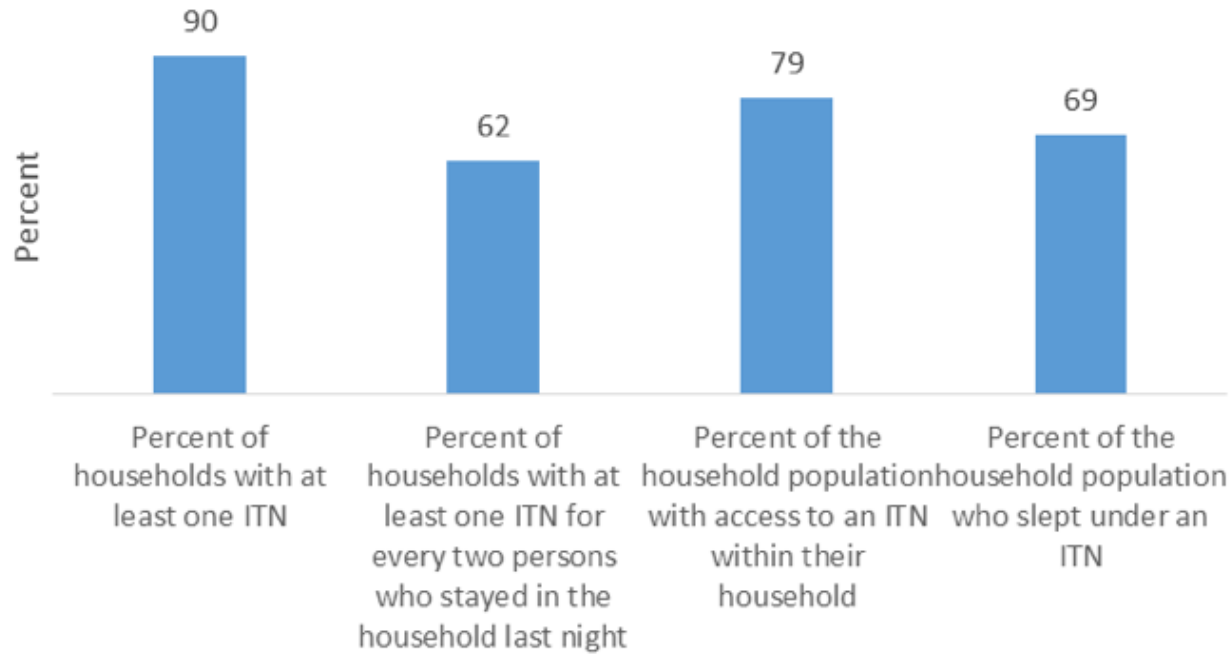
Core interventions in malaria vector control including sleeping under long lasting insecticidal nets (LLIN) and Indoor Residual Spraying (IRS) have demonstrated public health value and are broadly applicable for populations at risk of malaria in most settings [7]. Sleeping under Long Lasting Insecticidal Nets (LLINs) is one of the most effective ways of preventing malaria. LLINs can reduce the number of uncomplicated malaria episodes in areas of high malaria transmission by half (50%), and have an even bigger impact in areas of medium or lower transmission. LLINs have also been shown to reduce childhood mortality by up to a quarter (25%)[8,9]. LLINs are accepted as the most cost-effective nets for malaria prevention because the protection they offer is twice as much as that provided by untreated nets, LLINs are preferred because they do not require re-treatment and remain effective for three to five years. For this reason, the Ministry of Health (MoH) has adopted the international recommendation from the World Health Organization (WHO) that all public sector distributions should involve LLINs rather than conventional nets as its policy.

The Ministry of Health has adopted use of LLINs as one of the major interventions in the National Malaria Control Policy and Strategic Plan. The National Malaria Control Policy aims at achieving “Universal Coverage” for all interventions (prevention and treatment), including LLINs. Universal coverage involves reaching 100% of the population at risk of malaria with prevention and treatment. For Uganda, universal coverage for LLINs is defined as one LLIN for every two people. Evidence has shown that with high population coverage for prevention and treatment, malaria morbidity and mortality can be significantly reduced.

1.4. Coverage and use of LLINs in Uganda

LLIN distribution and use in Uganda has been increasing over the years. In 2009, Uganda adopted a strategy of universal LLIN coverage in which one net is given per two people and by 2010, the NMCD distributed over 7.2 million LLINs, with support from the Global Fund. The proportion of households with at least one LLIN increased from 47% in 2009 to 59% in 2011 [10]. In May 2013, the National Malaria Control Division of Uganda (NMCD) implemented a Universal Coverage Campaign (UCC) for the first time with LLINs in which more than 40 million recipients were registered, and over 22 million LLINs were distributed to achieve universal coverage in Uganda. The proportion of households with at least one LLIN was 90% in 2014 although only 62% of households had enough LLINs to cover each household member, assuming one LLIN is used by two people (Figure 1)[3]. In 2016, about 78% of households possessed at least one LLIN and 62% of households possessed at least one LLIN for every two persons [11]. Uganda conducted another LLINs mass distribution campaign in 2017, distributing 26.3 million nets to 116 districts and reporting 97.9% national coverage. According to the 2014 Malaria indicator survey, despite the increase in coverage, use of LLIN is still lower than the national coverage at only 69 % [12].

