

# How will the reduction of tariffs and taxes on insecticide-treated bednets affect household purchases?

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**Abstract** One of the steps called for in the fight against malaria is the removal of tariffs and taxes on insecticide-treated bednets (ITNs), netting materials, and insecticides, with a view to reducing the retail prices of ITNs and thus increasing utilization. In this paper we develop an approach for analysing the extent to which reform of tariff and tax policy can be expected to increase ITN purchases. We consider the following questions:

(1) How much does the retail price of ITNs change if tariffs and taxes are reduced or eliminated?

(2) How responsive is consumer demand to changes in the retail price of ITNs?

Data on the price elasticity of demand for ITNs are very limited. Nevertheless, they suggest that ITN demand is not highly responsive to lower prices if household preferences are held constant. The reduction in retail prices associated with the removal of tariffs and taxes depends on the structure of the market in individual countries. In Nigeria, reducing the tariff on insecticides from 42% to zero and the tariff on netting materials from 40% to 5% is expected to increase ITN purchases by 9–27%, depending on the elasticity used. Country-specific information about market structure and cost conditions is needed if predictions are to be made as to how a specific policy change will affect ITN purchases.

**Keywords** Bedding and linens/economics; Insecticides/therapeutic use/economics; Taxes; Public policy; Malaria/prevention and control; Households; Causality; Models, Economic; Africa; Nigeria (*source: MeSH, NLM*).

**Mots clés** Literie et linge/économie; Insecticides/usage thérapeutique/économie; Taxe; Politique gouvernementale; Paludisme/prévention et contrôle; Ménages; Causalité; Modèle économique; Afrique; Nigéria (*source: MeSH, INSERM*).

**Palabras clave** Ropa de cama y ropa blanca/economía; Insecticidas/uso terapéutico/economía; Impuestos; Política social; Paludismo/prevenición y control; Hogares; Causalidad; Modelos económicos; África; Nigeria (*fuelle: DeCS, BIREME*).

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*Voir page 898 le résumé en français. En la página 898 figura un resumen en español.*

## Introduction

Malaria is a barrier to economic and social development and a cause of immense hardship to communities throughout sub-Saharan Africa. It accounts for 20% of mortality among children under 5 years of age and 10% of the continent's overall disease burden (1). It imposes tremendous costs on households, businesses, health systems, and government budgets and is believed to be one cause of the poor economic performance and persistent poverty of many African nations.

On 25 April 2000 the heads of state or representatives of 44 African countries assembled in Abuja, Nigeria, to approve a plan of action for controlling malaria. A major recommendation of the resulting Abuja Declaration was that the use of insecticide-treated bednets (ITNs), one of the most effective interventions for protecting children and pregnant women against malaria, should be greatly expanded. Among the specific steps called for was the removal of tariffs and taxes on

ITNs and untreated nets packaged with a single insecticide treatment and the materials from which they are made. By 25 April 2001, the first Africa Malaria Day, at least ten African countries had announced their intention to eliminate or substantially reduce ITN tariffs and taxes.

ITNs are a low-cost, easily produced, and practical weapon in the fight against malaria. If properly used and maintained they can reduce all-cause mortality in children by an average of 17% and the incidence of severe and mild malaria episodes by 45–48% (2). Unfortunately, there is evidence that relatively few people in high-risk regions use them. WHO estimates that fewer than 10% of at-risk children and pregnant women in Africa regularly sleep under ITNs. Even where a larger proportion of households report owning a net, regular treatment with insecticides is rare (3). The public health challenge is to increase household demand for and access to ITNs on a scale commensurate with the size of the populations at risk. In order to achieve the Roll Back Malaria goal of 60%

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utilization by children and pregnant women it would be necessary for Africans to purchase and appropriately utilize 32 million new nets per year for the next 10 years (5).

Various social, behavioural, and economic barriers to ITN use have been identified. They include a lack of information about the benefits of ITNs, poor access to markets for ITNs and insecticide treatment, cultural preferences, and low incomes (6, 7). The price of ITNs is another important barrier to greater utilization (8–10). The reduction of prices may be a prerequisite for success with most other interventions. The retail price of an ITN is often equivalent to a significant proportion of a low-income household's annual disposable cash income. Additional costs are incurred for retreating bednets every six months.

