



AT A GLANCE

- Over one million individuals die annually from malaria, and ninety percent of malaria-related deaths occur in sub-Saharan Africa.
- Insecticide treated nets (ITNs) are extremely effective in preventing transmission of malaria.
- Financial constraints rather than a lack of concern about malaria play a primary role in a poor household's decision not to purchase ITNs at the market price.
- The majority of people who own freely distributed ITNs are unwilling to resell them at market price because they place a greater value on them than their market worth.

Glance continued on page 2

What is the most effective way to deliver life-saving anti-malarial bed nets in the developing world?

Does free distribution to vulnerable households do more harm than good, or is it a critical component of an overall strategy? Dr. Vivian Hoffmann at the University of Maryland examines this issue and comes to a surprising conclusion.

Imagine that your three-year-old child has a fever. The cause could be serious or a harmless flu. You don't know the temperature, but your child feels awful. Unfortunately, a trip to the doctor might cost you three or four weeks' worth of income, and you are struggling to feed and clothe your family as it is. Afraid to bring additional hardship to your home for a passing illness, you wait to see if your child recovers. A day later, the condition is worse. You spend the money to visit the nearest clinic. By then it may already be too late to save your child's life.

This plight affects millions of households throughout the developing world. Malaria kills more than one million people each year, most of them children, with sub-Saharan Africa accounting for ninety percent of annual deaths. In addition to such high death tolls, high economic losses result from non-mortal cases. While treating the disease is costly, sickness also reduces individuals' capacity to work and can force steep drops in income for households already in deep poverty.

Dr. Vivian Hoffmann researches the effectiveness of various policies that address this crippling public health problem as part of her work in

the Department of Agricultural and Resource Economics at the University of Maryland. In recent work with Dr. Christopher Barrett and Dr. David Just



Malaria kills over a million people a year, most of them children, with sub-Saharan Africa accounting for 90% of annual deaths.

Glance continued from page 1

- Free distribution of ITNs will not incite large-scale reselling of nets or result in the undercutting of local net sellers and commercial market distribution.



Insecticide treated nets (ITNs) are extremely effective in preventing transmission of malaria.

POLICY IMPLICATIONS:

Free distribution of ITNs is a critical means to increase malaria prevention for the most vulnerable populations—very poor households with young children and pregnant women.

at Cornell University, Hoffman notes that insecticide-treated nets (ITNs) are a very effective way to prevent and reduce malaria. Malaria is transmitted through mosquito bites, most often during the night when people sleep. Covering beds with nets treated by insecticide kills mosquitoes and prevents bites, and is therefore highly effective in stopping transmission of the disease. The problem is that households living on very little income may be unable to afford the cost of mosquito nets or the cost of travel to areas where they can be purchased. In addition, the lifespan of traditional ITNs is usually only a year, after which they should be replaced or re-treated with insecticide.

While ITNs are widely considered the most cost-effective approach to fighting malaria, the best method for distributing ITNs in Africa is intensely debated. Proponents of market-based approaches fear that free distribution

of nets will in fact be harmful in the long run. Since the cost is simply too high to cover all groups exposed to malaria through free distribution, they emphasize the large gap in need for ITNs that private markets are left to fill. They argue that free distribution will inhibit the emergence of these critical private markets. They also point out that sustainable solutions require the existence of local commercial markets for the nets. If these markets do not develop, communities will be left with even worse access if free distribution stops in the future.

Advocates of free distribution, however, similarly argue that commercial strategies by themselves will not be able to achieve high enough levels of coverage. Even when the price of nets is highly subsidized, many poor households still find the cost of ITNs too expensive. Commercial suppliers are also unlikely to expand access to

remote areas if few households in those areas can afford the nets. Proponents of free distribution also emphasize the substantial indirect benefits provided to nearby non-users of ITNs, caused by the general reduction in overall infection rates in an area when mosquitoes are killed by the nets. Households will not take these indirect benefits into consideration in their ITN purchasing decisions, suggesting an important role for government or other outside assistance.

