

Holden Karnofsky's notes from conversation with Thomas Smith, 8-Nov-2011

Holden Karnofsky: We're considering recommending the Against Malaria Foundation, and we're trying to understand the likely cost-effectiveness of the sort of insecticide-treated net (ITN) distribution they're focusing on, which is universal coverage campaigns, sometimes in areas that already have some measures for covering pregnant women and children under 5.

From the people we've spoken to so far, our understanding is that

- The main evidence for the positive impact of ITNs on life outcomes consists of randomized controlled trials, reviewed in two Cochrane reviews, focusing on benefits for pregnant women and children under five.
- The programs that were studied in these reviews were mostly population-level distributions, getting ITNs to everyone, not just pregnant women and children under five. This leaves some ambiguity regarding how much of the benefits of ITNs come from (a) protection for individuals vs. (b) protection for communities via killing mosquitoes.
- At the time of the reviews, the focus seemed to be on getting ITNs to pregnant women and children under five. However, now it seems that most of the mathematical models and most of the people working in this field conclude that a substantial part of the benefits come from community-wide effects, and that therefore, universal coverage can be cost-effective even when there is some existing coverage of children under five. I saw one paper arguing, roughly, that getting the overall population coverage up to around 35-60% can have the same kinds of benefits for children under five as getting coverage for children under five up to around 80%.
- These conclusions have some empirical evidence behind them but are based mostly on theory and mathematical modeling.

Does that sound right to you?

Thomas Smith: I think that's a fair summary of the situation.

In general, ITN distribution is going to be one of the most cost-effective ways of spending your money if you want to stop people from dying of avoidable diseases. I would argue that even of the things that can be done to protect against malaria, ITN distribution stands out.

In terms of what we expect nets to do in reducing transmission, there's a huge amount of data indirectly suggesting that most of the effect is the protection obtained by killing mosquitoes. Theoretically that's what one would expect, and if you look at the effects in the trials, the effects are consistent with this idea.

I'd be happy to point you to some more literature on that. There aren't many well-controlled field studies on this question, but the general conclusion is that the more people have ITNs, the better.

As I see it, there are three different sets of papers you might be interested in: (1) modeling papers, which are dealing with what you would expect theoretically; (2) analyses of field data that try to get at this question but without having ideal controls; (3) secondary analyses of the original field trials.

I believe there are 3 papers in the third category. The one by Hawley is the biggest, and has references to the older ones.

Holden Karnofsky: do you know of any literature reviews on the topic?

Thomas Smith: I don't, unfortunately.

Holden Karnofsky: Do you know of any papers or scholars arguing the opposite, that community-level effects are negligible and/or that universal coverage has little value-added above and beyond covering pregnant women and children under five?

Thomas Smith: I don't.

Holden Karnofsky: The Cochrane reviews included some studies that were randomized at the individual level, rather than cluster-randomized. In one of these cases (the review on effects of pregnant women), the one individual-randomized trial found comparable effects to the cluster-randomized trials. I haven't looked to see whether the same holds for the studies in the other review, but if it did, do you think this would constitute evidence for the contrary viewpoint, i.e., that most of the benefits of ITNs can be gained just by covering pregnant women and children under 5?

Thomas Smith: Perhaps, if you're comparing like with like in terms of the transmission settings, but you're probably not.

There are empirical studies that show that there seems to be a community-level impact of ITNs. There are theoretical studies that show that there ought to be a community-level effect. What I don't think there is is any attempt to estimate the magnitude of the community-level effect from empirical data. We've done this with mathematical models, but haven't completed the linkage with empirical data that could help with this estimate.

Holden Karnofsky: Do you think the mathematical modeling literature is too speculative to be useful?

Thomas Smith: No, it is useful and necessary, but it would be good if we could better ground the work in empirical data. If you go into the field trial data you find that in many cases the randomization hasn't been maintained very long term so you can't estimate

medium to long term effects - you can only get the short term effects. So you need modeling to estimate the longer term effects.

I personally don't have any doubt that distributing nets across Africa will have a very big beneficial effect on malaria and that we should encourage it. Bednets are one of the most efficient components of the mixture of interventions that we need to deploy.

Holden Karnofsky: Do you know of any mathematical models that include pre-existing ITN coverage of children under five as a parameter? What we're wondering is what happens if you go into an area where coverage of children under five is already high - do the additional ITNs, covering people over five primarily, give good bang for the buck in that circumstance?

Thomas Smith: That's an interesting question. We've got software that could run models of precisely that question, but we haven't done this. I can send you a link to the software, though it's quite complex.

Holden Karnofsky: Going to a more basic question - what is the mechanism by which ITNs kill mosquitoes?

Thomas Smith: Mosquitoes can pick up insecticide trying to enter the nets, or they can pick it up exiting the nets, and either way the insecticide can kill them. And even if they don't get killed they're being driven away, the main effect of this is that if mosquitoes can be prevented from feeding, then they will fly around looking for a host and get exhausted and die.

Holden Karnofsky: What if the nets have holes in them - is a big enough hole safe for a mosquito to enter, despite the insecticide?

Thomas Smith: This is an issue that people are trying to look at: how big the holes can be, and what the effect of holes can be. Obviously having holes is bad, but a net with holes is probably still better than no net at all. That's one of the things we're trying to consider when thinking about when to replace nets.

Holden Karnofsky: It seems that the consensus used to be that ITNs should be targeted at pregnant women and children under 5, but then there was a shift, and now the consensus is that ITN campaigns should aim for universal coverage. Why do you think this shift took place?

Thomas Smith: It was a very political process. Originally, people were negative on the idea that one might reduce transmission substantially using ITNs, because malaria eradication had failed in the past, and people feared that if they emphasized this goal they would be dismissed as ridiculously optimistic, so the trials were designed to see whether one could stop small children from dying. Later on, there was very little money available for malaria control. In the last five years funding for malaria control has been scaled up very significantly, so it's finally possible to go for universal coverage.

Holden Karnofsky: Any suggestions for GiveWell as we try to (a) recommend ITN charities that are going about their work the right way (b) raise unanswered and potentially productive questions for research?

Thomas Smith: (a) There are quite a few different organizations working on ITN distribution. Coordination/harmonization is critical. (b) There are many potential field studies that would be helpful, but haven't been done, because it's questionable whether they're ethical (i.e., whether it's ethical to withhold nets from part of the population).