

# Instructions for treatment and use of insecticide-treated mosquito nets



Use insecticide-treated mosquito nets  
to sleep in peace – and protect your health



World Health Organization  
Geneva



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World Health Organization  
Geneva, 2002

## ***Acknowledgements***

This document was prepared jointly by the SMT (Social Mobilization and Training) and PVC (Strategy Development and Monitoring for Parasitic Diseases and Vector Control) teams of the Control, Prevention and Eradication Department of the World Health Organization (WHO) Programme on Communicable Diseases.

It was financed jointly by the RBM (Roll Back Malaria) Initiative and WHOPES/GCDPP (WHO Pesticide Evaluation Scheme).

Many experts from scientific institutions, nongovernmental organizations, industry, national malaria control programmes and WHO provided valuable input during the preparation and field-testing of this document.

We thank them all.

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# Introduction

**The purpose of this booklet**, prepared primarily for the African region, is to provide a new and more simplified approach to treatment and use of insecticide-treated mosquito nets (ITNs). The approach is based on experiences in the field over recent years and a better understanding of insecticides and their interaction with netting materials. The booklet is designed for use by national malaria control programmes, dipping centres, mobile teams, village health workers, nongovernmental organizations, bednet and insecticide manufacturers and others who promote the judicious use of ITNs.

This document describes simple steps for two alternative methods of treating mosquito nets:

- **home treatment**, and
- **mass treatment** of nets in dipping centres and by mobile teams visiting communities.

The booklet also provides a brief summary of the steps, which can be adapted locally for distribution to net users with nets and insecticides (see Annexes). The list of steps may also be converted into a poster for health facilities, dipping centres and other community locations. Guidelines for local adaptation are included in Annex 1.

*Drawings in this booklet can be freely reproduced and used, including in promotional documents produced by private companies.*

It is hoped that this booklet will provide a contribution to rolling back malaria by helping to promote the proper use of ITNs and improve re-treatment practices.

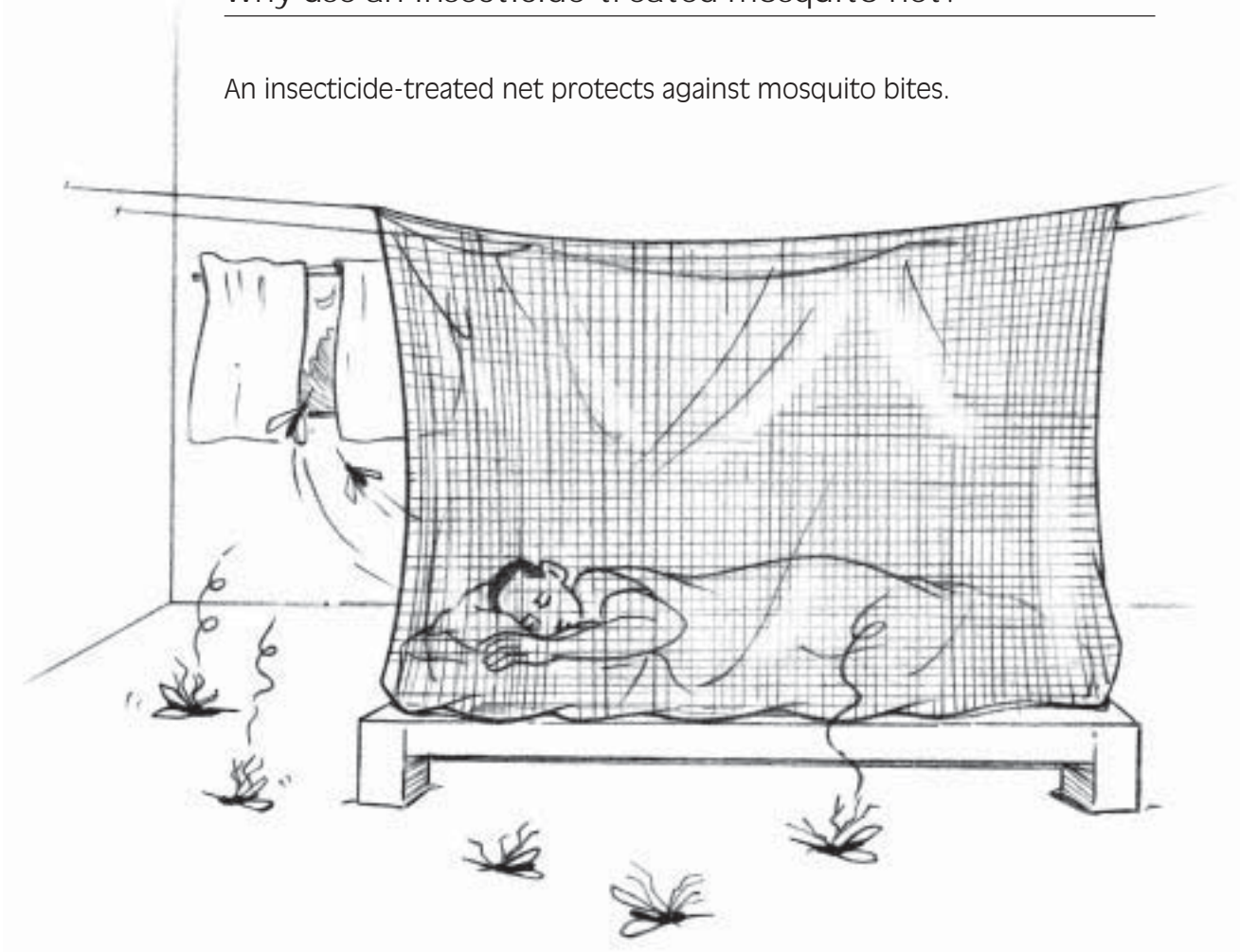


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## Why use an insecticide-treated mosquito net?

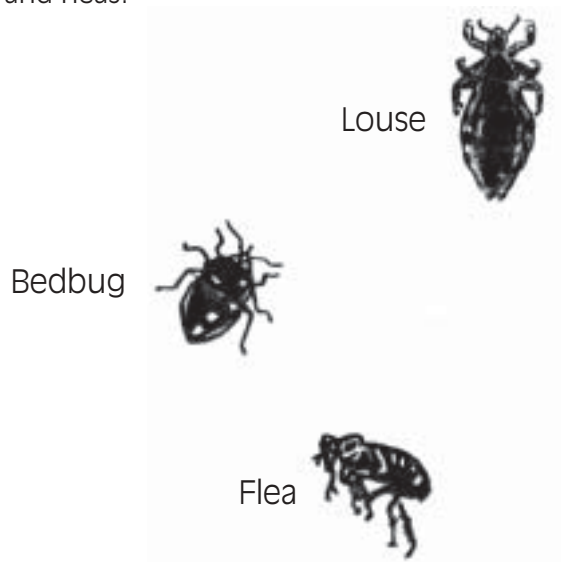
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An insecticide-treated net protects against mosquito bites.