Figure 1. Ownership of, access to and use of LLINs



Source: Uganda Malaria Indicator Survey 2014/15

1.5. Rationale for LLIN care, repurposing and disposal

LLINs are estimated to have a useful life of up to three years, that may be even shorter or longer depending on the fabric integrity and insecticidal residual efficacy [12 - 14]. The behavior of LLIN users, including net care and repair, may protect or damage LLINs and impact the physical integrity of nets. Physical deterioration of the net may shorten the effective lifespan to 1.5-2.5 years [15, 16]. The longevity of LLINs under field conditions has important implications for malaria vector control. When nets are physically deteriorated and insecticidal residual activity is reduced by improper washing practices, they offer poor protection to the users[17]. Thus, proper LLIN care and repair practices must be promoted[18].

With the introduction of universal coverage strategies and the ongoing distribution and sale of LLINs, more people have access to and are using LLINs. Older and inactive LLINs accumulate in households as they are replaced with new LLINs. Households have demonstrated countless ways to repurpose old nets, including protecting seedlings, creating screening for window and doors, or using under a mattress as pest control. There is a growing demand for guidance on what to do with old or worn-out nets throughout their life cycle.

Currently, LLINs and the vast majority of their packaging (bags and baling materials) are made of non-biodegradable plastics. The large-scale deployment of LLINs has given rise to questions on the most appropriate and cost-effective way to deal with the plastic wastes that result. Most endemic countries currently do not have the resources to manage LLIN collection and waste disposal programs. Burning of discarded bags for packaging LLINs and burning of old LLINs, produce highly toxic fumes including dioxins which are harmful to human health. Discarding old LLINs and their packaging into water releases high concentrations of residual insecticides that are toxic to aquatic organisms including fish. Insecticide-treated plastics can be incinerated safely in high-temperature furnaces but suitable facilities are lacking in most places.

The purpose of the guideline is to provide NMCD and implementing partners with clear recommendations and key messages on LLIN care, repurposing and disposal.

1.6. LLIN care, repurposing and disposal practices

LLIN care refers to actions that will maintain LLINs in good condition so they can be used for the prevention of malaria. We can prevent damage to LLINs by handling them carefully, keeping them away from sources of damage, and washing nets gently and not too often. We can maintain LLINs by closing holes and tears as soon as they appear on them by stitching, patching, or tying knots. The longevity of LLINs in the field is influenced by the type of textile used, the weave pattern, stress on the nets due to type of bed and hanging materials, as well as actions performed on the net from tucking and untucking, washing, damage by children, and in many areas, rats[19]. It is possible that careful handling and ongoing repair of LLINs would improve the useful life of LLINs at the household level. Significant cost-savings would be possible if significant proportions of LLINs in a given area were to last longer, and allow further spacing between mass distributions or replacement strategies using continuous distribution [20].

Most people in Sub Saharan Africa would rather repurpose or reuse expired, torn or un usable LLINs as opposed to discarding them [21, 22]. In cattle corridors LLINs are often repurposed for protecting livestock. They are used to fill gaps in Kraals to prevent cattle from escaping. LLINs are further repurposed to make ropes for restraining goats, sheep, cows and other livestock while in some areas they are used for trapping white ants. In fishing communities on Lake Victoria, 25% of nets were repurposed for drying small fish. In the Eastern region of Uganda, nets are put on grass-thatched houses to provide shelter and prevent leakage during rains. Among farmers, LLINs were repurposed to fence off gardens and poultry farms and to cover vegetable seedlings. In urban areas nets were repurposed and used for covering kiosks to provide shelter, for making football goalposts, and making wedding dresses[23]. In areas where households received less LLINs than were needed, they creatively repaired existing old nets [23,24].

1.7 Target audience

The main target audience for this document includes;

1. Policy makers
2. Program managers and implementers at the Ministries of Health
3. District health teams
4. Health sub-districts

5. Implementing partners
6. The private sector
7. Communities.

1.8 Objectives of the guideline

This guideline is intended to give guidance on LLIN care, repair, repurposing and disposal. It documents the criteria and acceptable activities for LLIN care, repurposing of worn-out LLINs and disposal of LLIN packaging and old LLINs, aligned to the National Environmental Policies. These guidelines should not be used in isolation but in relation to other guidelines such as the LLIN Mass distribution guidelines, the Routine LLIN distribution guidelines and the Uganda Malaria Communication Strategy 2014 – 2020.

Specific objectives

1. To Specify the criteria for LLIN care, repurposing and disposal
2. To Specify the different mechanisms for LLIN care, repurposing and disposal
3. To Specify appropriate IEC/BCC messages for LLIN care, repurposing and disposal

CHAPTER TWO: LLIN COORDINATION

2.1. Roles of the IVM TWG

Under the overall guidance of the Ministry of Health, the LLIN care, re-purposing and disposal activities, including those under this guideline, will be coordinated by the Integrated Vector Management Thematic Working Group (IVM-TWG).