A critical question that may help move this issue forward is whether or not the free distribution of ITNs really has negative effects on the development of local markets. If not, the two approaches to ITN delivery may be compatible, and the most effective strategy may be a combination of both. Hoffman examined this question through recent field experiments she

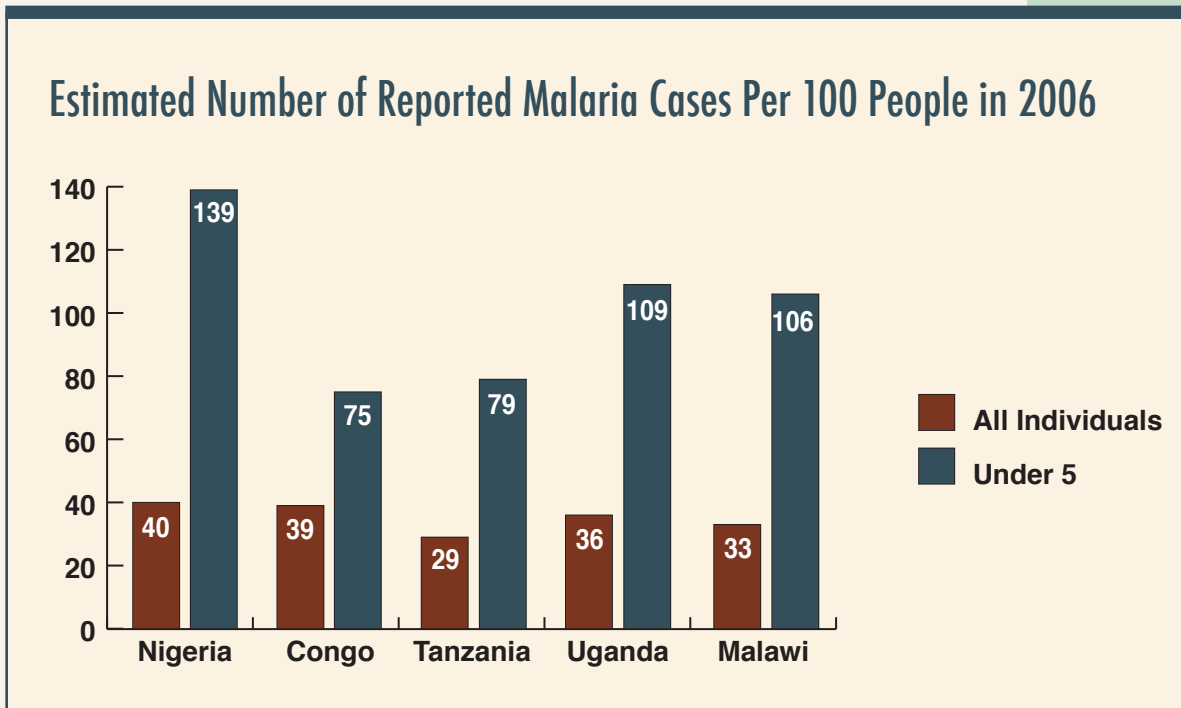
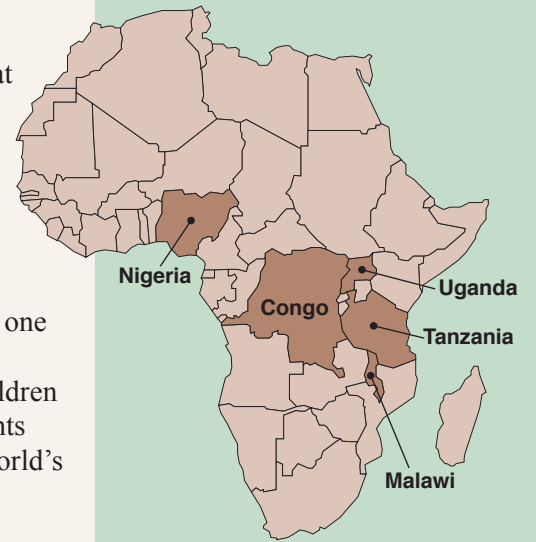
conducted in Uganda and found that free distribution is unlikely to have the negative effects feared.