**The insecticide on the net kills or keeps away mosquitoes**

An insecticide-treated net also kills or keeps away other insects, such as head lice, bedbugs and fleas.





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## Why use an insecticide-treated mosquito net?

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An insecticide-treated mosquito net protects you from diseases carried by mosquitoes, such as malaria.



**Malaria mosquito**

### How malaria is transmitted

Malaria is carried from person to person by a certain kind of mosquito that usually bites at night.

A person with malaria may have one or more of the following common symptoms:

- Fever (sweating, feeling cold and shivering)
- Headache
- Pain in the joints
- Loss of appetite
- Vomiting
- Diarrhoea
- Convulsions (fits)

### Most common symptoms of malaria



Fever



Headache



Vomiting

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## Why use an insecticide-treated mosquito net?

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Pregnant women, babies and young children are at the greatest risk of getting sick and dying of malaria.



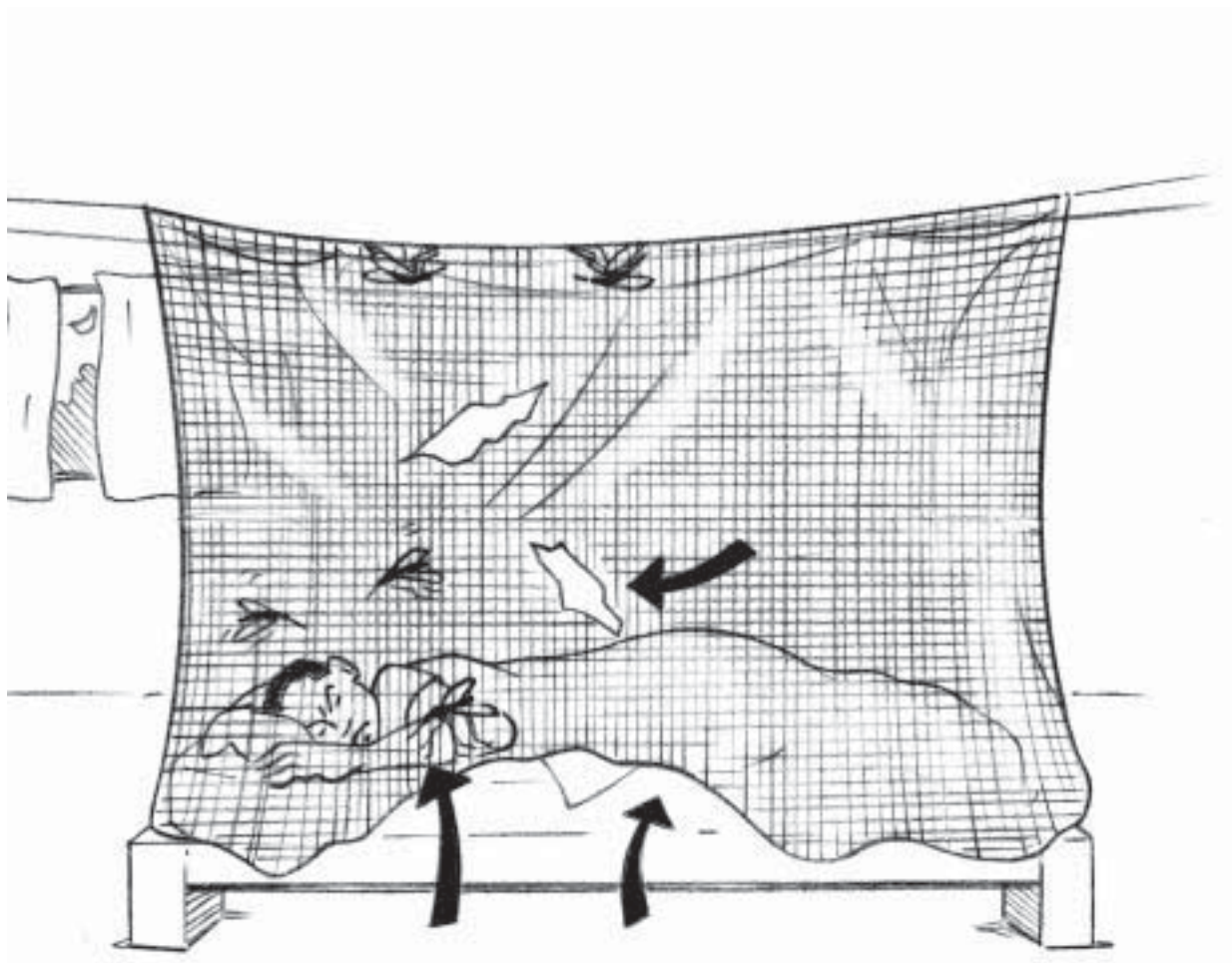
**The people most vulnerable to malaria**

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## Why treat the net with insecticides?

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If the net is not treated, mosquitoes and other insects will still fly around making noise, which disturbs your sleep. Without treatment with insecticides, mosquitoes may still bite your skin through the net and may get inside the net.



**Mosquito net not treated with an insecticide –  
holed and not tucked in**

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## Why treat the net with insecticides?

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A mosquito net treated with an insecticide is more effective in preventing mosquito bites.

### When to re-treat the net

You have to treat your net again **after three washes or at least once a year**. In areas that have mosquitoes all year long, you may need to treat the net twice a year.



**Mosquito net treated with an insecticide  
and properly used**

# How to treat the net



**All nets** should be treated by dipping them in basins or plastic bags containing insecticide mixed with water.

Here is a list of steps for:

- **Home treatment** (page 8): anyone can treat nets using treatment kits available through shops and health centres.
- **Mass treatment** (page 20) can be done by trained personnel in:
  - dipping centres, a fixed place where people bring their nets for re-treatment,
  - community campaigns that offer re-treatment once or twice a year, preferably before the rainy season, and
  - mobile teams that provide re-treatment at many sites including health centres, markets and homes.



## Home treatment

### Steps for home treatment of the net

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#### Preparing for treatment

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##### **STEP 1** Collect the necessary equipment

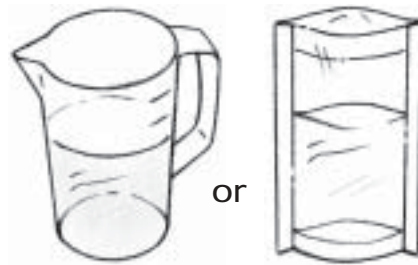
The necessary equipment consists of: net, insecticide, basin or plastic bag, measuring equipment and gloves.