1. Review and validate all LLIN documents related to net care, repurposing and disposal including those related to strategy and implementation.
2. Coordinate LLIN related activities with all relevant stakeholders (both national and sub-national) and implementing partners.
3. Advocate and ensure engagement of national, district and sub-district (Sub County, parish, village) authorities and stakeholders for the correct care, re-purposing and disposal of LLINs.
4. Collaborate with the Ministry of Water and Environment, the National Environment Management Authority (NEMA) and other relevant authorities to ensure that LLIN repurposing and disposal conforms to safe environment policies and guidelines.
5. Provide oversight and technical guidance for all LLIN related activities and processes including LLIN care, repurposing and disposal.
6. Supervise and monitor LLIN care, repurposing and disposal related activities and processes while providing technical guidance to resolve bottlenecks at central and decentralized levels
7. Supervises and regularly conduct operational research related to LLIN care, repurposing and disposal and support the inclusion of newly available and relevant evidence/information to support LLIN care, re-purposing and disposal activities.
8. In conjunction with the Ministry of Health Division of Health Information, manage all national LLIN care, repurposing and disposal related data and databases including data presentation and reporting.

The NMCD, which is the IVM-TWG secretariat, will lead the implementation of these guidelines through a LLIN coordinator as a focal point person. The IVM-TWG will work with other NMCD TWGs for effective implementation of these guidelines. The TWGs include the Surveillance, Monitoring and Evaluation and Operation Research (SMEOR) TWG; Social Behavior Change (SBC) TWG; and the procurement and logistics team. They will also work with other stakeholders from the private sector, at sub-national levels and at communities.

2.2 Roles of the SMEOR - TWG

1. Develop training materials and all tools needed for process related to assessment of care, durability, bio efficacy, repair, repurposing and disposal of LLINs.
2. Provide oversight for data management related to assessment of care, durability, bio efficacy, repair, repurposing and disposal of LLINs at all levels.
3. Work with the district and DHIS2 data management team to compile, clean and validate data related to LLIN care, durability, bio efficacy, repair, repurposing and disposal

2.3 Roles of the SBC- TWG

In addition to the roles specified under the Uganda Malaria Communication Strategy, such as overseeing the BCC strategy for the entire malaria program, the SBC - TWG will perform the following related tasks:

1. In collaboration with the IVM-TWG, design the LLIN care, repurposing and disposal communication plan, advocacy plan and talking points.
2. Carry out LLIN care, repurposing and disposal supportive supervision and monitoring activities

2.4 Roles of the procurement and logistics team

The procurement and logistics team, working in collaboration with the IVM-TWG and NEMA, will develop a comprehensive waste management plan, especially focusing on the implementation of LLIN reverse logistics and disposal. They will perform the following roles:

1. Provide technical support to the districts and sub counties for reverse logistics and disposal
2. Collaborate with relevant stakeholders, district, and sub-county and health facility leadership to assess availability of functional incinerators or areas where LLINs can be disposed of safely.
3. Routinely revise and update the waste management plan as informed by new evidence and research in consultation with the NEMA and stakeholders

2.5 Roles of the sub-national teams (district, parish, village level)

1. Coordinate, supervise and monitor LLIN care, repurposing and disposal activities planned for the sub-national level and ensure that key milestones are met.
2. Organize regular meetings to coordinate and follow up on activities of implementing partners and key stakeholders related to LLIN care, repurposing and disposal.

3. Flag bottlenecks that cannot be resolved at sub-national level and forward to the next higher level including the national level for follow up.
4. Ensure communication within the governmental structures to ensure political participation and buy-in.
5. Identify and engage potential advocates who can influence the population and promote engagement in LLIN care, repurposing and disposal activities.
6. Leverage existing partners and influencers for continuous post-distribution SBC activities to promote LLIN care, repurposing and disposal.
7. Monitor post-campaign SBC activities to encourage utilization, care, repair and proper disposal of LLINs.

CHAPTER THREE: LLIN CARE, REPAIR, REPURPOSING AND DISPOSAL

3.1 LLIN care and repair

It is assumed that LLINs have a relatively uniform lifespan of about 3 years. However, this is not always the case, especially when their useful life span is considered. The recognition that LLINs vary in degree of material durability (physical strength) in differing contexts such as between regions, between households, and within a household supports the promotion of LLIN care and repair.

What is net care?