One way for Africa to encourage the use of ITNs, at least in the short run, is to reduce or remove tariffs and taxes on treated and untreated nets, netting materials, and insecticides. The most direct pathway by which reducing or removing tariffs and taxes could achieve the goal of promoting ITN use, though not the only one, is to lower retail prices for ITNs, leading to greater consumer purchases. The purpose of this paper is to analyse whether, and by how much, tariff and tax policy reform can be expected to increase ITN purchases through a direct effect on retail prices. To do so, it is necessary to answer the following key questions:

- (1) How much does the retail price of ITNs change if tariffs and taxes are reduced or eliminated?
- (2) How responsive is consumer demand to changes in the retail price of ITNs?

We review some current data on tariff and tax rates and ITN prices in selected African countries. Price elasticity of demand for ITNs is examined and two models are developed to show how different market conditions would affect the translation of reductions in tariff and tax rates into changes in retail prices. The models are applied to current data from Nigeria.

## Current tariffs, taxes, and prices of insecticide-treated bednets

Table 1 presents retail prices of untreated nets and ITNs in selected African countries together with current World Bank estimates of gross national product (GNP) per capita. As of 2001 retail prices for nets, whether treated or not, represented 4–6% of gross domestic product (GDP) per capita in many countries and a significantly higher proportion of disposable income.

Old and new tariff and tax rates in some of the countries that have taken steps in accordance with the Abuja Declaration are shown in Table 2. We analyse below how the tariff and tax reductions shown in Table 2 might affect household purchases of ITNs.

## The basic economics of tariff and tax policy reform

In this section we consider the two key questions indicated above, the answers to which should determine the effect of the policy change on retail purchases of ITNs. To answer the second question (How responsive is consumer demand to changes in the retail price of ITNs?), we review the literature on ITN utilization and prices in order to assess what is known about the price elasticity of demand for ITNs in Africa. To answer the first question (How much does the retail price of ITNs change if tariffs and taxes are reduced or eliminated?) it is necessary to assess how much of the change in the cost of imported nets or netting materials can be expected to be passed through the marketing channels to consumers.

## Responsiveness of demand to changes in prices

A large body of evidence attests to the efficacy of ITNs in preventing malaria, and a good deal of work has been done on their cost-effectiveness (13, 14). Surprisingly little is known, however, about the basic household economics of ITNs. In

Table 1. Examples of retail prices of untreated and treated bednets, Africa, 2001

Country	Retail price of untreated net (US\$) <sup>a</sup>	Retail price of treated net (US\$)	GNP/capita (US\$) (11)	Source of price data
Côte d'Ivoire	Not reported by source	3.41–4.09	710	Côte d'Ivoire National Malaria Control Programme (2001)
Kenya (Kericho)	4.48 (large)	7.68 (large)	360	Lynne Elson, personal communication, 27 March 2001
Nigeria <sup>b</sup> (Lagos/Kano)	3.64–9.09	6.43–11.88	310	Bamgboye Afolabi, personal communication, 26 March 2001; Jerry Wright, personal communication, 30 March 2001
United Republic of Tanzania (Mwanza)	2.80 (small)–5.60 (large)	Treated nets and treatment kits not found in retail outlets visited	240	Elizabeth Mach, personal communication, 10 July 2001
Uganda (Kampala)	6.00–12.00 14.29 (small)	12–18	320	Nuwaha, 2001 (7); Angela Wakhweya, personal communication, 20 March 2001
Zambia (Lusaka)	5.39–8.99	10.80–21.58	320	Mubiana Macwan'gi, personal communication, 20 March 2001

<sup>a</sup> The size of the net is shown if it was reported. Small nets are typically intended for single beds. Large nets are designed for double or queen-sized beds. Size, materials (cotton or polyester), and other features all influence the retail prices of nets.

<sup>b</sup> The retail price of an ITN in Nigeria was inferred from data on retail prices for untreated nets and importers' stated prices for single-treatment insecticide sachets. Insecticides were not imported for net treatment in 2001, so actual retail price information was not available.