The Social and Economic Costs of Malaria

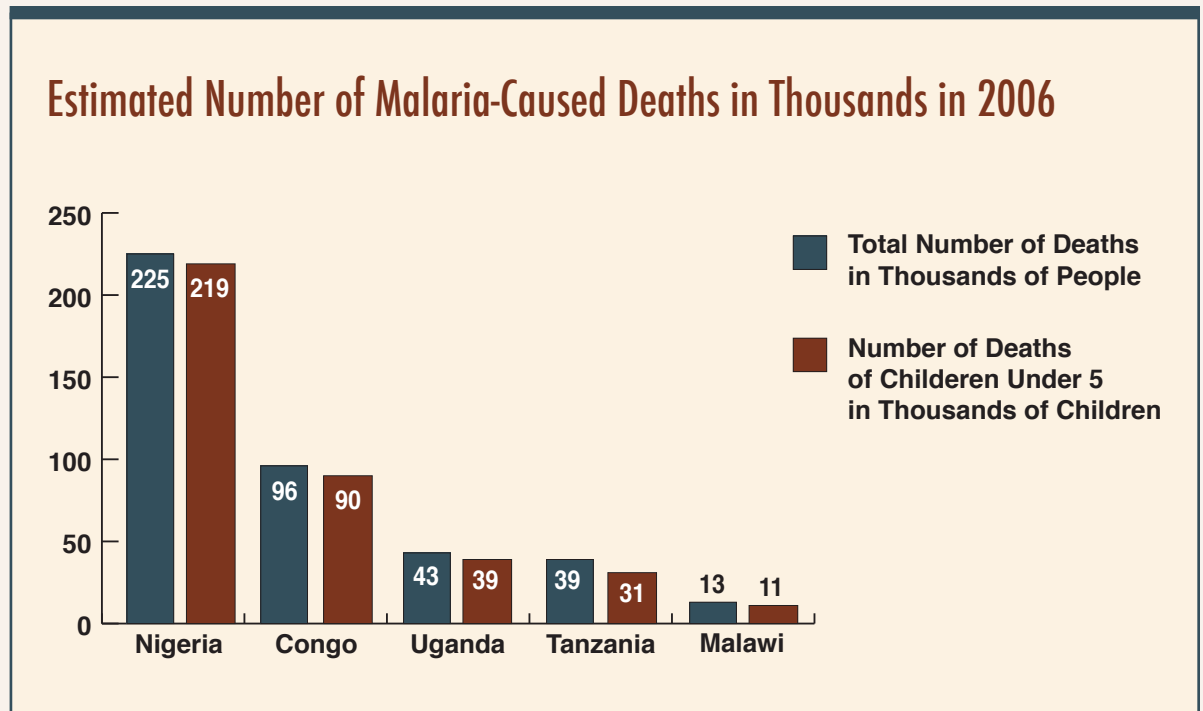
The World Health Organization estimates that malaria killed nearly one million people in 2006. Eighty-five percent of those who died were children under the age of five. Africa accounts for roughly ninety percent of the world’s malaria burden.

The Potential Pitfalls of Free Distribution

In an article published with co-authors Christopher Barrett and David Just in *World Development*, Hoffman explains why many people criticize the idea that free distribution of ITNs is the best way to improve reduce malaria infections in at-risk populations. There



From WHO *World Malaria Report 2008*. Only mean estimates reported (not upper and lower bounds). Note that cases per 100 people is not the same as percentage of people who had malaria at least once in the year, since one person can have multiple malaria cases in the same year



From WHO *World Malaria Report 2008*.

are in fact good reasons to question the effectiveness of free distribution. One problem is that target populations—very poor households with young children or pregnant women—may not be the ultimate users of goods that are freely distributed. If these households are not using ITNs in the first place, it is reasonable to believe they may resell them if received freely. Traditional economic theory suggests that if a person who is not willing to pay for a product at the current local price is given the product for free, he will prefer to sell it at the local price and use the money obtained in other ways.

For example, a poor household struggling to feed itself may care more about increasing the food intake of its children than protecting against mosquitoes. It may then sell freely given nets to a wealthier household in order to buy more food. While this may assist the initial household in some ways, it undermines the public health

objective of reducing malaria. It also frustrates any attempts that may have been made to target specific “high-risk” segments of a population. If many households resold their nets, it could cripple the potential overall impact of net-distribution projects and fail to protect the most vulnerable households.