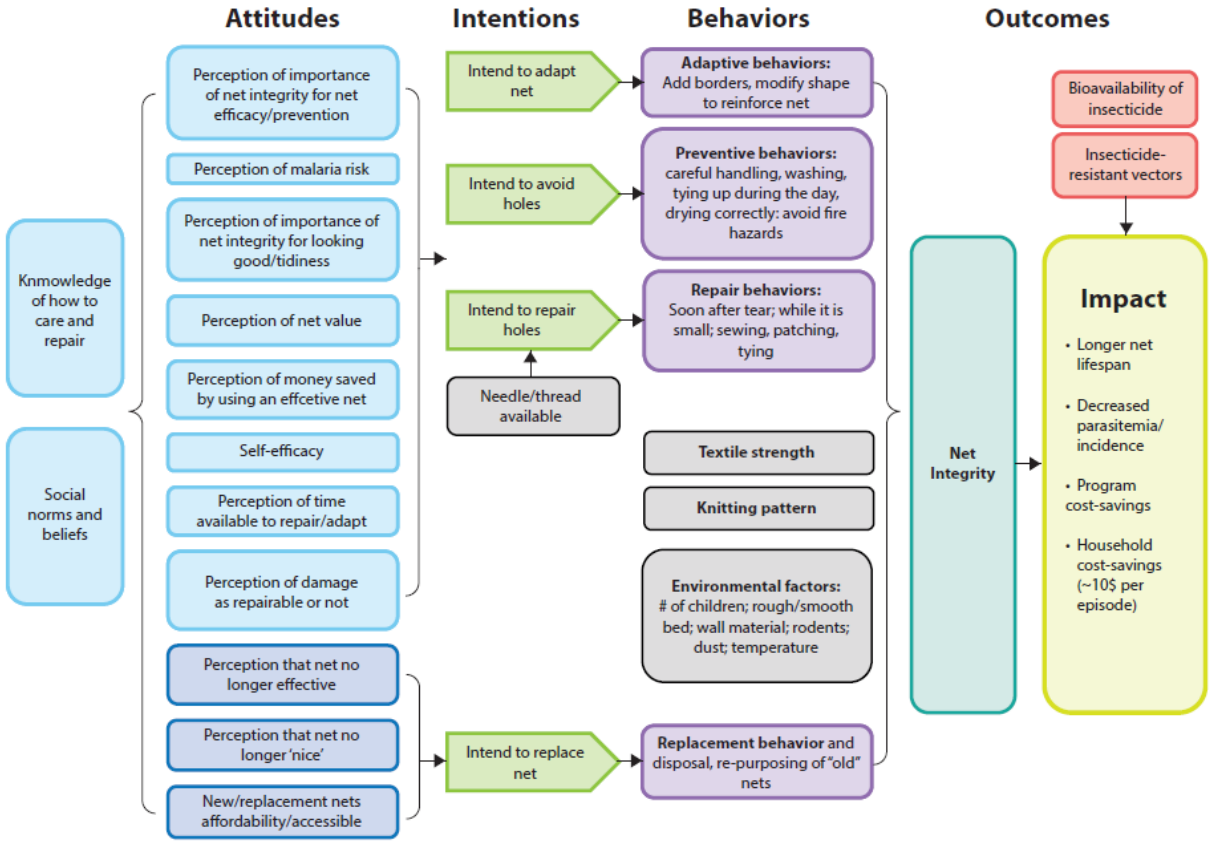
Net care refers to actions that will maintain mosquito nets in good condition so they can be used for the prevention of malaria. Caring for nets means preventing damage to nets by handling nets carefully, keeping them away from sources of damage, and washing nets gently and not too often. Repairing nets means closing holes and tears as soon as they appear by stitching, patching, tying knots, or any other method.

Why promote net care?

The longevity of nets in the field is due to many reasons, including the type of textile used, the weave pattern, stress on the nets due to type of bed and hanging materials, as well as actions performed on the net from tucking and untucking, washing, small children, and in many areas, rats. It is possible that careful handling and ongoing repair of nets would improve the useful life of nets at the household level. Lengthening the useful life of nets would have significant implications for procurement and net replacement strategies. Nets that currently are supposed to last for 3-5 years are observed to be very torn after much shorter periods of time, limiting their protective capacity. Significant cost-savings would be possible if significant proportions of nets in a given area were to last longer, and allow further spacing between mass distributions or replacement strategies using continuous distribution.

By caring for LLINs, the rate of deterioration can be delayed, thus ensuring that LLINs last as long as possible, which is important to sustaining universal coverage and preventing malaria. Factors that potentially influence LLIN care and repair, and key LLIN care and repair behaviors are summarized in figure 2.

Figure 2. Factors that potentially influence LLIN care and repair, and key LLIN care and repair behaviors.



Adapted from LLIN CARE & REPAIR: Improving Net Lifespan through Behavior Change Communication

LLINs are valuable and worth the time for care and repair. LLIN care starts with proper use that entails the following:

- When using LLINs, tuck the net under the sleeping surface (mattress) to keep the mosquitoes out.
- Tuck netting over a crib under the sleeping surface (mattress) or select a net long enough to touch the floor.
- Pull the net tightly to avoid choking hazards for young children. Hook or tie the sides of the net to other objects if they are sagging in towards the sleeping area.
- Do not hang the net near any candles, cigarettes, or open fires, as it can catch on fire.
- Do not sleep directly against the net, as mosquitoes can still bite through holes in the net.
- Households should continue to maintain and use their nets for as long as possible and follow recommendations for effective care to prolong their useful life.