Table 2. Old and new tariff and VAT rates for insecticide-treated nets in Africa<sup>a</sup>

Country	Old tariff rate	New tariff rate	Old VAT rate	New VAT rate
Côte d'Ivoire	20%	0%	10%	0%
Kenya	25%	25% (outside EAC <sup>b</sup> ) 5% (EAC)	18%	0%
Mali	20%	0%	18%	0%
Nigeria	35% netting 37% insecticides	0% netting 0% insecticides	5% netting 5% insecticides	5% netting 0% insecticides
United Republic of Tanzania	25%	0%	20%	0%
Uganda	10–15%	0%	8%	0%
Zambia	25%	0%	17.5%	0%

<sup>a</sup> VAT = Value-added tax. Tariff rates on nets are for products identified in the Harmonized Tariff System using the United States 2001 Schedule B Book, Chapter 56, as "Knotted netting of twine, cordage or rope/other" (HS #5608.19). Tariff rates on insecticides are for products identified in the Harmonized Tariff System using the United States 2001 Schedule B Book, Chapter 38, as "Insecticides, rodenticides, fungicides, herbicides, antisprouting products and plant-growth regulators, disinfectants and similar products, put up in forms or packings for retail sale or as preparations or articles" (HS #3808) (12). For all countries, information on tariff rates was provided by the Trade Information Center of the International Trade Administration, United States Department of Commerce and through the authors' research. See reference 2 for more details.

<sup>b</sup> East African Community.

particular, we have not found a single estimate of a price elasticity of demand, a standard measure of price responsiveness, for ITNs which uses data from actual retail markets. Some researchers have used contingent valuation methods to estimate households' willingness to pay for ITNs, and their results provide an indication of the range of possibilities that might exist.

In one such study carried out in Ethiopia (15) it was concluded that household demand for untreated nets was inelastic with respect to price (i.e. a 1% price reduction led to an increase in demand of less than 1%), with a point elasticity estimate of about -0.5. In other words, if the retail price of nets fell by 10%, demand would increase by 5%. In regions where 20% of households purchase a net at the original price, this 5% increase in demand resulting from the price cut implies that 21% of households would be expected to buy a net at the lower price. The Ethiopia study (15) also concluded that demand was not very sensitive to higher incomes.

Point estimates of willingness to pay do not allow the estimation of elasticities, but they do provide an indication of gaps between retail prices and household preferences. Contingent valuation surveys in the United Republic of Tanzania (16) and Nigeria (17), for example, estimated median values of US\$ 2.50 and US\$ 2.11, respectively, for the willingness to pay for ITNs. Local market prices were US\$ 5.36 in the United Republic of Tanzania and US\$ 5.00 in Nigeria. At the study site in the United Republic of Tanzania and at two of five study sites in Nigeria, free or subsidized nets had previously been distributed by an ITN project. The study in Nigeria found some evidence that distribution of free or subsidized nets reduced subsequent willingness to pay.

For households that already own nets and have been exposed to social marketing through ITN projects, there is evidence that demand for insecticide retreatments is highly sensitive to prices in some locations but less so in others. In the Gambia, for example, the average rate of community retreatment was 77% in villages where insecticides were provided free of charge but only 14% in villages charged US\$ 0.50 per treatment per net, a huge difference that implies a relatively high elasticity of demand (18). However, the villages

in which retreatment cost US\$ 0.50 per net had previously received retreatments free of charge, and this experience might have reduced willingness to pay for retreatment. On the other hand, in three villages in Senegal almost 80% of nets in one village were treated when treatment was offered at US\$ 0.10 per net, while about 40% of nets in another village were treated when treatment cost US\$ 0.40 per net. A 300% price increase thus resulted in a 50% decline in demand (from 80% to 40% coverage), implying a relatively low price elasticity of demand of -0.16 (10).

Contingent valuation methods have also been used to estimate willingness to pay for community retreatment of nets. A study in Nigeria, for example, found that communities were willing to pay on average US\$ 0.21 for retreatment of nets (19), less than half the goal of US\$ 0.50 per treatment set by Roll Back Malaria in Nigeria. However, it is possible that many households would pay considerably more for the convenience of home treatment involving the use of a single-dose insecticide packet, just as people are often willing to pay much more for a household piped water connection than for a communal standpipe (20).