- Make sure the net is clean.
- It is best to treat the net outdoors in the shade. If you must treat the net indoors, do it in a room with open windows.

#### What you will need to treat the net



Gloves



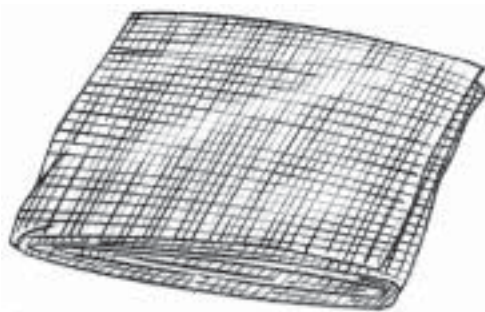
Measuring container



Basin or plastic bag



Insecticide



Clean net



Soap

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 Mixing the solution
 

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**STEP 2** Put on protective gloves before treating the net



**STEP 3** Measure the correct amount of water

The amount of water needed depends on the material the net is made of. Regardless of the size and shape of the net:

- **for one synthetic net** (polyester, nylon), add 1/2 litre of water,
- **for one cotton net**, add 2 litres of water.

**How much water for one net?**

**For a synthetic net** (e.g. nylon)



1/2 litre

**For a cotton net**



2 litres



If measuring equipment comes with the insecticide, use it to measure the water. If there is no equipment, use any measuring container that is not used for food, drinks or medicines.

If the net is very large or thick, you may need to add more water.

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Mixing the solution

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**STEP 4** Pour the correct amount of water into the basin or plastic bag





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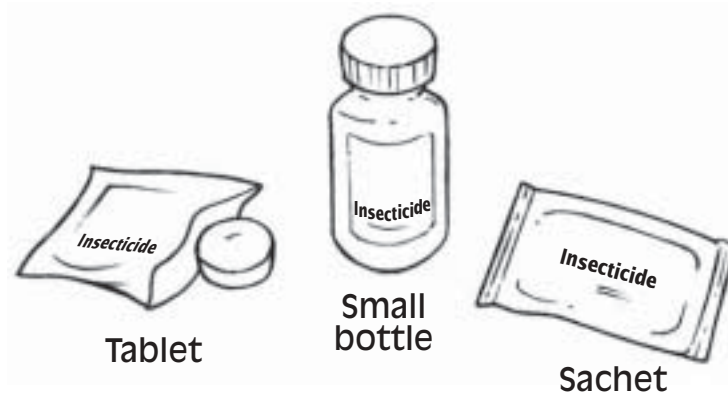
## Mixing the solution

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### **STEP 5** Add the correct amount of insecticide

The amount of insecticide or “dose” needed to treat one net may come as a tablet, small bottle or sachet of liquid. Mix one dose of insecticide with water to treat one net of any size.

#### One dose for one net



**Be sure to use only those insecticides that are recommended for mosquito nets.**

---

## Treating the net

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**STEP 6** Mix the water and insecticide thoroughly



**STEP 7** Unfold the net and put it in the basin or plastic bag with the insecticide solution you have prepared



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## Treating the net

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- STEP 8** Soak the net long enough to ensure that all parts of the net are impregnated



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## Treating the net

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### **STEP 9** Lift the net and wring gently

Do not wring too hard – as when washing clothes – or you will lose the insecticide.



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## Drying the treated net

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### **STEP 10** Let the net dry flat in the shade

Direct skin contact with the insecticide on a net that is still wet may cause a tingling sensation on the skin. This is not harmful, even for small children.

After treatment, the net may smell of the insecticide. The smell will go away in a few days and is not harmful to people who sleep under the net. Remember that net treatment is effective, even if the net does not smell.



**Stretch the net out flat to dry**



Later, you can also hang up the treated net **to finish** drying.

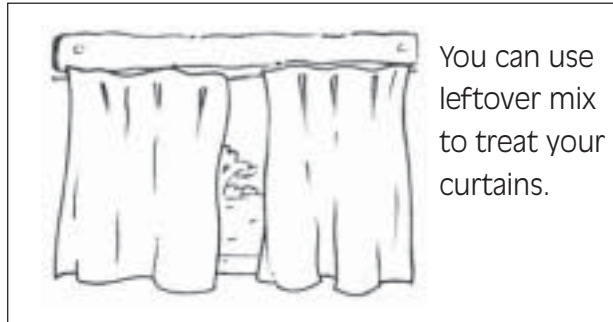


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## After treating the net

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**STEP 11** Use any leftover mix of water and insecticide to treat curtains



**Otherwise, dispose** of it in the latrine or in a hole, but away from ponds, rivers, streams, the house or animal shelters. Never store the mix of water and insecticide.



**Dispose of leftover mix in a latrine...**

**...or in a hole**



---

**After treating the net**

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**STEP 12** Wash the basin with soap and lots of water



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## After treating the net

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**STEP 13** Destroy empty insecticide containers and plastic bags so that they cannot be reused. Bury any remnants and the disposable gloves

Bury sachets or small bottles as well as disposable gloves.



**STEP 14** Wash your hands with soap



## Safe use of insecticides

Insecticides used for treatment of mosquito nets are not harmful to people **if used correctly**.



**Always wear gloves when handling insecticides or the wet net.**



**If insecticide splashes into the eyes, rinse immediately with plenty of clean water.**



**If insecticide splashes onto the skin, wash immediately with clean water. The insecticide might cause a tingling sensation on the skin, but this is not dangerous and should go away in a few hours.**



## Mass treatment

### Steps for mass treatment of nets

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#### Preparing for treatment

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##### **STEP 1** Collect the necessary equipment

The necessary equipment consists of: nets, insecticide, basin or plastic bag, measuring equipment, gloves, plastic sheeting and soap.

- Make sure the nets are clean.
- It is best to treat the nets outdoors in the shade. If you must treat the nets indoors, do it in a room with open windows.

#### What you will need to treat the net



Gloves



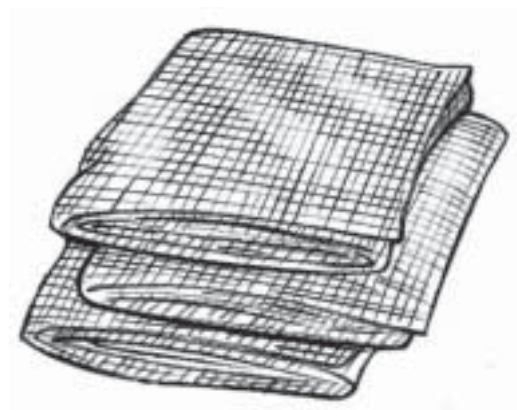
Measuring container



Basin or plastic bag



Insecticide



Clean nets



Plastic sheeting



Soap

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## Preparing for treatment

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**STEP 2** Put on protective gloves before treating the nets



**The use of protective gloves is especially important for anyone who is treating large numbers of nets on a regular basis.**

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## Mixing the solution

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### **STEP 3** Measure the correct amount of water

The amount of water needed depends on the material the net is made of. Regardless of the size and shape of the net:

- **for one synthetic net** (polyester, nylon), add 1/2 litre of water,
- **for one cotton net**, add 2 litres of water.


