Note from GiveWell: This review is based on a draft of our report on the mass distribution of insecticide-treated nets, which may differ from the final public version (available here). Some figures and claims attributed to GiveWell may be out of date.

1. P1: Basics: "*Long-lasting insecticidal nets (LLINs) are nets that have been treated with insecticide".* Technically that better describes ITNs – LLINs are nets with insecticide impregnated into the fiber through a process specifically designed to ensure the insecticide lasts a long time. (This is correctly clarified on page 9-10).

2. P1: "*Mass campaigns involve large-scale distribution of LLINs to households, either door-to-door or through central distribution sites in a community. Our understanding is that these campaigns are the main way people in malaria-endemic countries access LLINs. We think that relatively few people would access nets through alternative avenues, such as routine distribution (which only targets certain groups and which many countries have huge funding gaps for), continuous distribution (which isn't being implemented at large scale in many countries), or purchasing nets on their own."* This logic seems somewhat circular to me and maybe requires some introspection. It accurately describes what exists currently, but the situation exists primarily because that's what donors pay for, not because it's an immutable feature of the universe. If GW chose to prioritize funding routine distribution instead of campaigns, that channel would become a more important mechanism for distributing nets than it is today: if all GW nets in countries where AMF is the largest procurer of nets (e.g., DRC) were distributed through routine distribution, then routine distribution would suddenly become the main way people receive nets in that country, and campaigns would be of lesser importance. The reason I think this is more than semantic is because several recent analyses have suggested that routine distribution may be a more cost-efficient channel for distributing nets. These include Koenker et al. Mal J 2023, and unpublished work by Scates et al. I think this needs more interrogation yet (e.g., Koenker finds routine distribution is more efficient for achieving 80% coverage, but that's not necessarily the right outcome to optimize against from a CE perspective), but at minimum it suggests we probably shouldn't take "campaigns are the best way of distributing nets" as a given.

3. P2 & p13 – *"Mass campaigns are the main way people access nets"* – same point as above. *P13 "We haven't seen evidence of non-campaign channels achieving high coverage"* – Similarly, we haven't because we are achieving high coverage through campaigns, and so investing in non-campaign channels to do so would be duplicative.

4. The footnote #21 on p13 saying AMF finds most nets in places where it conducts campaigns are AMF nets feels circular: would suggest using MIS/DHS survey data instead – this still shows that most nets come from campaigns, but it isn't AMF specific. Still would note however that lower routine coverage levels might be even more cost effective than high campaign coverage levels if they targeted nets to infants and

pregnant women who are at highest risk (which they do since they typically involve ANC and EPI distribution).

5. P2 – *"distributing nets that are effective given local resistance profiles"* – I have not reviewed the AMF profile, but I would not take it as a given that AMF always buys the most effective net given resistance – I believe they may often choose a mix of cheaper nets and more effective ones.

6. *"We think our funding of nets from AMF causes mass campaigns to achieve higher coverage… these cause people to have access to more protection from nets than they otherwise would have."* Despite my quibbles above, I still 100% agree with this statement. My comments suggest only that perhaps even *higher* coverage is attainable with the same resources.

7. P10 – *"WHO recommends that LLINs be distributed for free to achieve universal coverage".* I believe this language is outdated. In the revised Global Technical Strategy, WHO has moved away from talking about "universal coverage" and I think the current guidelines speak more to "optimal coverage" (which is never really defined) to avoid suggesting that everybody in the country requires protection.

8. P11 *"Our analysis in this report therefore focuses on conventional nets and (to a lesser extent) PBO nets."* – I find this problematic as the decision to fund and purchase chlorfenapyr nets vs PBO nets vs pyrethroid nets is not a future problem but very much the key question today that determines the impact of a dollar spent on nets. Based on the available RCTs and mathematical modeling based on them (you might check out Imperial's MINT tool), I would for the most part advise all high endemic countries to purchase chlorfenapyr nets immediately if they seek the most cost effective vector control strategies. And this is indeed happening: the Alliance for Malaria Prevention (AMP) tracks net procurement globally in their Net Mapping Project. If you download the most recent database there and look at the "Global by type" tab, you'll see that in 2023 so far, 17% of all net procurement is dual insecticide nets (compared to <10% in 2021-2022), with 65% PBOs, and only 19% standard pyrethroids. By 2024 I would expect the standard pyrethroids will have virtually gone away unless there are some severe disruptions: so an assessment of pyrethroid nets and PBOs only is I think really no longer relevant.

9. P17 net costs. Are these recent, or historical? [The cost per net] seems too low for today given recent inflation in manufacturing and shipping costs. (Here are the prices Global Fund budgets through its pooled procurement mechanism, for comparison). As per above, given extensive resistance, it is hard to rationalize purchasing these nets today, however, unless more effective nets are dramatically more expensive to the point that their greater impact is outweighed by their cost. I would include prices for chlorfenapyr nets as those will be a growing fraction of AMF's purchases going forward.