Another issue is whether free distribution will prevent the development of local markets for ITNs, weakening the long-term sustainability of household ITN use and the benefits they bring. If many households resell nets they are freely given by aid agencies, this would create a secondary market for nets that may compete with locally sold nets and drive prices down. (A poor household receiving the net for free may be willing to sell it at a cheaper price than that charged by local net sellers in order to use the cash “windfall” for other essential purchases.) A similar concern is frequently raised in the context of

food-aid distribution. While presumably a good way to relieve hunger and improve food sufficiency for extremely poor households, a large supply of free food from aid agencies may drive prices down. This is good for poor farming households as buyers of food, but it is bad for them as sellers and depresses their incomes even further. In the context of mosquito nets, depressed local prices may hurt commercial sellers of mosquito nets enough that they decide not to sell them, causing the local ITN market to disappear. This would severely undermine sustainability objectives, creating dependence on donors and aid agencies for ITNs. If free distribution ever stops, access to nets may disappear.

Is Free Distribution Necessarily at Odds with Sustainability?

Hoffmann and her co-authors explain that there are also good reasons to believe that households—even extremely poor ones—may not resell ITNs they are freely given. The first is that the failure of households to purchase ITNs at current local prices may not be an indication of a household’s lack of willingness to pay the local price. Rather, it may be an indication of the household’s lack of ability to pay that price. Many households in rural areas of the developing world have very tight financial constraints and little access to credit. This prevents them from being able to obtain goods or services they might be willing to purchase even if they had to borrow money (and incur an additional interest cost) in order to pay for them.

Someone with enough cash on hand to easily cover the cost of an ITN, but who chooses not to buy one at local prices, clearly does not believe the net is worth the price being charged. Such a



OLYSET NET

person could reasonably be expected to sell a freely given net for very close to the local price (since they value the net below that amount) and use that money to buy something else. Someone in deep poverty, however, may actually value a net above the price at which it is being sold locally, even if he does not buy one. He may simply have far too little income and other resources to cover the ITN purchase. When provided an ITN for free, this individual will not resell it, since the highest price he could receive is the local price, and he believes the net is worth more than that. If financial constraints and difficulty accessing loans (rather than lower valuations of nets) drive households’ failure to purchase ITNs, they will not sell freely given nets on secondary markets.

Another factor that may prevent households from reselling nets they are freely given is the “endowment effect”—an increasingly well-documented divergence of behavior from standard economic theory. This effect refers to the observation that people apparently often value a good they already possess more than one they do not yet already own. For example, a

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OLYSET NET

person may decide a non-owned net is worth five dollars. She would therefore be willing to pay up to five dollars, and no more, in order to obtain it; she will refuse to buy the net if it costs eight dollars from the local net sellers. Now imagine she is given the net for free. A second person searching for a good deal might offer to buy the net from her for seven dollars. According to traditional economic theory, the original recipient will sell the good and increase her net gain by two dollars. While this is good for the original recipient and the second person in terms of individual payoffs, it clearly hurts the local ITN industry and frustrates policy attempts to target the original recipient.

Surprisingly, however, economists are finding more and more evidence from lab experiments that individuals value owned and non-owned goods at different prices. This means people require more money to part with an item they already have than they would have been willing to give in order to buy it. In the example above, the person who valued a non-owned net at five dollars might value the owned net at nine dollars. If so,

even though this person refused to buy an eight-dollar net, she will only sell a freely given net for nine dollars or more. Clearly, if the local price is just eight dollars, no one will buy the net from her. The existence of an endowment effect thus also reduces the likelihood that free distribution will undercut the development of local markets.

A final factor that may inhibit any tendency for free distribution to create harmful secondary markets stems from differences within households in what each person believes a net is worth. In households with multiple decision-makers, the recipient of a free ITN may value the net more than the household member responsible for purchases and other financial decisions. If the recipient of the free ITN has more control over how the net is used than the other household member, such a dynamic would increase the likelihood that households retain and use freely distributed nets. This may happen, for example, if men tend to control financial resources and women tend to value children's health more and see ITNs as an investment in child health.

What's Really Happening?

Hoffman and her colleagues found strong evidence that free ITN distribution will not induce secondary markets as feared. Their research was conducted in 2006 in remote villages of western Uganda. Locally purchased ITNs cost about \$5.50, not including transportation time and cost. ITNs are only available in an urban center many hours from the research villages on foot, or reachable by a \$7.50 motorcycle ride.

In the area they studied, ninety percent of household members suffer from malaria at least once a year. A single malaria episode is very expensive—costing on average of \$17.85 in treatment expenses and lost labor income. This represents 7.2

percent of annual per capita income. The cost in lives is also high—four out of five people in the area know someone who has died from the disease. Local knowledge about how the disease is transmitted is widespread—about ninety percent of respondents correctly reply it is spread through mosquito bites. Given the high toll malaria takes, one might therefore expect a high demand for mosquito nets. Yet still only about five percent of households in the area were using nets.

