Battling Over Bed Nets

A collision of big thinking and logistical realities has sparked an intense debate over how best to deliver bed nets to combat malaria in Africa

JEFFREY SACHS IS AN IMPATIENT MAN. In a widely promoted editorial in *The Lancet* on 21 June, the economist, public health advocate, and head of Columbia University's Earth Institute lit a fire under the organizations and individuals involved in battling malaria. He called on international donors, in essence, to blanket sub-Saharan Africa in insecticide-treated bed nets (ITNs)—for free, and right now.

The delay in delivering bed nets "is one of the shocking crimes of our time," says Sachs. He blasts donors for trying to save money instead of lives by targeting nets only to the most vulnerable groups, pregnant women and young children—and often charging the recipients a modest fee. That strategy penalizes the poor, who can't afford to pay, and fails to take full advantage of the "herd effect" nets can provide by reducing the numbers of mosquitoes that transmit the disease, Sachs argues. By contrast, providing one bed net for every sleeping space—which he estimates would cost about 60 cents a year per person—could slash malaria transmission in Africa by 90%, he says. In the absence of a vaccine, he maintains, free universal bed-net distribution, accompanied by rapid access to state-of-the-art antimalaria drugs, is *the* best solution to Africa's malaria crisis, which kills an estimated 1 million people a year.

It sounds simple, and it's hard to argue with the goal, especially against someone of Sachs's stature. But some malaria experts disagree vehemently on whether such a grand plan is feasible, much less desirable. "There is no universal one-size-fits-all solution to malaria," says malaria researcher Christian Lengeler of the Swiss Tropical Institute in Basel, who says he has developed a different perspective from 15 years of working on the ground in Africa.

Without question, bed nets are the best intervention available to prevent malaria. And everyone agrees that coverage, although rising, remains far too low. But they differ on whether giving a net to almost everyone, adults and children alike, is the best use of scarce resources. Critics complain that a big new program would disrupt existing strategies for malaria control that have worked reasonably well, if not perfectly. And they question whether donors would continue to foot the bill once malaria cases plummet and other diseases become relatively bigger killers of Africa's children.

"These are real substantive issues," says Mark Grabowsky, the malaria program manager at the Global Fund to Fight AIDS, Tuberculosis, and Malaria, which was created in 2000 to help the world's poorest countries fight those diseases. "There are true believers on both sides," agrees Richard Steketee, the science director of the nonprofit Malaria Control and Evaluation Partnership in Africa, headquartered in Seattle, Washington, which is helping Zambia scale up its ambitious malaria-control program.

Sachs did win a key endorsement from Arata Kochi, head of the Global Malaria Programme at the World Health Organization (WHO). In late August, Kochi announced that WHO would now recommend universal access to bed nets, free or at sharply reduced costs. Data just in from Kenya, showing a 44% drop in mortality following a huge upswing in bed-net coverage, "ended the debate" on how best to distribute them, Kochi said.

That may have been wishful thinking on Kochi's part. When Sachs started promoting his idea—which he estimates would cost $3 billion a year, including drugs—he touched a raw nerve in the malaria community, exposing existing fissures and reopening old wounds, and the debate has taken a nasty personal turn. As special adviser to directors general of the United Nations, past and present, and chief architect of the Millennium Development Goals, Sachs commands the global bully pulpit like few others. And he has used it to denounce those who resist his plan as obstructionists and even immoral.

They, in turn, accuse Sachs of heavy-handed interference in country policies and of almost monomaniacally pushing his view to the exclusion of all others. "There is one way to do things, and that is Sachs's way," says Nick Brown, who coordinates bed-net efforts for the National Malaria Control Programme in Tanzania, where these issues have recently come to a head.

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Simple solution. Decidedly low-tech, insecticide-treated bed nets are one of the most effective tools for preventing malaria.