10. P17 – "*In Uganda, we currently estimate that AMF plans to purchase 100% PBO LLINs in future campaigns*." I don't know AMF's plans, but I note that already in 2023, per the

AMP database, 22% of Uganda's net purchases have been dual insecticide nets, and we should expect that % to increase.

11. P19 – *"Our calculations rely on estimates of non-net costs incurred by other funders, but we have very limited information on these costs"*. I'm curious why you haven't asked either NMCPs or the implementers for this information directly rather than requesting it via Global Fund? I would assume that Global Fund does not own the data on implementation costs – they provide the money for programs planned and implemented by other actors, including NMCPs and the NGOs that often act as the implementers. These entities may be happy to share their budgets transparently and may not require Global Fund's permission to do so.

12. Net use – I think the logic makes sense, but I do note that your estimate of 63% is considerably lower than estimates made by others. I might particularly take a look at the papers by Bhatt et al. and extended by Bertozzi-Villa et al. 2021 in Nature Comms: they calculate usage (given access) of 91% and rarely below 80%. I guess there are three possible explanations for this difference: first, as you note, it is possible that people report sleeping under nets when they do not (however, the study you cite showing this inflation found 85% reports vs 70% in reality; the gap between your estimate and those of others is much larger than that). Second, usage (including self reported usage) tends to vary with risk of malaria – if a study/survey is done during the low season, people will report lower use. The modeled estimates from Bertozzi-Villa are based on DHS/MIS surveys so may be somewhat inflated by #1 but do adjust for #2 – I have not revisited the sources you use to evaluate whether they might be affected by seasonality. Third, I'd note that Bertozzi-Villa do show temporal increases, and the studies/values you cite are from quite a while ago and it is possible usage is now improved.

13. P24 – people per net. I note that here and elsewhere you rely on AMF surveys – it is worth noting that DHS/MIS surveys ask the same questions and would I guess provide a much richer dataset of usage patterns across a wider set of geographies, implementers, and time points.

14. P25 – usage by age. *"We assume that people of different ages sleep under LLINs in equal proportion to their share of the population"*. I think this is probably not a good assumption. It can be evaluated from DHS/MIS surveys, which compile a complete net roster of all LLINs in the house and ask about where each was received from and who used it. I recently analyzed a few of these looking at this question and found that reported usage for children <5 is substantially higher than would be expected if usage was random based on the age distribution: e.g, in Uganda, children <5 were 12.7% of the surveyed population, but if a campaign-delivered net was used, 28% of the time it was used by a child under 5 – almost 3x what would be expected by chance. I believe there is old literature that confirms that households preferentially use nets to protect children, though would need to dig it up. Not sure how much this matters though!

15. P27 durability. Your analysis seems reasonable to me, but it may be worth examining some more recent studies for comparison. Bertozzi-Villa et al. calculate retention using a

model fit to survey-derived data, with substantially lower estimates in some cases than your estimate (e.g., for Uganda). Lindsay et al. Lancet 2021 review 13 surveys of net durability – though it is not immediately clear how the estimates compare. There is some initial evidence that PBO nets may have worse durability than pyrethroid nets as the chemical may degrade the plastic (e.g., Bioefficacy and durability of Olyset® Plus, a permethrin and piperonyl butoxide-treated insecticidal net in a 3-year long trial in Kenya | Infectious Diseases of Poverty (mednexus.org)).

16. P34 – *"Our analysis estimates how far AMF's funding will reduce the interval between campaigns in each location (e.g. 42 to 33 months in DRC)."* It is possible that this logic held in the past, but as of today, there appears to be a massive gap in funding to procure nets in DRC for campaigns, regardless of whether they are conducted at 3 or 4 year increments. Right now, I would imagine it is not the case that the entire country will receive a campaign every 42 months in the absence of AMF contributions – even *with* AMF's current contribution I believe there is likely to be a substantial gap for DRC's next campaign. The 29% reduction in coverage thus seems incorrect to me given current circumstances.

17. P49 – I agree that ascribing all observed effects in the net trials to those who actually used nets is probably fairly wrong due to community protection. There have been some efforts to quantify it using models – see for example Unwin et al. 2003 in Nature Comms – but generally speaking I think we can expect diminishing returns once we have achieved high coverage, since everyone both covered and uncovered are receiving protection at high coverage levels. The model may thus overestimate the individual protection afforded by a net at coverage levels that are higher than what was observed in the RCTs; conversely I would think it would underestimate protection at coverage levels lower than observed in the RCTs by assuming protection decreases linearly. Given that you are not actually modeling coverage, but rather the number of children directly protected, it's not immediately clear to me that there are better ways to deal with this, however. One option (assuming real-world coverage is lower than in trials) would be to assume each person protected also contributes some small level of community protection, in the same way the model assumes each directly averted malaria death averts 0.75 indirect deaths; but again there is no obvious way to parameterize this, so leaving it out and considering the results conservative is probably reasonable.