3.2 LLIN care practices

The following re recommended LLIN care practices

- Hang and handle the LLIN carefully
- Fold or tie the LLIN out of the way during the day, to keep them away from children
- Hang the net with care and ensure that it is not too stretched when tucked in.
- Keep the LLIN away from any possible sources of damage
- Keep LLIN out of reach of children and do not let children play with the net
- Teach children not to play with LLINs
- To avoid attracting rodents, do not soil the net with food and keep food away from it.
- Wash LLINs only when dirty and not more than once every 3 months
- Wash LLINs gently with mild soap (not detergent)
- Wash nets in a basin or bucket
- Do not wash LLINs on rough surfaces like stones
- Do not wash LLINs with a brush
- Do not soak LLINs in water for a very long time (overnight).
- Do not beat LLINs against hard objects
- Do not dry LLINs under direct sunlight or on rough surfaces, dry only in the shade.
- Inspect the LLIN every night for holes and tears
- Enter your net carefully every night to avoid damage

3.3 Damage to physical integrity of LLINs

When LLINs are not properly taken care of, they can be damaged. The commonest damage at household level is on their physical integrity (holes in the nets). The main causes of holes in LLINs include the following:

- Quality of housing (rough surfaces)
- Location of LLINs (indoors or outdoors)
- Type of sleeping space (mattress, reed mat)
- The presence of rodents and other animals
- High frequency and rough methods of washing LLINs
- Drying LLINs under the sun
- Whether the net is taken down during the day
- Frequency of LLIN use

- The number of people who sleep under the LLIN
- Whether the LLIN is used by children or adults
- Whether LLIN use is a new or a well-established habit in the household.

3.4 LLIN Repair practices

- Residents should be advised through appropriate communication strategies to continue to use LLINs even if they have holes until another LLIN in a better condition is available to replace it.
- A torn LLIN can still be effective when repaired
- When laying out the LLIN in the evening, inspect it regularly for holes
- Communities should be encouraged to regularly repair their LLINs when they become damaged.
- Repair small holes immediately
- LLIN holes can be repaired by tying a knot, sewing a patch, or stitched

Methods for repair of holes in LLINs are shown in figure 3.

Figure 3. LLIN repair practices

	To stitch you can use a needle and thread
	To patch you can use cloth material
	Tying a knot

Residents should be advised through appropriate communication strategies to continue to use long-lasting insecticidal nets (LLINs) - even if they have holes until another LLIN in better condition is available to replace it.

3.5 Repurposing of LLINs

One of the aims of this guideline is to provide guidance on what household members can do with old or worn-out LLINs. It is essential to understand the three categories of LLINs before talking about their alternative uses, to provide a benchmark for what is acceptable repurposing. LLINs can fall under one of the following categories.

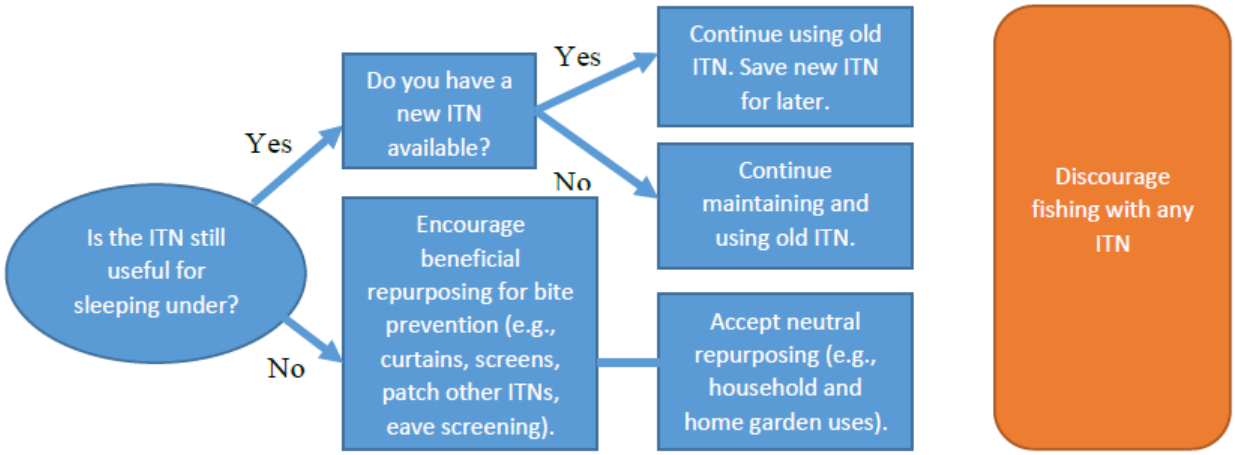
1. New LLIN: A LLIN obtained from the most recent campaign, distribution or purchase.
2. Old LLIN: A LLIN obtained in an earlier distribution (e.g., a previous campaign or from an antenatal care visit), which may still be used to protect a sleeping space.
3. Inactive LLIN: A LLIN that is no longer used by a household to protect a sleeping space based on the perception that it can no-longer be used for malaria control, including that it could be torn (multiple large irreparable holes) or no longer needed. Inactive could also refer to a presumed lack of insecticide if the owner no longer perceives the LLIN to be killing insects. Whether a LLIN is considered inactive is determined by the household and does not necessarily reflect quantitative thresholds of efficacy determined by holes on the net, bioassay, packaging expiration date, or other methods. Perceptions of whether a LLIN is inactive vary among settings and between households.