Net work

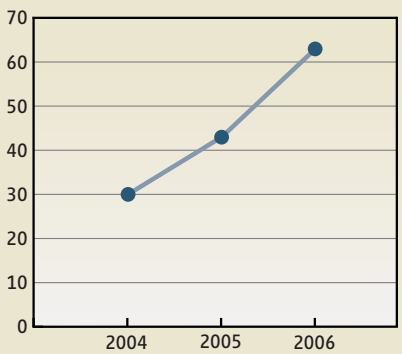
Nobody disputes that ITNs work. A series of big clinical trials in Africa in the 1990s consistently showed a 20% drop in childhood mortality from regular ITN use. Even untreated nets protect against mosquitoes, at least until they rip. And the treated versions work even when they are torn, because they not only block contact but also repel or kill the mosquitoes that transmit the malaria parasite. Until recently, however, they have had to be retreated at least yearly, a significant hurdle. New long-lasting nets that are effective for 5 years are helping solve that problem.

Lack of money for malaria control has been the big barrier to widespread net distribution. Over the years, donors and countries alike have scrambled to stretch dollars to get nets to where they would do the most good. That limitation gave rise to the consensus strategy—adopted in the late 1990s by WHO, the Roll Back Malaria Partnership, and donors such as the World Bank, the U.S. Agency for International Development, and the U.K. Department for International Development—of targeting those most likely to die from malaria: pregnant women and children under age 5. And because dollars were short, donors, health workers, and researchers also threw their support behind a strategy known as social marketing, which involves priming, or in some cases creating, a commercial net industry that, in principle, could help make nets available at prices most people could afford.

This was the approach adopted in Tanzania, long held up as a model for Africa. The program there focused on "creating a net culture": convincing people of the benefits of sleeping under nets and shoring up a retail industry to provide them. Because much of the country is too poor to pay full price, a voucher system was created to provide subsidized nets to the most vulnerable groups. Distributed at antenatal clinics, the printed vouchers entitled a pregnant woman to get an ITN for about $1 or $1.50, instead of $3 or $4. "It was the paradigm," says Lengeler, who helped develop the Tanzania program.

At a Roll Back Malaria summit in Abuja, Nigeria, in 2000, the leaders of malaria-affected countries set a target of getting bed nets to at least 60% of the vulnerable groups by 2005, a target that has since been boosted to 80% by 2010. But progress has been painfully slow. By 2002, less than 5% of African children, on average, were routinely sleeping under a bed net. And a disturbing inequity has persisted: Coverage across Africa has been far lower among the rural poor, who are at greatest risk of malaria, than among urban and wealthier people.

Scaling Up



Number of insecticide-treated bed nets produced worldwide, 2004–2006 (millions).

Sea change

All that began to change about 2003, with the congruence of a big jump in funding for malaria, new evidence that nets work even in the most challenging settings, and new models for net distribution.

Thanks in no small part to the advocacy of Sachs and others and the entry of big donors such as the Global Fund, the Bill and Melinda Gates Foundation, the World Bank, and the U.S. President's Malaria Initiative, global funding has increased more than 10-fold over the past decade. Between 2003 and 2006, the Global Fund alone pumped $1.7 billion into malaria, and the number of bed nets it distributed in Africa surged from 1.35 million to 18 million. Available funds continue to climb, says Grabowsky: "The rate-limiting step is no longer money but the ability of countries to absorb it."

Also in 2003, the last of the five big clinical trials of ITNs in Africa provided the firmest evidence yet of the so-called community effect, akin to the herd effect provided by vaccines. People in nearby control villages who weren't sleeping under nets experienced a substantial drop in malaria mortality as well. That's because ITNs, which in the trial were targeted to the entire household and not just vulnerable groups, were reducing the vector population and thus the chances a person would encounter an infected mosquito.

The new results from Kenya changed perceptions. They meant that bed nets, like vaccines, should be seen "as a public good, worthy of public support," wrote William A. Hawley of the U.S. Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, and other leading malaria researchers in an accompanying article in *The American Journal of Tropical Medicine and Hygiene*. To make a real dent in malaria, everyone should have a bed net, Hawley and colleagues proposed. And increasingly, experts such as Sachs and colleagues Christopher Curtis of the London School of Hygiene and Tropical Medicine and Awash Teklehaimanot of the Earth Institute were saying bed nets should be free.