18. P50: *"Share of LLIN effectiveness provided by insecticide / physical barrier".* If I understand correctly, the 73%/27% used lumps together all outcomes in the review, including reductions in prevalence, incidence, etc – these are not comparable metrics and I don't think that's defensible. I'd have thought the most straightforward way to assess this would be to compare incidence (the same metric used for the disease effect) between untreated and treated nets – that shows ITNs being 42% more effective than untreated nets, suggesting more of a 42%/57% split. This is I think reasonably well aligned with other evidence (e.g., the early trials of ITNs vs untreated nets found adding insecticide improved the effect by ~50%). There's also some suggestion that nets can still work reasonably well in areas of moderate resistance (e.g., Implications of

insecticide resistance for malaria vector control with long-lasting insecticidal nets: a WHO-coordinated, prospective, international, observational cohort study - The Lancet Infectious Diseases) which would suggest attributing such a large proportion of the effect to insecticide is likely overstating it.

19. P53 – As above - understood that chlorfenapyr nets are new, but there are now two extremely compelling studies showing their improved effect over pyrethroids, and I would expect the change over to them to be rapid – it will thus be important to update this with that newest evidence quickly for it to remain relevant.

20. P54 – *"Roughly estimating the proportion of PBOs that we expect our grantees to purchase for distributions in each country (19% - 100% across countries, 100% in Uganda)".* Again, per AMP tracker, PBOs and dual nets now comprise ~90% of all purchases.

21. "*The relationship between insecticide resistance and LLIN effectiveness is unclear*." Have cited a few things previously here, but would suggest in particular connecting with Tom Churcher and team from Imperial who have modeled these questions extensively: The impact of pyrethroid resistance on the efficacy and effectiveness of bednets for malaria control in Africa | eLife (elifesciences.org).

22. P59: "*We use 2019 national-level estimates for malaria mortality among 1-59-month-olds with the exception of Nigeria, where we use state-level estimates*". Mortality data are quite challenging, and I'd generally agree with not trying to parse them too finely – however, it could be worth trying to disaggregate rural vs urban populations. Urban populations will likely have far lower malaria mortality rates, both because of overall risk of acquiring malaria as well as better access to healthcare if they do – these children will thus (to some degree) skew the national averages downwards, when what we are primarily interested in is the rural mortality rate. Increasingly given limited resources, we can expect net campaigns to primarily focus on rural populations (current plans in several countries remove urban pops from their net campaign targets), so we may be underestimating the effect in that case.

23. P60: *"Lack of a strong correlation between malaria incidence and malaria mortality gives us some doubts about quality of these data and whether variation across countries is capturing true variation"* I think this is very fair. I am not sure if anybody has done the analysis, but it might be worth going back to DHIS/MIS data and correlating the % of children reported as having died in those surveys (which I think should be a reliable figure) against the malaria prevalence, which should let us calculate an attributable fraction of deaths. Would be surprised if nobody has done this but I'd be curious to try it if not!

24. I've never really looked at the evidence around the income gains so don't have much to comment on there – all sounds reasonable to me.

25. P87 – Rebound effects. WHO recently held a technical consultation on this, though I believe it was not focused on nets. the report is here.

26. P98: "*The grants to national governments from the Global Fund (the world's largest malaria funder) increased by ~25% between the 2018-20 and 2021-23 grant periods*". This needs to be contextualized with population growth, however, which means there were also substantially larger populations to protect with those funds, as well as more recently the rising costs of nets. For the most recent grant period, 2023-2025, Uganda's allocation increased by <3% - which means effectively it actually has less money than last cycle. I published a bit of an analysis of these trends though more globally.

27. P102: "*The Global Fund funds HIV, tuberculosis (TB), and malaria programs. We assume that all funding that the Global Fund could use for net campaigns in Uganda but actually uses for other activities is spent on programs combating these diseases*." I'm not sure if I'm following this correctly, but it sounds like you may be assuming Global Fund expenditure could be spent across their portfolio (i.e., on malaria, HIV, or TB programs) and are using a combined value for what else they could spend funds on. If that's correct I'd have some concerns given the structure of GF allocations – a country has a malaria-specific envelope that they allocate across malaria activities. If funds currently intended to distribute nets went to something else, it would be malaria case management, chemoprevention, surveillance, etc – not HIV care. But not sure if I've interpreted this properly.