Since many households purchase untreated nets in order to reduce the nuisance factor of mosquitos rather than to prevent malaria, it is likely that the determinants of demand for insecticides differ from those for nets. It is also clear that households spend a good deal of money on malaria treatment and on other mosquito protection items, such as coils and sprays. Annual household expenditures on mosquito protection goods range from about US\$ 1 in rural Burkina Faso to almost US\$ 25 in urban Cameroon (21). However, ITNs are not perfect substitutes for other mosquito protection products, as nets provide protection only while people are sleeping (6).

There is insufficient evidence on which to base precise and reliable judgements about price elasticities of demand for ITNs, untreated nets, and retreatment. The short-term response of households to lower prices for ITNs is likely to be modest, provided that other determinants of demand, such as bednet quality, the cost of malaria treatment, and the understanding of malaria prevention among household members, remain con-

stant (6). Non-price factors that shift the demand curve for ITNs at any price are fundamental to the purchasing decision. These factors include historical patterns of use, household knowledge of the benefits of ITNs, access to markets where ITNs and retreatments are sold (22), cultural preferences and beliefs about nets and insecticides, and access to savings or credit sufficient to cover the initial investment in an ITN (21).

The available evidence does not allow us to answer question (2) (How responsive is consumer demand to changes in the retail price of ITNs?). In the analysis of tariff and tax reductions and retail prices that follows, we examine two scenarios, one in which demand responds only modestly to price changes and one in which it is somewhat more responsive.

### Transferring tariff and tax reductions to retail price changes

To answer question (1), we must determine how the savings gained by the importer or domestic manufacturer as a result of lower tariffs or taxes are passed on to the final consumer in the form of lower prices. We develop two models to do this. In Model 1, ITNs are imported as final consumer items by local importers who sell them to shops, which in turn sell them to the final consumers. Model 2 considers the case where netting and insecticides are imported for the production of ITNs locally. These ITNs are sold through retail shops to the final consumers.

To simplify the analysis we limit our discussion to tariff changes. Models for reductions in domestic taxes can easily be produced by extension of the models presented here. We treat ITNs as a single product, even though untreated nets (or netting materials) and insecticides are typically imported separately and are subject to different tariff rates. This does not alter the conceptual basis of the analysis. The empirical example from Nigeria presented at the end of this section demonstrates that it is easy to repeat the analysis for untreated nets and insecticide treatments imported separately.

#### Model 1: Insecticide-treated nets imported as final consumer items

In Model 1 we assume that finished ITNs are imported as final consumer items and that there is no local production of nets. The import price of an ITN in local currency ( $p^w$ ) is typically the cost, insurance, and freight (CIF) US\$ price at the port of entry multiplied by the local currency exchange rate. Exchange rate policies determine if the importer's rate is a market rate or a distorted rate attributable to currency controls and other policies. Importers pay tariffs and other import fees which add an additional percentage equal to the tariff rate,  $r^T$ , to the import price, so that the importer's basic cost is  $p^w(1 + r^T)$ .

We now have to consider the marketing channel whereby a net passes from the importer to the final consumer. The private sector marketing chain can include international producers of ITN materials, importers, formal and informal domestic manufacturers of nets, and an array of distributors and retailers responsible for making ITNs available in every village and community. An insecticide importer in Nigeria, for example, reported that his product passed through the hands of between three and five distributors and retailers before it reached its end users.

Let us consider the case where importers sell directly to consumers, perhaps through their own retail outlets, e.g. village shops or market stalls, and set the price on the basis of cost plus a per unit profit  $M = r^I p^w$ , where  $r^I$  is a fixed percentage of the

CIF local currency price. The amount  $M$  could also represent additional costs per unit incurred in the importation and delivery of the ITNs to their retail outlets, including port handling fees and customs clearance charges.

If domestic taxes, such as value-added tax (VAT), are denoted as  $r^t$ , the final price at the retail level offered to consumers,  $P_R(T)$ , is:

$$P_R(T) = [p^w(1 + r^T) + M](1 + r^t).$$

For example, with an import (CIF) price  $p^w = 100$ , a tariff rate of 50%, a VAT rate of 20%, and an importer mark-up of 30% of CIF, the final retail price would be  $P_R(T) = [100(1 + 0.50) + 100(0.30)](1 + 0.20) = 216$ .