Exactly how many nets are needed for maximum impact is hard to quantify. A 2007

Voucher scheme. Women in Tanzania receive vouchers at antenatal clinics, which they can redeem at local shops to purchase subsidized bed nets.

CREDITS (TOP TO BOTTOM): MARKO KOKIC/REUTERS/LANDOV; SOURCE: UNICEF; CHRISTIAN LENGELER

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study by Gerry Killeen of the Ifakara Health Research and Development Centre in Tanzania and others, including Lengeler, suggests that 60% coverage of all adults and children is enough. Sachs thinks it is closer to 80% and argues that the cost is so low, it is absurd to settle for less than full coverage. Whatever the number, "there is likely some incremental value to every bed net in the community," says Grabowsky.

People widely credit Grabowsky for coming up with the model that would transform net delivery. Then in charge of measles vaccination for Africa for the American Red Cross, Grabowsky decided to piggyback ITN delivery onto the measles infrastructure. Pilot projects in Ghana and Zambia in 2002 and 2003 began giving out free bed nets to every family with a child younger than 5 years old during measles vaccination campaigns.

The first nationwide campaign was launched in Togo in 2004: Over the course of 7 days, about 900,000 nets were distributed free of charge, and the number of households owning a bed net skyrocketed from 5% to 91%, says Grabowsky, who adds that education is essential to ensure that ownership translates into use.

The delay in delivering bed nets **"is one of the shocking crimes of our time."**

—Jeffrey Sachs, Earth Institute, Columbia University

Sachs raves about the results. These joint campaigns "have the capacity to reach the very isolated rural areas in the poorest countries," Sachs told *Science*. "It is astounding how much coverage it is possible to get in these campaigns. In Togo, Sierra Leone, Niger, a 1- or 2-week campaign gets 70% to 80% coverage."

Other countries and donors, such as the Global Fund and the U.S. President's Malaria Initiative, took the cue. Since then, there have been a dozen more mass campaigns, in Ethiopia, Kenya, Niger, São Tomé and Príncipe, Angola, and Rwanda, to name a few, usually integrated with measles immunization or other childhood interventions. One of the biggest is now under way in Zambia, which is on target to provide bed nets to 80% of the population by 2008 (see sidebar).

Free for all

That's the model Sachs wants to capitalize on. But rather than giving nets to children only, he wants countries and donors to give out enough nets for every sleeping space, roughly three per household. This would protect children and adults alike and remove the reservoir of infection, taking full advantage of the net's community effect. He thinks it should be done within 4 years, if not sooner.

Who could be opposed? asks Lengeler: "In theory, we would all love to do it." But in reality, he and others say, it might not be the best strategy to try to reach almost every person in Africa, especially single men, who have no regular point of contact with the health system. Early in the Zambian effort, for instance, the military was engaged after nets sat around unused for months, says Steketee, who concedes that campaigns are taxing, time-consuming, and hard to organize, but worth it. Skeptics say discussions of Sachs's plan tend to gloss over those difficulties. And even Sachs's staunchest supporters agree, confidentially, that although he is a brilliant advocate for malaria, his genius does not lie in such operational details.

Lengeler also questions whether Sachs's scheme is worth the cost, because covering even half the population still provides considerable community protection. He suggests donors could get a bigger bang for the

A PROOF OF PRINCIPLE

What if money were no object and you could employ all the weapons that exist today to fight malaria in one country? How much could you reduce mortality? That experiment, known as the Malaria Control and Evaluation Partnership in Africa (MACEPA), is going great guns in Zambia.