Repurposing of a LLIN is the use of an inactive LLIN for other purposes other than for sleeping under it and not dangerous to the environment. There are two main categories of LLIN repurposing;

1. Beneficial repurposing is the use of inactive LLINs as a barrier against mosquitoes to protect against malaria infection. Examples of beneficial repurposing include using inactive LLINs as curtains, patches for holes in viable nets, stuffing eaves, and constructing window or door screening.
2. Neutral repurposing is the use of an inactive LLIN for household uses that do not prevent mosquito bites and are not dangerous to the environment. Examples include covering latrines, protecting seedlings, fencing, transporting and storing crops, screening of poultry or animal enclosures, soccer goals, tearing into strips for tying objects, and other household uses.

When households have enough LLINs to sleep under, both beneficial and neutral repurposing of inactive LLINs is acceptable. Households' main priority however should be protecting themselves from mosquito bites by sleeping under a LLIN. Households have autonomy over their LLINs and how they are used. The ultimate decision about whether a LLIN is still useful for sleeping under or not is made by the household members. If a LLIN is no longer useful for sleeping under we should encourage beneficial repurposing for mosquito bite prevention. The flowchart in figure 4 should be used as a guide to understand when LLINs can and cannot be repurposed and for what beneficial uses.

Figure 4. Recommendations for LLIN use and repurposing.



Adapted from LLIN CARE & REPAIR: Improving Net Lifespan through Behavior Change Communication

Once a family deems a LLIN inactive, beneficial and neutral repurposing is recommended and should be promoted. Neutral repurposing of inactive nets is acceptable however repurposing new LLINs is not acceptable. Fishing with any LLIN is not acceptable. New nets should be stored away from rodents and children for a period of time while older nets are still useful for sleeping under. The specific uses for which nets may be repurposed are summarized in table 2.

Table 2. Context and specific acceptable uses for inactive LLINs.

	Context	Specific use
1	Mosquito control	• Inactive LLINs can be cut into sizes suitable for window or door screening to prevent entry of mosquitoes into houses. • Inactive LLINs can be used as curtains, patches for holes in nets, and stuffing eaves.
2	Farming	• Inactive LLINs can be used to make enclosures for chicken and ducks coops to protect chicks against predators and restrict adult birds from loitering around and destroying crops. • Inactive LLINs can be used to protect seedlings or plants from getting damaged • Inactive LLINs can be used for fencing gardens • Inactive LLINs can be used for screening of poultry or animal enclosures • Inactive LLINs can be used as ropes for tying animals to restrict them while grazing and tethering in their shed.
3	Domestic	• For making ropes for clothes lines and for tying objects • For making body and dish washing sponges. • For making pillows, blankets, and mattress covers • Making bags for keeping items • Used as a table covering
4	House improvement	• Used as window curtains to offer privacy in the room • Used as a ceiling in houses • Used as a curtain to demarcate a room
5	Building and furniture	• Used to make ropes for construction of mud or thatched houses • Used as ropes for making local beds or chairs. • Padding for sleeping mats
6	Recreation	• For making skipping ropes and as ropes for swings • Used for making soccer balls and as goal post net.
7	Security	• Used to fence around homes, and other enclosures to secure the compounds and restrict entry.
8	Recycling	• Consider strategies of recycling to re-use the plastic

3.6 Misuse of LLINs

Misuse of a LLIN is the use of an active LLIN for purposes other than its intended use as a bed net to protect against mosquito bites.

Misuse of LLINs is not acceptable under any circumstances and not only defeats the public health purpose of providing protection from malaria, but can also has negative environmental outcomes.

A prime example of LLIN misuse is the use of LLIN, whether new, old, or inactive, for fishing. This is because the chemical, pyrethroids, can kill fish, especially young fish and aquatic crustaceans. Also, the fine mesh of treated or untreated mosquito nets may also cause ecological damage by physically removing many small aquatic animals from an area. In fishing communities, misuse of LLINs can be a problem and efforts should be made to address these situations. Residents should also be advised not to dispose of old or inactive LLINs in any water body, as the residual insecticide on the net can be toxic to aquatic organisms and especially to fish.

LLIN misuse should be discouraged through a combination of structural interventions including SBC messages, and policing aligned to the Public Health Act. At the sub-national level, the Uganda Public health act gives authority to local bodies to take all lawful measures to safeguard and promote public health. This can be used to set up ordinance and by-laws to penalize community members or other individuals that are found misusing LLINs.

3.7 LLIN disposal

LLINs and the vast majority of their packaging (bags and baling materials) are made of non-biodegradable plastics. In Uganda, the NEMA is responsible for setting up and enforcing laws/regulations to manage plastic waste and pesticide-contaminated plastics broadly. The NMCD will work together with NEMA to provide guidance on appropriate methods of disposal of inactive and non-useful LLIN and LLIN packaging aligned to WHO recommendations. Burning of discarded LLIN bags and old LLINs can produce highly toxic fumes including dioxins. Discarding old LLINs or LLIN packaging into water releases high concentrations of residual insecticides that are toxic to aquatic organisms, particularly fish. The following are the recommended safe disposal methods of old LLINs and LLIN packaging:

1. **Safe incineration** in high-temperature furnaces if suitable facilities are available
2. **Burial** away from water sources and preferably in non-permeable soil in the absence of a suitable high-temperature incinerator.
3. **Reverse logistics** to collect and dispose old LLINs and LLIN packaging. **This should only happen if there is a suitable plan for safe disposal of the collected LLINs**

Reverse logistics involves collection of old and inactive LLINs that are no longer needed and LLIN packaging for disposal. This can be implemented through the following channels.