If the tariff were eliminated the new retail price would be  $P_R(w) = [p^w + M](1 + r^t)$ . Using the same numerical example, the retail price without the tariff falls to:

$$P_R(w) = [100 + 100(0.30)](1 + 0.20) = 156.$$

The percentage change in the retail price which results from eliminating a tariff is:

$$[P_R(w) - P_R(T)] / P_R(T) = -r^T / (1 + r^T + M/p^w)$$

In the above example the elimination of a 50% tariff reduces the retail price by 28%, just over half the level of the tariff that was removed.

In order to estimate the final impact of a tariff reduction on consumer demand a price elasticity of demand, denoted as  $E < 0$ , is multiplied by the percentage change in retail purchases to approximate the percentage change in retail purchases as:

$$[Q_R(w) - Q_R(T)] / Q_R(T) = -[r^T / (1 + r^T + M/p^w)] * E$$

where  $Q_R(w)$  is the quantity sold without the tariff and  $Q_R(T)$  is the quantity sold with the tariff.

Table 3 provides three examples of this basic calculation in which possible demand elasticities drawn from the above review, current tariff and tax rates in various countries, and an illustrative profit rate of 30% are employed. In case 1, with a tariff rate of 25% and a demand elasticity of  $-0.5$ , eliminating the tariff would reduce retail prices by about 16% and increase ITN purchases by 8%. In case 2, with a tariff rate of 40%, which could be viewed as the tariff plus domestic taxes, and the same elasticity, eliminating the tariff would reduce retail prices by 23.5% and increase purchases by about 12%. In case 3, where demand is highly responsive to price ( $E = -1.5$ ) and the tariff rate is also high, removing the tariff again reduces price by 23.5% but increases purchases by 32%.

It should be borne in mind that the above equation and examples are based on the assumption that the price elasticity of demand remains constant for the price reduction under consideration, no matter what the starting price of the ITN is. This assumption implies that the demand schedule is non-linear and becomes less steep as the price falls. In absolute price units, therefore, a reduction of US\$ 1 from the original price leads to a larger *increase* in demand than the *decrease* in demand would be if the original price were increased by US\$ 1. The assumption of a constant price elasticity of demand produces larger estimates of the effect of price reductions on demand than would, for example, a linear demand schedule (23).

If Model 1 accurately reflects the real conditions, removing ITN tariffs can be expected to produce substantial benefits in countries with high initial tariff levels and price responsiveness. It is important to remember that, where ITN utilization rates are low, even a 20% increase in purchases represents a somewhat small absolute number.

Table 3. Effect of tariff reduction with fixed profit M per unit imported (Model 1)

Parameter	Case 1	Case 2	Case 3
Tariff rate ( $r^T$ )	25%	40%	40%
Importer's profit rate as percentage of import price ( $M/p^w$ )	30%	30%	30%
% reduction in retail price attributable to tariff removal	-16.1%	-23.5%	-23.5%
Price elasticity of demand (E)	-0.5	-0.5	-1.5
% increase in retail purchases	8.1%	11.8%	32.3%

**Model 2: Materials imported, nets manufactured locally, and then sold to final consumers**

We now consider the case where netting materials are imported and used to manufacture ITNs domestically. The ITNs are then sold through retail shops to households. If ITNs can be produced by local manufacturers at a constant marginal cost, i.e. if each additional net costs the producer the same amount of money as the previous one, the marginal cost can be defined simply as  $p^w (1 + r^T) + b$ , where b denotes other costs of producing an ITN locally, e.g. the cost of labour. For Model 2 the initial retail price is then:

$$P_R(T) = [p^w (1 + r^T) + b + M] (1 + r^f);$$

and the retail price without the tariff is:

$$P_R(w) = [p^w + b + M] (1 + r^f).$$

The percentage change in the retail price becomes:

$$[P_R(w) - P_R(T)] / P_R(T) = -r^T / [1 + r^T + (M + b)/p^w].$$

In this situation the unit profit M plus the additional per unit production costs b determine the final impact of the tariff reduction on retail prices.