A collaboration of the Zambian government, the various Roll Back Malaria partners, and the nonprofit PATH (Program for Appropriate Technology in Health) in Seattle, Washington, the Zambia project is employing long-lasting insecticide-treated bed nets, indoor spraying with insecticides, and rapid access to the most effective antimalarial drugs, artemisinin-based combination therapies. Started in 2005 and funded by the Bill and Melinda Gates Foundation, the World Bank, and the Global Fund to Fight AIDS, Tuberculosis, and Malaria, the goal of the project is to slash malaria mortality 75% by 2008, an achievement that has been estimated to cost between $30 million and $50 million a year. It is well on its way to achieving that goal, says the scientific director of MACEPA, Richard Steketee of PATH.

With MACEPA's support, the Zambian government aims to deliver bed nets to 80% of the population, adults and children alike, by the end of 2008. The first year was not a rousing success. The partners finally called on the military to help distribute the 526,500 nets that were sitting unused in Lusaka—the running joke is that they probably spent more on gas than on nets. For the second shipment of 200,000 nets, they settled on a decentralized plan. Nets are now delivered directly to districts where health-management teams work with local leaders to arrange big community events where people come to pick up their nets. Health teams are trained to explain why and how nets should be used, a key component in any net-distribution strategy, says Steketee. It is working, he says. Last year, 1 million nets were distributed, and this year, the target is 3.4 million. "By the end of the year, we will be close to covering the entire nation with three nets per household."

Bold experiment. Zambia hopes to slash malaria mortality by 75% by 2008.

Mass campaigns are supplemented by net distribution during vaccination campaigns and at antenatal clinics, where women pay about 50 cents for a net, although next year, nets may be provided for free, says Steketee.

Of course there are problems and nets that go undistributed, he says. "But we have seen a huge drop in malaria. Houses with nets have way less malaria and less severe anemia in young kids. It is entirely consistent with the data from controlled trials." And although final data on mortality reduction won't be available for a year or two, evidence so far "consistently shows a good number of lives are being saved." **–L.R.**

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buck by doubling the salary of health-care workers in Africa and ensuring regular drug supply instead.

The program in Tanzania, where 95% of the population lives in highly malarial regions and the disease claims 100,000 lives a year, has become a battleground in this debate. In many ways, the national malaria-control program, which received one of the first grants from the Global Fund in 2003, has been a success, says Brown, who coordinates the program's ITN efforts. The country now boasts four domestic net manufacturers and some 5700 retailers, mostly small stores that also sell soap, sugar, and batteries. But bed-net coverage hasn't climbed as fast as anyone would like, and it has remained stubbornly low among the rural poor. By 2006, "we covered 35% of the children and 25% of adults," says Lengeler. "That is clearly too low. … We accept the criticism."

The various partners working in Tanzania set out to fix those problems last spring, holding a series of meetings to chart a way forward. The debates were intense, with some arguing to jettison the voucher scheme, and Lengeler, Brown, and many of the donors saying don't throw the baby out with the bath water.

One of their chief concerns was that Sachs's plan would destroy the commercial market that has been built up so carefully over the years in Tanzania. "It's all your eggs in one basket," says Lengeler. "If the government plans a mass campaign and it doesn't happen, there is no backup." And if campaigns aren't repeated, he warns, within 3 to 5 years, the country "will go backwards. Nets are destroyed or lost, new babies are born, and it happens fast."

With Tanzania's application for continued support due to the Global Fund in July, the partners settled on a middle ground: They would continue giving out the vouchers but increase their value so that the maximum a woman would pay would be 40 cents per net. They would also switch to the more expensive long-lasting nets, which cost about $5 each. And in 2008, they would launch a massive catch-up campaign to give a free net to each child younger than 5.

Sachs, however, wasn't impressed. When he jetted into Dar es Salaam for 2 days in July, he tried to convince the president and the minister of health to change course and rewrite the proposal. In a series of e-mails and phone calls before and after his visit, Sachs blasted the Tanzanian plan in general and Lengeler in particular. Tanzania is being encouraged to be bold, and Lengeler is standing in the way, Sachs wrote to one of Lengeler's colleagues. He called Lengeler's defense of the current system "shocking" and "reactionary." In an e-mail to Lengeler, Sachs dismissed his approach as "disreputable" and "economically ignorant."