**How much water for one net?**

**For one synthetic net**  
(e.g. nylon)



1/2 litre

**For one cotton net**



2 litres



**If measuring equipment comes with the insecticide, use it to measure the water. If there is no equipment, use any measuring container that is not used for food, drinks or medicines.**

**If the net is very large or thick, you may need to add more water.**

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## Mixing the solution

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**Pour it into the basin or plastic bag (one net per bag)**

## Mixing the solution

### **STEP 4** Measure the correct amount of insecticide

The amount of insecticide or “dose” needed to treat the net depends on the type of insecticide used. See the following chart.

#### Quantity of insecticide for treating one net

Insecticide	Dose for one net
Deltamethrin (K-Otab) 25% WT	1 tablet
Deltamethrin 1% SC	40 ml
Lambda-cyhalothrin 2.5% CS	10 ml
Alpha-cypermethrin 10% SC	6 ml
Alpha-cypermethrin 6% SC	10 ml
Cyfluthrin 5% EW	15 ml
Etofenprox 10% EW	30 ml
Permethrin 10% EC	75 ml

The dose for one net may come as a tablet, small bottle or sachet of liquid. Mix one dose of insecticide with the recommended amount of water to treat one net of any size.

#### One dose for one net



## Mixing the solution

### Auto-dose bottle



Insecticide in liquid form may also come in an auto-dose bottle. When the bottle is squeezed, the upper cup fills with the correct dose of insecticide for one net.

### Bottle without auto-dose device



If the insecticide comes in a bottle without a measuring cup or a drum, measure the necessary dose with a container that is not used for food or medicines.



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## Mixing the solution

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**STEP 5** Mix the water and insecticide thoroughly





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## Mixing the solution

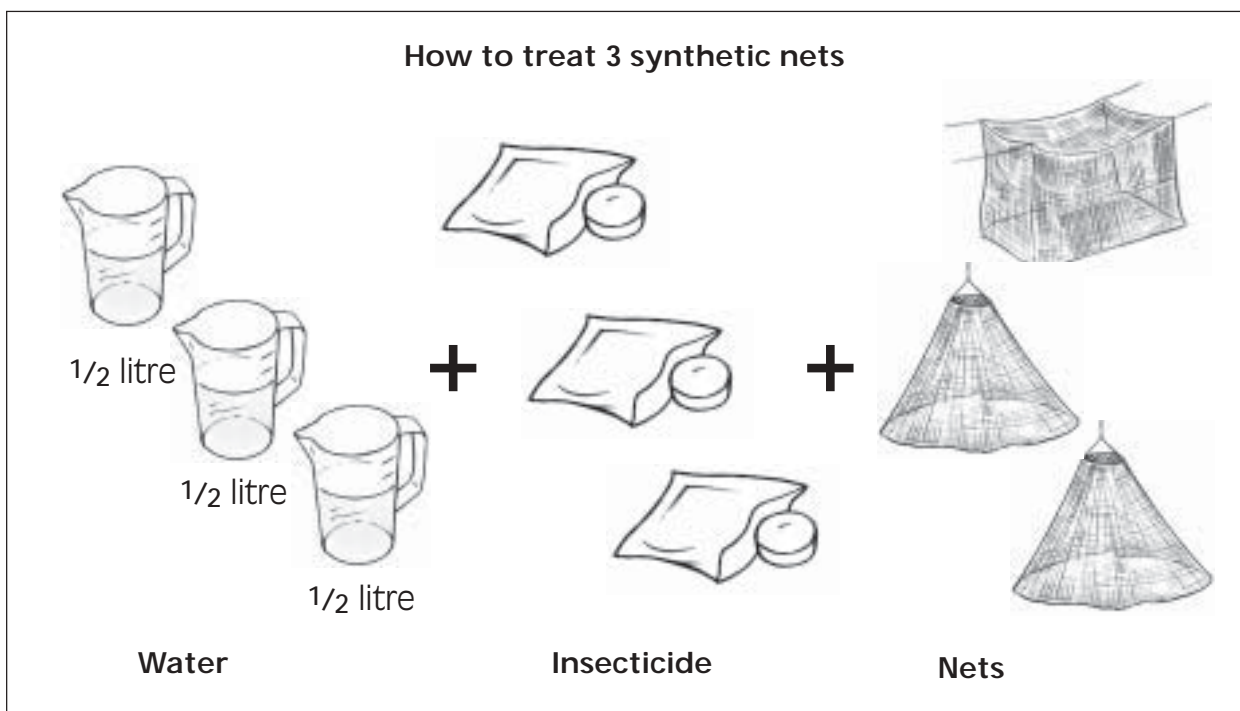
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### To treat several nets

To treat several nets together, multiply the volume of water and the amount of insecticide for one net by the number of nets to be treated.

**For example:** to treat 3 synthetic nets, measure the amount of water to treat both nets:

$1/2$  litre +  $1/2$  litre +  $1/2$  litre and add 3 doses of insecticide.



Avoid mixing nets from different families in the same treatment bath. Nets should be treated individually or grouped by family.



**Always treat synthetic and cotton nets separately.**

---

## Treating the nets

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**STEP 6** Put the nets in the basin or plastic bag containing water and insecticide



**STEP 7** Soak the nets long enough to ensure that all parts of the nets are impregnated

**STEP 8** Take out the nets one by one and wring gently

Do not wring too hard – as when washing clothes – or you will lose the insecticide.