The experiment performed by Hoffmann and her colleagues was designed to elicit the values households place on nets and determine the likelihood that freely given nets would be sold to other households at prices that undercut local sellers. They obtained a couple of hundred high-quality ITNs at a wholesale price of \$7.63—a price they believe is close to the lowest that a local trader of this type of net might be able to charge and still turn a profit. After recruiting participants from households with at least one child under five, they freely distributed the nets to some individuals and cash money to others; a third group was simply invited to participate and given a small sum of money to compensate them for their time. All three groups were requested to offer prices at which they were willing to buy or sell the ITNs given to the first group. The maximum they were allowed to pay (if buying) or accept (if selling) was \$7.63, partly to reflect that this would have been the cheapest possible local price for the net.

The people who had to use their own financial resources to buy an ITN were willing and able to pay an average of \$2.34 for one net (far below the lowest price of \$7.63 a local trader selling the ITN might be expected to charge). On the other hand, among those given cash (which they could have simply taken and spent on something else), the



(c) M. Hallahan/Sumitomo Chemical-Olyset Net

OLYSET NET

Evidence was found that nets are valued highly enough that, even if freely given, they will not be resold. Seventy-three percent of the individuals who received nets for free were unwilling to sell them at the maximum price.

average bid was nearly six dollars. In fact, half of them were willing to pay the maximum price (\$7.63) they were allowed to bid in order to purchase an ITN from someone else (which means they probably valued the net at some unknown price even higher than the max of \$7.63). This strongly suggests that the reason households in the area do not own nets is not that they don't believe nets are worth the local prices charged. Instead, households simply have very tight cash constraints. While they would be willing to pay higher prices if they had the cash on hand, they cannot afford the sacrifices required to buy a net, given their typical resources. Note that a willingness to pay \$7.63 or higher when provided the cash to do so (rather than spend that cash on something else) implies that individual will require at least \$7.63 in order to part with the net (since clearly it is worth at least that much to him). This by itself is strong evidence that nets are valued highly enough that, even if freely

“Free distribution of ITN’s will not incite large-scale reselling of nets, undercutting local sellers of nets and commercial market distribution.”



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given, they will not be resold.

Yet even stronger evidence comes from the fact that seventy-three percent of the individuals who received nets for free were unwilling to accept the maximum price (\$7.63) for even just one of their nets. The fact that forty-nine percent of those given cash valued the nets at or above \$7.63, while seventy-three percent of those who were freely given the ITN value it above that price indicates a likely endowment effect. Once the net is owned, it is valued higher.

Interestingly, they did not find evidence that married men and married women value nets any differently from each other. Among those freely given ITNs, married men require about the same amount of money as married women in order to sell the net to someone else and are willing to spend about the same amount of cash they have been given for a net. However, Hoffmann and her colleagues found that married men are willing and able to spend about a dollar more on nets out of their own cash resources, reflecting the fact that men generally have access to more cash than women in rural Uganda.

Implications for Health Policy

Hoffman and her colleagues found that liquidity constraints (and not low valuations of ITNs) are a major reason for which more people do not purchase ITNs. They also found that the endowment effect does indeed cause

people to require substantially more money to part with an ITN they already own than they would have been willing to pay for it. Together, these suggest that free distribution of nets will not incite large-scale on-selling of the nets, which would undermine commercial market distribution.

Moreover, in a simulation of the market for nets in rural western Uganda, they found that less than six percent of nets would be resold. Perhaps the most compelling evidence, however, is that very few of the households that were freely given nets were willing to resell them at their true cost (which represented relatively high prices), and none of the households that had to use their own cash resources were willing to pay the true cost of the net. This suggests that households with freely given ITNs would only accept quite high prices to part with the ITN—prices that are too high for other households to be able to pay.

Freely given ITNs thus appear likely to “stick” to a targeted group unable or unwilling to pay for the nets on their own. Fears over “external leakage” of targeted ITN interventions to non-poor or non-targeted groups, as well as weakening the development of commercial markets, appear unfounded. Free distribution of ITNs therefore appears to remain a critical component of reducing malaria in the most vulnerable populations, with little risk of the negative long-term drawbacks. ■