Table 4 provides numerical examples that can be compared directly with the numbers in Table 3. For case 1 under Model 2, removing a 25% tariff leads to a 12% reduction in retail prices and a 6.1% increase in ITN purchases. For case 2, removing a 50% tariff reduces the retail price by 18% and increases purchases by 9.1%. For case 3, where demand is rather price-responsive, retail prices also fall by 18% but demand increases by 27%. These increases in purchases, while potentially important, are less than the corresponding increases estimated for Model 1.

Model 2 assumes that the producer sells directly to final consumers. A simple extension to Model 2 allows for additional players in the marketing chain. If producers sold to suppliers and these sold to retail outlets that sold to final consumers, additional mark-ups at each point would have to be included in the analysis. If, for example, one additional player in the marketing chain added a mark-up of Z per unit the retail price with the tariff would be  $P_R(T) = [p^w (1 + r^T) + b + M + Z] (1 + r^f)$ , and the percentage change in retail prices and purchases would be adjusted accordingly.

**Extending the models to other market conditions**

Models 1 and 2 assume that the marginal costs of supplying or producing ITNs are fixed and that all markets are perfectly competitive, i.e. sellers and buyers cannot individually influence market prices and all mark-ups reflect normal profits. We are willing to believe that retail markets are fairly

Table 4. Effect of tariff reduction for domestically produced ITNs (Model 2)

Parameter	Case 1	Case 2	Case 3
Tariff rate ( $r^T$ )	25%	40%	40%
Importer's profit rate as percentage of import price ( $M/p^w$ )	30%	30%	30%
Local production costs per unit as percentage of import price ( $b/p^w$ )	50%	50%	50%
% change in retail price attributable to tariff removal	-12%	-18%	-18%
Price elasticity of demand (E)	-0.5	-0.5	-1.5
% change in retail purchases	6.1%	9.1%	27.0%

competitive in Africa, but the potential clearly exists for non-competitive practices by importers and manufacturers. In general, increasing marginal costs of production and non-competitive practices can be expected to reduce the transfer of tariff reductions to retail prices, leading to a smaller change in ITN purchases than in the competitive markets portrayed in Models 1 and 2. Under monopolistic conditions, retail prices are likely to be substantially higher than under competitive conditions. This implies a significant transfer of wealth from consumers to monopolistic or oligopolistic suppliers.

In all the cases we have considered, the transfer of tariff reductions to retail prices, while not trivial, is attenuated by basic market mechanisms. The impact of a change in tariff policy depends heavily on the market structure of the country in question (24). It is therefore important to adapt the analysis to country-specific conditions. The models presented here show two ways in which analyses can be carried out. Detailed analysis using country-specific information about market structure and cost conditions is needed to predict how a specific policy change will affect ITN purchases in a given country (25).

**An example from Nigeria**

In Nigeria, most if not all untreated nets are manufactured locally from imported materials. For this example (Table 5) we assume that importers sell the materials to local manufacturers who assemble the untreated nets and sell them to local distributors. There is no local production of insecticides for treating the nets, so treatment products, whether for individual or community use, have to be imported as finished products and then sold directly to distributors. We also assume that netting materials and insecticides are imported separately and that a single untreated net and a single-treatment packet of insecticide are packaged together by a local distributor for final sale as an ITN.

In 2001, tariffs and taxes on netting materials were reduced from 40% to 5%. Tariffs and taxes on insecticides for public health use, which had been 42%, were eliminated completely. Using a combination of actual cost data provided by colleagues in Nigeria and inferred costs based on known retail prices and margins, we estimate that the reduction in tariffs and taxes on netting materials and insecticides would lead to an 18% decline in retail prices, from US\$ 5.61 to US\$ 4.61 per ITN (Table 5). At a price elasticity of demand of -0.5 there would be a 9% increase in retail purchases. If, on the other hand, the price elasticity of demand were -1.5, retail purchases would rise by 27%.