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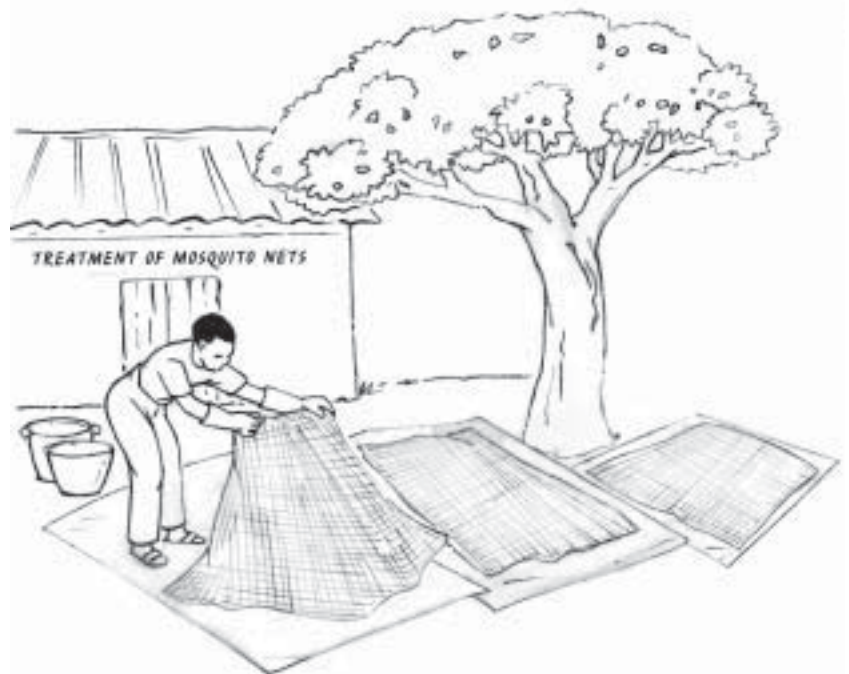
## Drying the treated nets

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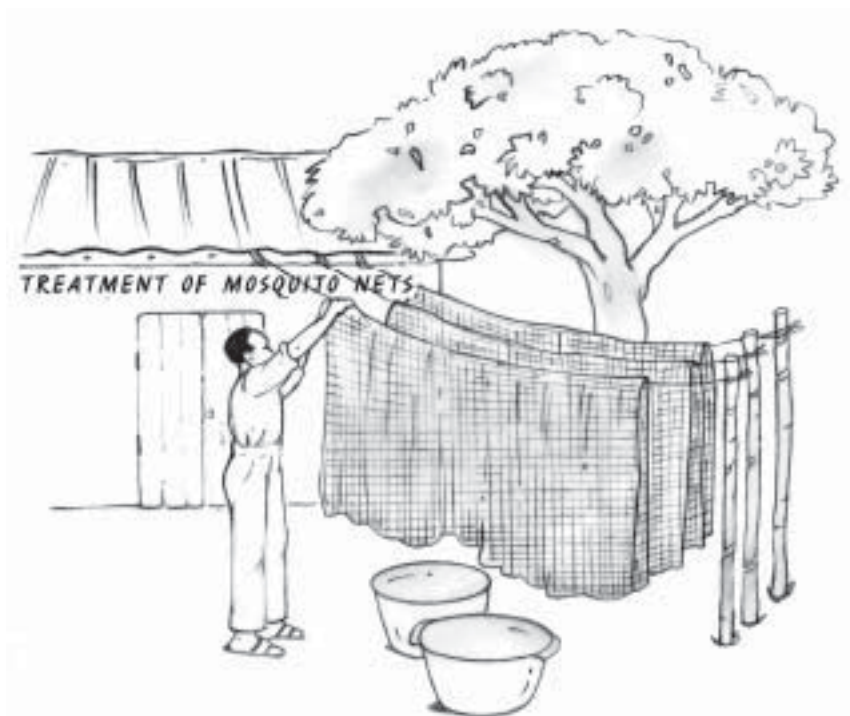
### **STEP 9** Let the nets dry flat in the shade

Direct skin contact with the insecticide on a net that is still wet may cause a tingling sensation on the skin. This is not harmful, even for small children.

After treatment, the net may smell of the insecticide. The smell will go away in a few days and is not harmful to people who sleep under the net. Remember that net treatment is still effective, even if the net does not smell.



**Stretch the nets out flat on plastic sheeting**



Later, you can also hang up the treated nets **to finish** drying.

---

After treating the nets

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**STEP 10** Use any leftover mix of water and insecticide to treat curtains

Otherwise, dispose of it in the latrine or in a hole, but away from ponds, rivers, streams, the house or animal shelters. Never store the mix of water and insecticide.



Dispose of leftover mix in a latrine...

... or in a hole



**STEP 11** Destroy empty insecticide containers



Destroy empty insecticide containers and bury any remnants in a hole.

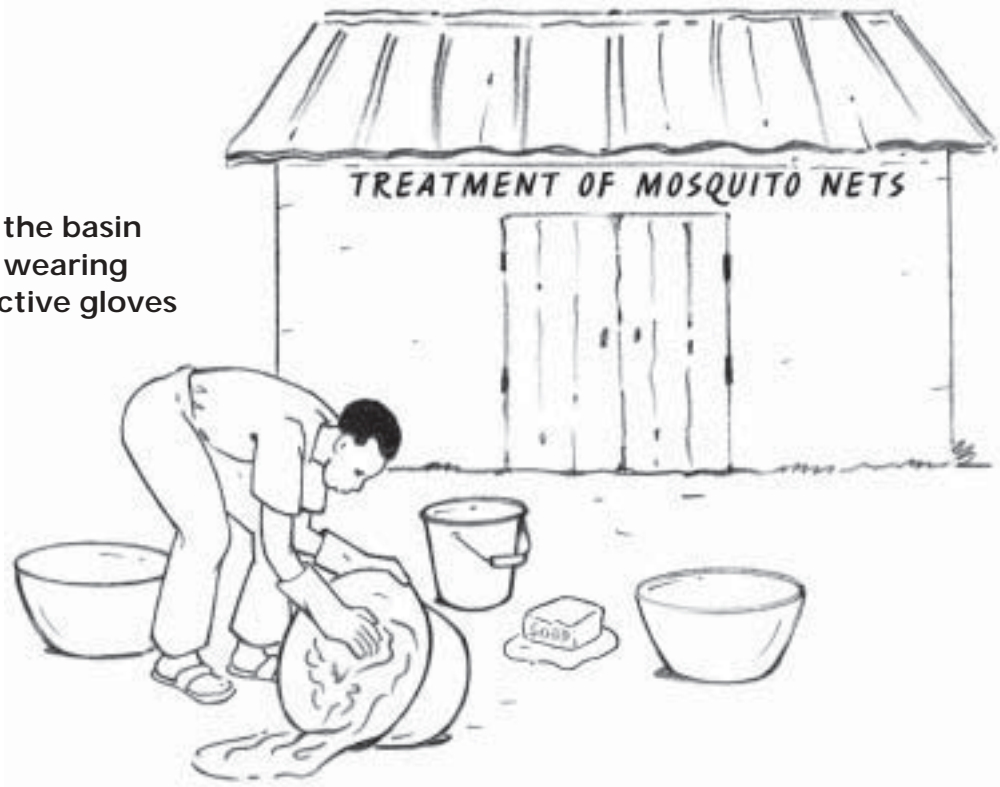
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After treating the nets

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**STEP 12** Wash hands and equipment with soap and lots of water

Wash the basin while wearing protective gloves



Remove gloves





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After treating the nets

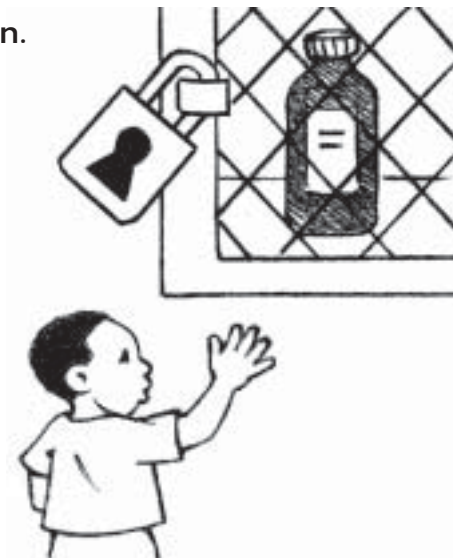
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Wash your hands  
with soap

**STEP 13** Store leftover insecticide:

- in its original container,
- in the dark,
- away from children.