A. Through household participation

1. Household members who perceive their LLINs to be inactive and in a status for disposal can take them to the nearest health facility for collection.
2. Household members can give their inactive LLINs for disposal to the resident Village Health Team member (VHTs), from where they can be taken to the health facility.
3. The health facility, in discussion with the Malaria and environmental focal persons and other relevant stakeholders, can then arrange to collect the inactive LLINs for disposal by an appropriate and recommended approach that is environmentally safe.

B. Through direct collection

The NMCD, working with relevant stakeholders, including the districts and private sector can implement LLIN reverse logistics mechanisms. Household members are informed of scheduled times for transporting old LLINs and LLIN packaging to disposal centers/sites. Arrangements are made to pick the LLINs and LLIN packaging from collection centers and transport them to the designated disposal area/sites.

The NMCD should only collect LLINs if the communities are adequately covered, and if there is a suitable plan for safe disposal of the collected LLINs. Collecting old LLINs should not divert effort from core duties, including maintaining universal coverage. If LLINs and packaging are collected, the best option for disposal is high-temperature incineration. If this is not possible, the next best option is burial, away from water sources. NMCD should work with NEMA to take WHO recommendations into consideration when formulating local guidance.

CHAPTER FOUR: SOCIAL MOBILIZATION AND BEHAVIOUR CHANGE FOR LLIN CARE AND REPURPOSING

4.1. Communication to promote LLIN care, repurposing and disposal

Communication is an essential element of malaria control efforts in the country that facilitates adoption of good practices by the community. The success of proper LLIN care, repurposing and disposal hinges heavily on a robust communication strategy. The NMCD therefore considers this a priority area. It is important to incorporate LLIN care, repair, repurposing and disposal into malaria Social and behavioral change (SBC) strategy. This should be done in a systematic and informed way to ensure that communication activities align with intended program objectives and outcomes, in this case those related to LLIN care, repurposing and disposal activities and process. The messages on LLIN care, repair, repurposing and disposal should be included in the broader malaria control communication plan.

The SBC messages should place greater emphasis on preventive LLIN care messages than on repair messages. The communication should ensure that the community understands the difference between a new net, old net, inactive net, LLIN care, repair, re-purposing and the criteria for selection of inactive LLINs for re purposing or disposal. The messages should be re-enforced continuously so that they are not "lost" among the many messages that are shared during LLIN distribution. LLIN care, repair and repurposing behaviors should be promoted regularly over time in much the same way that LLIN use messaging is typically communicated. In addition, these messages need not stand alone; they should be incorporated into existing messages for malaria prevention and for promotion of LLIN use. The key SBC messages should further focus on community mobilization to ensure better understanding and perception of the importance of LLIN use, care, repair and disposal at household level

4.2. Roles and responsibilities of key stakeholders

The NMCD will lead national level efforts for LLIN care, repurposing and disposal implementation. They will involve all National level stakeholders responsible for LLIN care, repurposing and disposal implementation. At the district level, the District Health Team (DHT) will sensitize district level stakeholders important in LLIN care, repurposing and disposal implementation. The districts will further sensitize community members on LLIN care, repurposing and disposal. The roles and responsibilities of key persons for SBC are shown in table 2.

Table 1. Roles and responsibilities of key stakeholders for IEC/SBCC

NMCD SBC team	• Develop and approve LLIN care, repurposing and disposal guidelines. • Advocacy and resource mobilization for LLIN care, repurposing and disposal • Sensitization and engagement of stakeholders on LLIN care and repurposing implementation • Developing a communication plan broadly addressing malaria prevention including LLIN use, care, repair, repurposing and disposal. This is done with support from communication focal points from implementing partners. • Developing communication trainings packages on LLIN care, repurposing and disposal • Identify target audiences, key messages, communication channels, and tools/materials to be developed and disseminated. • Take the lead in developing the key messages that all partners and implementers should communicate. • Managing logos on communication materials for donors and implementing. • Coordinating resource mobilization and utilization in support of SBC activities for LLIN care, repurposing and disposal. During the communication planning process, the NMCD can express overall needs for the country and identify which partners can contribute to avoid duplication of efforts.
District Health Team (DHT)	• Participate in district level sensitization for LLIN care, repurposing and disposal implementation • Provide support for old and inactive LLIN disposal
Community members	• Implement proper use and care of LLINs at the household level • Implement proper repurposing and disposal of LLINs at the household level

4.3. SBC at district and community level

SBC will target district civic, political and religious leaders for advocacy purposes, while community members especially heads of households will be targeted to improve LLIN care, repurposing and disposal at households. SBC will focus on increasing the risk perception of malaria to ensure that the community members recognize malaria as a major killer disease in Uganda. SBC interventions will also serve to address knowledge gaps, negative perceptions, attitudes, myths and enhance skills around LLIN care, repurposing and disposal for malaria prevention and control.