Table 5. Example of Models 1 and 2 showing the effect of tariff and tax policy reform on ITN purchases in Nigeria

<b>1. Distributor price for an untreated net (US\$)</b>		
<i>Costs per net</i>	<b>Old rate (40%)</b>	<b>New rate (5%)</b>
CIF <sup>a</sup> of imported materials	1.00	1.00
Tariff and VAT <sup>b</sup>	0.40	0.05
Import price after tariff and VAT	1.40	1.05
Port charges (clearance, delivery, etc.)	0.14	0.14
Total cost to importer	1.54	1.19
Importer's margin	0.05	0.05
Price of materials to manufacturer	1.59	1.24
Local manufacturing costs	0.50	0.50
Taxes	0.13	0.12
Manufacturer's margin	0.10	0.10
<b>Price paid by distributor</b>	<b>2.32</b>	<b>1.96</b>
<b>2. Distributor price for a single insecticide treatment kit (US\$)</b>		
<i>Costs per treatment kit</i>	<b>Old rate (42%)</b>	<b>New rate (0%)</b>
CIF of imported kit	1.36	1.36
Tariff and VAT	0.58	0.00
Import price after tariff and VAT	1.94	1.36
Port charges (clearance, delivery, etc.)	0.21	0.21
Taxes	0.22	0.16
Total cost to importer	2.35	1.72
Importer's margin	0.07	0.07
<b>Price paid by distributor</b>	<b>2.42</b>	<b>1.79</b>
<b>3. Retail price for an ITN (US\$)</b>		
<i>Costs per ITN</i>	<b>Old rate</b>	<b>New rate</b>
Supply price per ITN (net + treatment kit packaged together)	4.74	3.74
Domestic shipping cost	0.10	0.10
Distributor's mark-up	0.24	0.24
Wholesaler's mark-up	0.25	0.25
Retailer's mark-up	0.27	0.27
<b>Retail price</b>	<b>5.61</b>	<b>4.61</b>
<b>4. Results</b>		
Change in retail price attributable to tariff and tax reform		-17.9%
Change in retail purchases attributable to tariff and tax reform if E = -0.5 <sup>c</sup>		8.9%
Change in retail purchases attributable to tariff and tax reform if E = -1.5		26.9%

<sup>a</sup> Cost, insurance, freight.

<sup>b</sup> Value-added tax.

<sup>c</sup> E = price elasticity of demand.

This example is intended only as an illustration of the application of the models, not as representing a result of rigorous research. As in Models 1 and 2, the example assumes that Nigerian markets for untreated nets and insecticides are perfectly competitive. This may not be realistic at present. More suppliers may enter the market if the demand for ITNs rises in response to projects funded by the Nigerian Government and others. This would bring conditions closer to those assumed in the above example and would parallel the experience of the United Republic of Tanzania, the first country to take steps to eliminate tariffs and taxes on ITNs (2).

## Conclusions

Increasing household demand for, and access to, ITNs on a scale commensurate with the size of the populations at risk

remains a major challenge for African governments, international organizations, and public health specialists. The retail price of ITNs is often cited as a major barrier to their use. Although there is limited direct evidence that this is the case, it is certainly true that a low-income African household would have to spend a substantial proportion of its annual disposable income in order to obtain an ITN at current market prices. Bringing prices down may therefore increase purchases and facilitate success with other types of interventions, such as social marketing programmes.

We have developed two models that provide a starting point for estimating the impact of tariff and tax reduction on ITN purchases. We conclude that the elimination of tariffs and taxes should lead to some reduction in retail prices and that the price changes should induce a modest increase in ITN purchases in developing countries in the short run. However, the percentage increase in demand is likely to be comparatively smaller than the percentage of tariffs and taxes removed.

The policy change discussed in this paper has implications for public finance as well as for public health. Removing or reducing tariffs and taxes decreases government revenues. Eliminating a 25% tariff on a US\$ 5.00 imported net, for example, costs the government in question US\$ 1.25 in tax revenues for each net imported. However, this loss may be offset directly by a reduction in the cost of malaria case management at public health facilities resulting from ITN use, and indirectly by the higher tax revenues paid by healthier, more productive citizens (26). A country considering such a policy change should evaluate the public finance trade-off involved.

This paper has considered the public health implications of changing tariff and tax policy and has examined only one pathway by which the change could affect ITN utilization. There are other possible pathways, e.g. the potential for tariff removal to bolster the supply side of the market by allowing importers to compete with domestic manufacturers. Further research is needed to determine how important these other effects might be, as well as to analyse the public finance, employment, and other outcomes of changes in tariff and tax policy.