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## Safe use of insecticides

---

Insecticides used for mosquito nets are not harmful to people if used correctly.



**Always wear gloves when handling insecticides or the wet net.**



**If insecticide splashes into the eyes, rinse immediately with plenty of clean water.**



**If insecticide splashes onto the skin, wash immediately with clean water. The insecticide might cause a tingling sensation on the skin, but this is not dangerous and should go away in a few hours.**



# How to use the treated net

## Hanging the treated net

### Sleeping indoors

Once the net is dry, hang it from the walls or roof to cover the bed or sleeping mat.

To keep the mosquitoes and other insects out, be sure to tuck the bottom of the net under the mattress or let it hang so that it touches the ground all around.



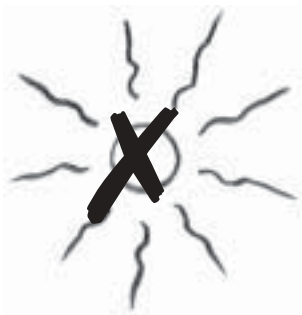
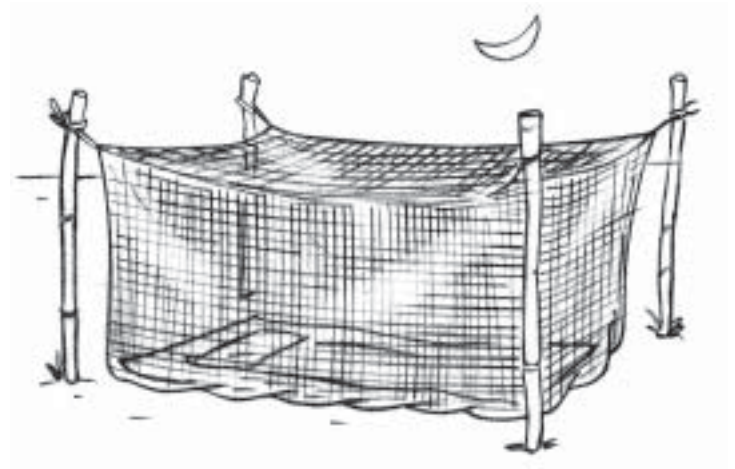
**Avoid using fire near the net.**



### Sleeping outdoors

Hang the net over the sleeping mat on sticks at each corner or under a tree. Tuck the net under the sleeping mat or make sure it touches the ground all around.

### Hanging the net outdoors



**Do not leave the net in the sun during the day because sunshine weakens the insecticide.**



---

## Washing the treated net

---

### Washing removes insecticide from the net.

Wash the net gently with soap and **cold water**. **Avoid hard and frequent washing because it removes the insecticide.**

Always wash the net before treating it again.

Do not wash and rinse the net in rivers, lakes or ponds. The insecticide from the net may be harmful to small fish. Always dispose of water used for washing and rinsing the net in the latrine or on the ground, away from home and animals.



**Wash the net gently and as seldom as possible**



### Repair torn nets

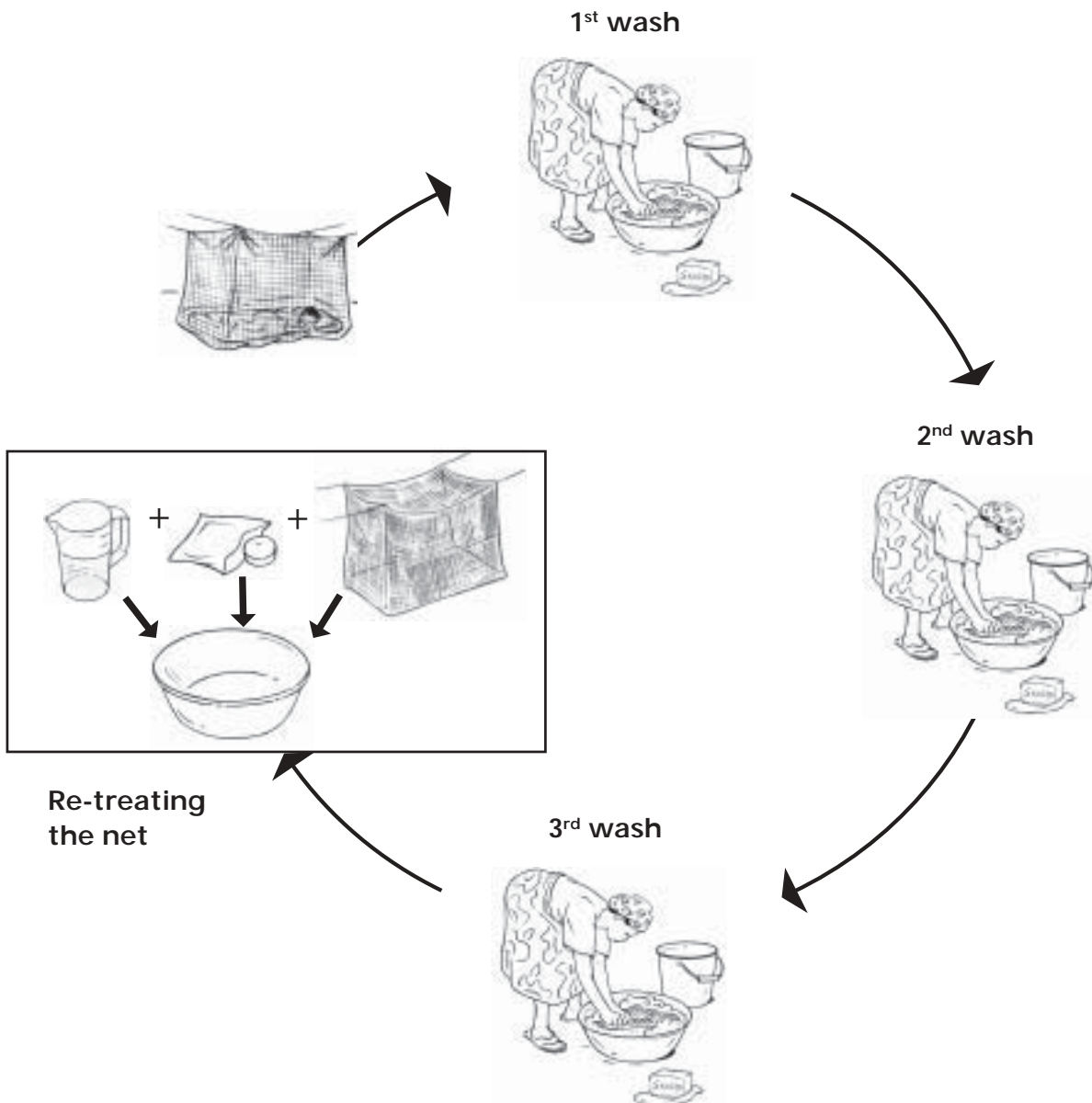
If the net is torn, sew it up so that mosquitoes and other insects cannot get inside.