"Jeff Sachs is entitled to his opinion," responds Alex Mwita, the National Malaria Control Program manager in Tanzania's Ministry of Health. But he denies that Lengeler blocked anything. "No partner was interfering. It is the government that makes policy." And the priority is clear, he says: Get nets out fast, whichever way works best.

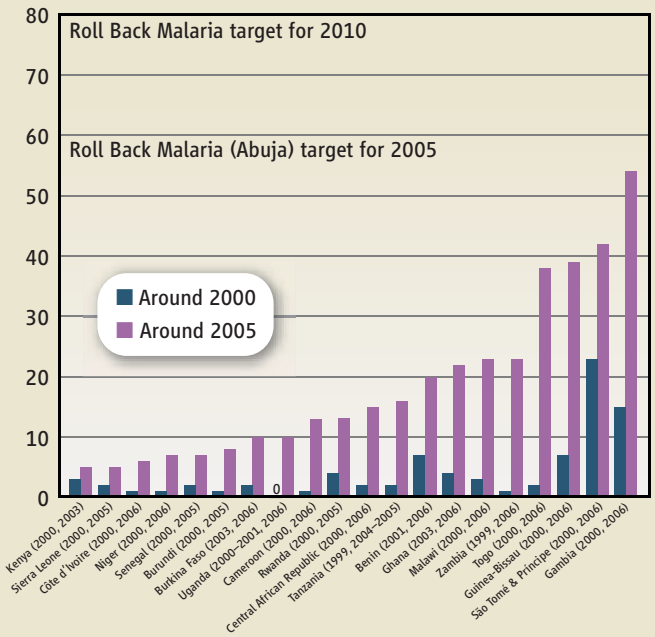
"There is no universal one-size-fits-all solution to malaria."

—Christian Lengeler, Swiss Tropical Institute

Mwita adds that he is all for universal coverage: "Everyone deserves to be protected … if we have the resources," he says. "We would need $200 million for universal access in Tanzania. That is almost three-fourths of the Ministry of Health budget. The government doesn't have that much money. Bill Gates can give it. Or Warren Buffet can. … But you can't depend on Bill Gates and Warren Buffet always." Until such funding is assured, Mwita says Tanzania will continue to focus its efforts on getting bed nets to children who are most at risk of dying.

And so the debate continues, with more commentaries in various journals and more phone calls between Sachs and Tanzania's president. The Tanzanian Ministry of Health submitted its proposal as written, although at Sachs's urging, it is now drafting a new proposal for a free mass campaign in 26 of Tanzania's hard-hit districts. Sachs, who is pushing for a nationwide campaign and says he has the president's support, has vowed to find money for it. Meanwhile, Sachs has continued to rebuke the skeptics on the global stage.

Progress, But a Long Way to Go



Percentage of children under age 5 sleeping under an insecticide-treated bed net, sub-Saharan Africa, 2000–2005

SOURCE: UNICEF; CREDIT: COURTESY OF CHRISTIAN LENGELER

Resolution?

Grabowsky is optimistic that the feuding factions will coalesce eventually, if not this year, around a game plan for getting bed nets out fast to most, if not all, of the population. And there is still a long way to go. A recent study estimated that as many as 264 million nets are needed just to reach the Abuja goal—80% coverage of vulnerable groups—much less fulfill Sachs's vision of universal coverage.

There will need to be catch-up and keep-up strategies, says Grabowsky, and to date, few countries have managed to implement both. There is probably room for multiple approaches, even vouchers and the commercial sector, he suggests. He says the Global Fund is "agnostic" on which approach countries should take; its strategy is to fund those programs that seem to have the best chance of working on the ground. And right now, there are lots of experiments but few definitive answers, he says.

As for the intensity of the debate Sachs has ignited, Grabowsky says, "at its best, public health is a public process. We are all better off having a vigorous debate. There was a time when few people cared about Tanzania's malaria problem. Now we all do."

–LESLIE ROBERTS

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