At the district level, SBC will be led by the District Health Educator (DHE), who will mobilize the district Leadership at political and administrative levels. This is intended to promote correct care, repurposing and disposal of LLINs. District officials, religious leaders, and local leaders

will be targeted to disseminate information on proper LLIN care, disposal and repurposing. SBC interventions will further be implemented during LLIN distribution, to empower community members with skills on LLIN use, care, re-purposing and disposal. A variety of practical methods that engage the community members will be employed including; role plays that present different net care and re-purposing practices, quizzes, and debates. After distribution of LLINs, integrated messages on malaria prevention and control and net care and repurposing practices should be disseminated to enable community members embrace proper LLIN use and re-purposing practices.

4.4. Communication channels

The following communication channels will be used to reach the audiences with LLIN care, repurposing and disposal messages.

- Print materials: Booklets, posters, leaflets, flyers, fact sheets, tool kits and guidelines
- Radio: Announcements, talk shows, debates
- Inter-personal communication during the antenatal clinic (ANC), expanded program for immunization (EPI), or other health consultation. Health personnel, trained community agents, or trained partner organization staff can conduct educational sessions that communicate key messages, answer questions and concerns, dispel myths, and encourage LLIN use, care, repurposing and disposal directly with beneficiaries.
- Newer technology (e.g. SMS, Internet).
- Film vans to support the whole process of BCC on correct use, repurposing and disposal of LLINs.
- Leaders: Health workers, Village Health Teams (VHTs), Health Assistants, Health Educators, and religious and cultural leaders will serve to mobilize the community

The Choice of media channels should take into consideration access of the population to the medium (radio versus television (TV), for example) and literacy levels. Communication can be channel through the already existing advocacy, communication and social mobilization sub-committee. This committee should coordinate communication and make recommendations to the larger malaria task force in developing a communication plan broadly addressing malaria prevention. This process should be led by the NMCD and/or the MOH communication division, with support from communication focal points from implementing and donor partners.

CHAPTER FIVE: MONITORING AND EVALUATION.

5.1. Monitoring and evaluation of LLIN care, repurposing and disposal.

Collection of accurate and timely information on indicators of program progress is a key element of managing and improving program quality. Monitoring and evaluation of LLIN care, repurposing and disposal requires timely periodic assessment to be put in place to guide improvements. Monitoring and evaluation of LLIN care, repurposing and disposal primarily involves the evaluation of outcomes. There exist indicators developed by Roll Back Malaria that will be tracked as part of the M&E strategy. Data for purposes of M&E include collected and collated information about LLIN care, repurposing and disposal from community level assessments.

Monitoring is important to maintain the quality of implementation and to measure progress towards attainment of the objectives. Evaluation will be periodically conducted with planned national level surveys such as the Uganda Demographic and Health Survey (UDHS) and the Malaria Indicator Survey (MIS). Indicators to monitor will include the following.

- Proportion of households that have received messages on LLIN care, repair, repurposing and disposal.
- Proportion of households that have repaired any holes in the nets in the last 6 months
- Proportion of households that have repurposed any LLINs in the last 6 months
- Proportion of LLINs that have been repurposed in the last 6 months
- Proportion of LLINs with any signs of repair of holes
- Average frequency of LLIN washing per year
- Proportion of households employing different modes of LLIN repurposing.
- Number of scheduled old unwanted LLIN or LLIN package incineration or burial activities
- Proportion of LLINs or LLIN package materials disposed through incineration or burial
  Information collected will help inform the communication approaches to improve LLIN care, repair, repurposing and disposal.

Additionally, monitoring of the durability of nets may lead to better understanding of the factors that determine LLIN durability and laboratory indicators that correlate with these net qualities. It can also provide an opportunity to improve behavior and communication messages

so that users take better care of their LLINs. Indicators to measure while conducting durability studies include:

1. LLIN survivorship (the proportion of distributed nets still available for use as intended in the households to which they were given after a defined period)
2. LLIN Attrition (the proportion of nets no longer in use as intended after a defined period after their distribution to the households). Attrition can be categorized by the main reasons why a net is no longer used, namely decay (e.g. destroyed, so torn and worn out that it is considered useless for protection against mosquitoes), absence (e.g. stolen, given away, moved) or used for other purposes.
3. Physical or fabric integrity: reflects the number, location, type (burn, tear, seam failure, nibbled or chewed by animals) and size of holes in each net. Fabric integrity is assessed by counting the number of holes (including tears in the netting and split seams) by their location on the net and their size. Holes are classified into standardized categories according to the WHO guidelines.
4. LLIN bio-efficacy indicators (the degree of knock-down, mortality or inhibition of blood-feeding induced in susceptible mosquitoes, as determined by standard WHO test procedures and criteria i.e. cone bioassay, tunnel test).

5.2. Implementation research

To better understand the issues, assumptions and factors associated with the field performance of LLINs and to fill knowledge gaps, operational research is needed in various eco-epidemiological and socio-cultural settings where LLINs have been chosen as one of the main malaria control interventions. Some key areas for additional research include factors associated with LLIN wear and tear in different settings, country specific LLIN care and repair methods, acceptable LLIN repurposing strategies and disposal with the aim of improving/updating these guidelines

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