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## When to re-treat the net

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Washing treated nets always removes insecticide. Unless you have a “long-lasting insecticidal net”, it must be treated again after it has been **washed three times**, or at least once a year even if it is not washed.



Re-treat the net after three washes or at least once a year

---

## When to re-treat the net

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A good time to treat the net is just before the rainy season.

You may wish to treat the net twice a year in areas that have a lot of mosquitoes all year long.

**It is best to treat the net just before the rainy season**

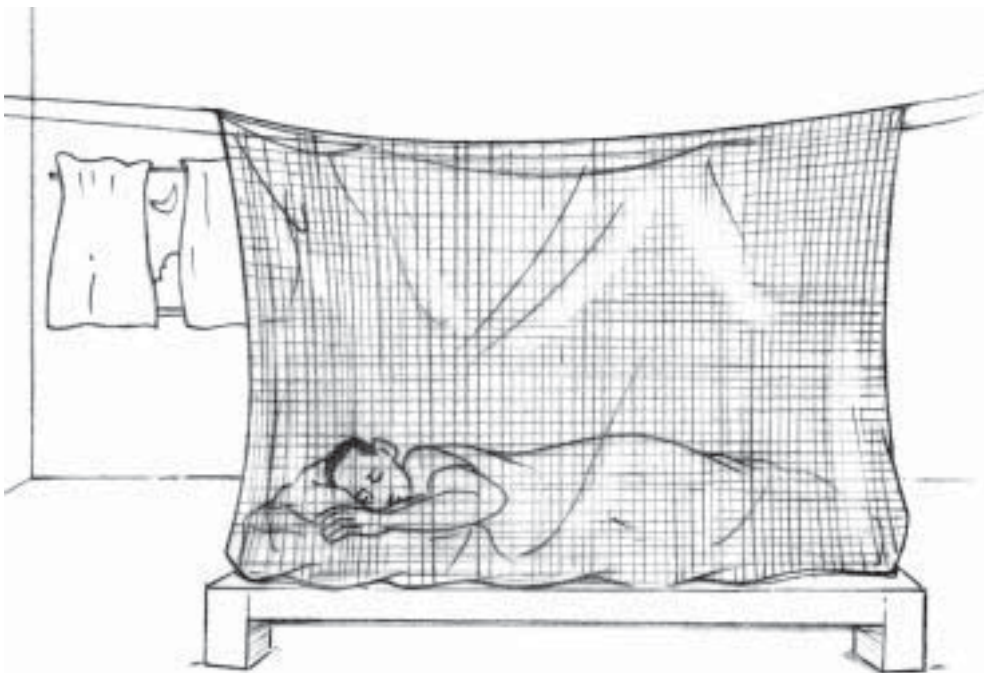


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## When to use the treated net

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**Use the net every night, all year round, even if you don't see or hear mosquitoes.** You never know when a malaria mosquito might bite.



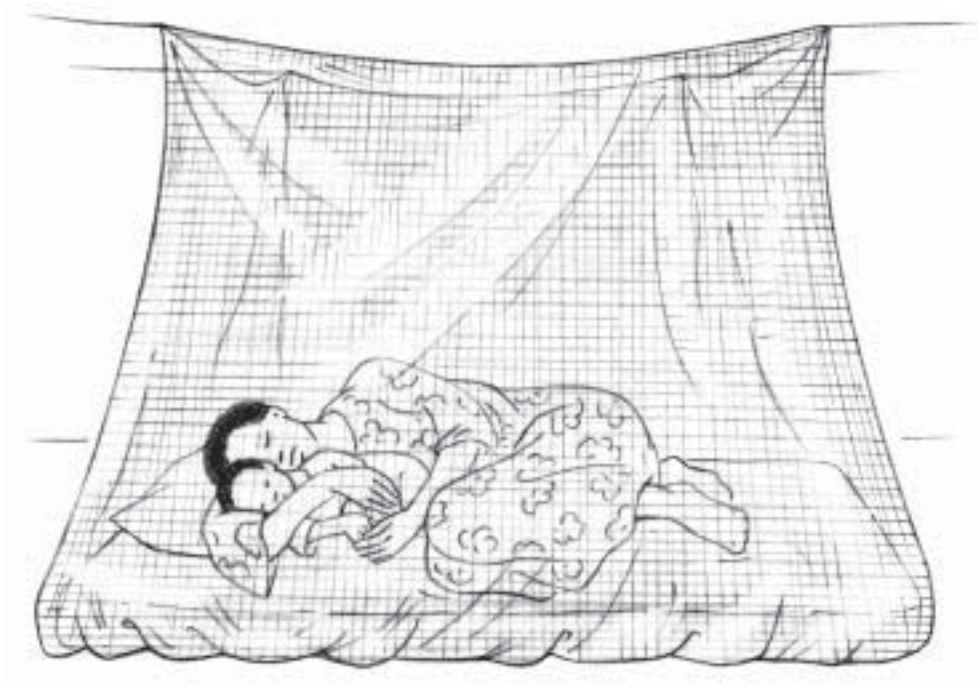
**Use your net every night, all year round**

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## Who should use the treated net?

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Everyone should sleep under a treated mosquito net. But don't forget that pregnant women and children under five are at the greatest risk of dying from malaria.



**Everyone should sleep under the treated net, especially pregnant women and children under five**

### **Remember**

- Treat the net with insecticide at least once a year.
- Avoid frequent washing of the treated net since washing removes the insecticide.
- Use the treated net every night, even if you don't see or hear mosquitoes.
- Protect yourself and your family from mosquitoes and malaria.