We conclude that the reduction of tariffs and taxes can contribute to the expansion of ITN utilization. The priority should be to increase the demand for ITNs by altering household preferences. It is likely that price reductions of almost any magnitude will increase the success of all the other initiatives aimed at expanding ITN demand. As education and social marketing lead to an increase in the willingness to pay for ITNs, lower prices should foster a more rapid expansion of the market. This in turn might improve access and reduce the non-price costs of ITN use, such as travel time to the nearest vendor. Lower prices should also reduce the numbers of people requiring project-subsidized nets. As there are major concerns about the sustainability of subsidized ITN programmes and their impact on the creation of commercial markets for nets, reducing the size of the target population for free or subsidized nets is important. Finally, the waiving of tariffs and taxes on ITNs may serve as a signal to the public and to donor agencies of government commitment to ITN promotion and malaria control. ■

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## Résumé

**Réduction des droits de douane et des taxes sur les moustiquaires imprégnées d'insecticide : incidence sur les achats des ménages**

L'une des mesures qui s'impose dans la lutte contre le paludisme est la suppression des droits de douane et des taxes sur les moustiquaires imprégnées d'insecticide, sur les matériaux utilisés pour leur fabrication et sur les insecticides afin de les rendre moins cher et d'encourager leur utilisation. Les auteurs du présent article ont mis au point une formule pour étudier la mesure dans laquelle une réforme de la politique douanière et fiscale pourrait favoriser l'achat de telles moustiquaires. Les points suivants ont été examinés : 1) baisse du prix de détail qu'entraînerait la réduction ou la suppression des droits de douane et des taxes ; 2) effets du changement du prix de détail sur la demande des consommateurs. Si les informations sur l'élasticité de la demande en fonction du prix sont peu

nombreuses, elles laissent toutefois entendre que la demande ne réagit guère à la baisse du prix si les préférences des ménages restent constantes. La réduction du prix de détail liée à la suppression des droits de douane et des taxes dépend de la structure du marché de chaque pays. Ainsi, au Nigéria, la réduction des droits de 42 à 0 % sur les insecticides et de 40 à 5 % sur les matériaux utilisés pour la fabrication de moustiquaires devrait entraîner une augmentation de 9 à 27 % des achats de moustiquaires selon l'élasticité retenue. Pour prévoir la façon dont un changement de politique affectera les achats de moustiquaires imprégnées d'insecticide il faut pouvoir disposer d'informations sur la structure du marché et les conditions de coûts de chaque pays.

## Resumen

**Efecto en las compras domésticas de la reducción de los aranceles e impuestos sobre los mosquiteros tratados con insecticida**

Una de las medidas requeridas para combatir el paludismo es la supresión de los aranceles e impuestos sobre los mosquiteros tratados con insecticida (MTI) y los tejidos e insecticidas empleados para fabricarlos, a fin de reducir los precios al por menor de los MTI y de fomentar así su utilización. En este artículo desarrollamos un método para determinar hasta qué punto es posible fomentar la compra de esos productos reformando las políticas arancelarias y tributarias. Intentamos responder a las siguientes preguntas: (1) ¿Cuánto varía el precio al por menor de los MTI cuando se reducen o eliminan los aranceles e impuestos que los gravan? (2) ¿Cuál es la sensibilidad de la demanda de los consumidores a las variaciones del precio de venta al por menor de los MTI? Los datos sobre la elasticidad de la demanda de MTI

en función de su precio son muy limitados; no obstante, llevan a pensar que la demanda de MTI no es muy sensible a los precios bajos cuando las preferencias domésticas se mantienen constantes. La reducción de los precios al por menor asociada a la eliminación de los aranceles e impuestos depende de la estructura del mercado en cada país. En Nigeria, se prevé que la reducción de los aranceles sobre los insecticidas y sobre los tejidos de mosquitero del 42% al 0% y del 40% al 5%, respectivamente, aumentará la adquisición de MTI en un 9%–27%, según la elasticidad considerada. Es necesario obtener información sobre los costos y la estructura del mercado en cada país para poder predecir la magnitud de la incidencia de un determinado cambio de política en la compra de MTI.

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