**And sleep well!**



## ANNEX 1

# Introduction to steps in treating mosquito nets with insecticides

### Introduction

What follows are summary sheets of the steps for treating mosquito nets with insecticides:

- Annex 2 for home treatment and
- Annex 3 for mass treatment.

You may want to adapt the home treatment instructions for distribution to net users with nets and insecticides and for posting in health facilities and other community locations. The mass treatment instructions might also be converted into a poster for display at dipping centres and community dipping sites.

Drawings can be freely reproduced and used, including in promotional documents produced by private companies.

### Adapting the instructions

In order to ensure that the instructions are appropriate for your community, review the pictures and words used and adapt them, as necessary.

For example:

- What kind of basin or bag would be used to treat the net?
- What kind of containers are commonly used to measure water?
- Which local words are used to describe malaria, mosquitoes, mosquito nets, insecticide and other equipment?
- Are the pictures appropriate for your community? Do the faces, clothes, houses or treatment steps need to be changed?

### Testing the instructions

Consider testing the locally adapted instructions to ensure that people can understand and follow them safely and effectively.

- For home treatment, select a variety of community members who will practise using the instructions to dip a net. Observe their dipping practice and note any problems.
- For a dipping centre, invite the staff to practise using the instructions to dip one or more nets.

If problems were noted, ask people how the instructions could be made clearer.





## ANNEX 2

## Steps in home treatment of mosquito nets with insecticide

**1. Collect the necessary equipment: basin or plastic bag, insecticide, measuring equipment, net, gloves and soap.****3. Measure the correct amount of water and pour it into the basin or plastic bag:**

- 1/2 litre for a synthetic net
- 2 litres for a cotton net

**7. Soak the net long enough to ensure that insecticide + water mix reaches all parts of the net.****8. Lift the net and wring gently.**

**If you wring too hard you will lose the insecticide.**





9. Stretch the net out flat in the shade to dry.



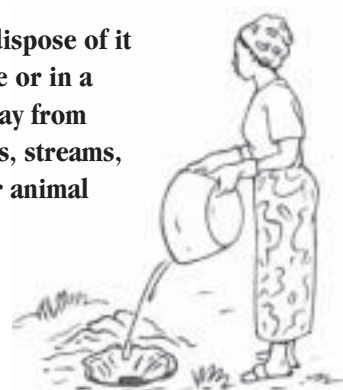
Later, it can be hung up to finish drying.



10. Use any leftover mix of water and insecticide to treat curtains.



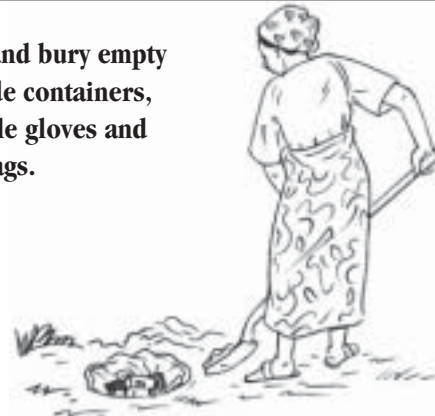
Otherwise, dispose of it in the latrine or in a hole, but away from ponds, rivers, streams, the house or animal shelters.



11. Wash the basin with soap and lots of water.



12. Destroy and bury empty insecticide containers, disposable gloves and plastic bags.



### Remember

- Treat the net with insecticide after three washes or at least once a year.
- Avoid frequent washing of the treated net since washing removes the insecticide.
- Use the treated net every night, even if you don't see or hear mosquitoes.
- Protect yourself and your family from mosquitoes and malaria.

**And sleep well!**

13. Wash your hands with soap.





## ANNEX 3

## Steps in mass treatment of mosquito nets with insecticide

1. Collect the necessary equipment: basin or plastic bag, insecticide, measuring equipment, nets, gloves, and soap.



2. Put on protective gloves.

3. Measure the correct amount of water and pour it into the basin or plastic bag:

- 1/2 litre for each synthetic net
- 2 litres for each cotton net

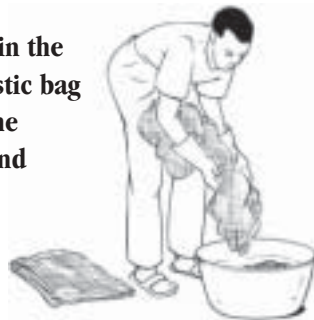


4. Add the correct amount of insecticide to the water.



5. Mix the water and insecticide.

6. Put the nets in the basin or plastic bag containing the insecticide and water mix.



7. Soak the nets long enough to ensure that the insecticide and water mix reaches all parts of the nets.



8. Lift the nets and wring gently.



If you wring too hard, you will lose the insecticide.

9. Stretch the nets out flat on plastic sheeting to dry in the shade.



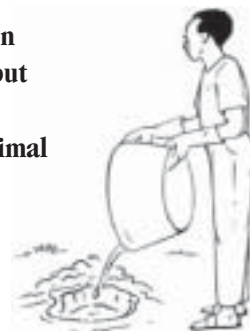
Later, they can also be hung up to finish drying.



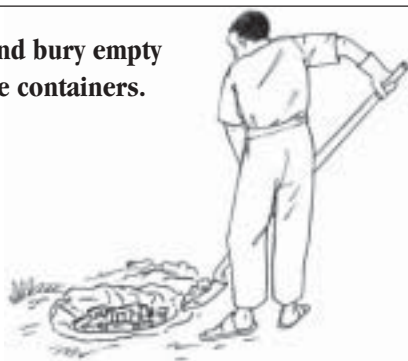
10. Use any leftover mix of water and insecticide to treat curtains.



Otherwise, dispose of it in the latrine or in a hole, but away from ponds, rivers, streams, the house or animal shelters.



11. Destroy and bury empty insecticide containers.



12. Wash hands and equipment with soap and lots of water.



13. Store leftover insecticide:
- in its original container,
  - in the dark,
  - away from children.

### Remember

- Treat the net with insecticide after three washes or at least once a year.
- Avoid frequent washing of the treated net since washing removes the insecticide.
- Use the treated net every night, even if you don't see or hear mosquitoes.
- Protect yourself and your family from mosquitoes and malaria.

**And sleep well!**





**For further information:**

- on malaria, generally, and malaria control: [www.rbm.who.int](http://www.rbm.who.int)
- on insecticide-treated nets and specifications for netting materials: [www.rbm.who.int/itns](http://www.rbm.who.int/itns)
- on insecticides (efficacy, safety, specifications, choice, etc.) and vector control: [www.who.int/ctd/whopes](http://www.who.int/ctd/whopes)
- on communicable diseases generally: [www.who.int/infectious-diseases-news](http://www.who.int/infectious-diseases-news)
  
- to order free WHO documents on communicable diseases: [cdsdoc@who.int](mailto:cdsdoc@who.int)
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