A dozen doubts about GiveWell's numbers

An entry to [GiveWell's Change Our Mind Contest]

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Summary

We raise twelve critiques of GiveWell's cost-effectiveness analyses. Ten apply to specific inputs for malaria prevention, cash transfers, deworming. Two are relevant for more than one intervention. Our calculations are available in this modified spreadsheet of GiveWell's cost-effectiveness analyses[2]. We provide a summary of these first, then set them out in greater detail. We encountered these as part of our work to replicate GiveWell's analysis. They do not constitute an exhaustive review.

Malaria prevention

1. GiveWell assumes that a large fraction (34%) of the total effects of anti-malaria bed nets come from the extra income children will later earn due to reduced malaria exposure. However, GiveWell provides little explanation or justification for these numbers, which are strikingly, indeed suspiciously, large: taken at face value, they imply that bednets are 4x more cost-effective at increasing income than cash transfers.

We were unsure what the income-increasing effect of bednet should be, so we investigated a number of factors, which we enumerate as the next six critiques.

2. The evidence GiveWell uses to generate its income-improving figure for bednets is from contexts that seem very different from that of the charities it recommends. While GiveWell does discount this evidence it uses for 'generalisability', we suggest a larger discount would be consistent with GiveWell's reasoning regarding deworming, and would reduce the total cost-effectiveness by at least 10%.

3. We present possible mechanisms for malaria prevention to income benefits, but they do not explain most of the effect. It's unclear how this would change the cost-effectiveness results.

4. We demonstrate how GiveWell's analysis does not sufficiently adjust for differences in context by looking at malaria prevalence. Malaria prevalence was higher in the context of

[1] Joel produced the critiques and did most of the reasoning, calculations and the writing. Michael and Samuel provided feedback and some writing.

[2] We realise that the most up to date version of the 2022 CEA is version 5 but we use version 4. However, we checked and found no substantial differences between versions 4 and 5.

the evidence than in AMF's context. When we adjust for this, we expect this will lead to around a 17% decrease in AMF's total cost-effectiveness, with low confidence.

5. GiveWell has missed some evidence for the effect of malaria prevention on income. We expect this decreases the total cost-effectiveness of AMF by 14%, with moderate confidence.

6. GiveWell may underestimate the differences in benefits between women and men. We expect with moderate confidence that incorporating more evidence would decrease the total cost-effectiveness of AMF by 16%.

7. GiveWell assumes, without clear justification, that the income effects of malaria prevention will endure in just the same way as they suppose the effects from deworming do. We've previously called deworming's benefits into question (McGuire et al., 2022), incorporating the adjustment proposed there would decrease the total cost-effectiveness by AMF by 3.4% to 10.2% (low confidence)

We've presented these changes in cost-effectiveness for changing only one variable at a time. If we implement all of them at once (excluding critiques 3 and 7 for which we are more uncertain how they'll change the results), then the effects decline by 29% (see row 202 of "AMF total" tab)[3].

Cash transfers

8. GiveWell's analysis of the effectiveness of cash transfers only uses one study to estimate GiveDirectly's immediate increases to consumption (Haushofer & Shapiro, 2013) when there are many more available. Using more data we show that recipients of GiveDirectly cash transfers are actually 70% richer than assumed in GiveWell's cost-effectiveness analysis. Hence, the relative increase in consumption from GiveDirectly cash transfers decreases from 0.35 to 0.22 log-units (i.e., a decrease of 27%, which leads to an overall 38% decrease in cost-effectiveness).

Deworming

9. GiveWell's analysis relies on one long-term study from Kenya (the PSDP; Miguel & Kremer, 2004). We found another long-term study, by Liu and Liu (2019), which was from China. We're not sure how comparable these are but, if we naively average the income effects, the cost-effectiveness of deworming goes up by 22%. If we add some adjustments based on context (although we have not fully considered these), then the effects of deworming *decrease* by 22%.

[3] This is different from simply summing the reductions because some of the variables that are changed interact with each other (e.g., the adjustment factor and the income increase).

10. GiveWell subjective apply a large 87% 'replicability' discount to deworming to (in part) account for the fact it relies on only one long-term study. Given there are now two studies, that indicates GiveWell could reduce the replicability discount by some fraction, which would increase the cost-effectiveness of deworming. If, for example, the replicability discount decreased to 80% (a total guess), then the effects of deworming would increase by 21%.

Intervention non-specific concerns

GiveWell split their cost-effectiveness analyses at the country level. However, they fail to consider the granularity across two important factors at the country-level that might change the cost-effectiveness of the charities:.

11. Granularity about the age at which recipients would have died from a cause and how this relates to GiveWell's moral weights.

12. Household sizes differ across countries which would affect the calculation of household spillovers.

General methodology

Unless specified otherwise, we follow the same process in each of our critiques for quantifying how a change in an input in GiveWell's analysis alters the overall cost-effectiveness estimate. First, we identify a value that we think should be changed. Then, we plug this into our copy of GiveWell's cost-effectiveness spreadsheet, and report how great a change (in percentage) this causes to the overall (average) cost-effectiveness of the charity. GiveWell's models are complicated, and so we are not always able to explain why a tweak to a model's changes the results..

Malaria prevention

GiveWell's malaria prevention CEA considers two sources for the value of malaria prevention: (1) saving lives by preventing malaria deaths, and (2) increasing later consumption by preventing children from suffering from malaria. In their malaria prevention analysis, they estimate that increases in income stemming from malaria prevention comprise 34%[4] (see row 141 of "AMF" tab) of the total value of malaria prevention. We investigated this part because some of the numbers

[4] According to their calculations ('AMF' tab), giving $100,000 to the Against Malaria Foundation (AMF) produces - on average across the countries of implementation - 4,408 units of 'good' by saving under-5 year olds (row 62), 1,294 units by saving over-5 year olds (row 77), and 2,969 units through income-increasing benefits (row 128). Hence, 34% of the benefits of AMF comes from income benefits.

looked suspicious; we haven't closely examined, or noticed problems with, the numbers relating to the prevention of deaths.

1. Income effects of malaria prevention are surprisingly large yet mostly unexplained

GiveWell estimates that malaria prevention with bed nets is 4-times more cost-effective at improving economic outcomes than GiveDirectly cash transfers (see row 224, sheet "AMF")[5]. This is a surprisingly large effect, as we assumed that cash transfers, given they aim to improve economic outcomes, would be more effective at doing so. What's more, we expected that, if GiveWell were aware of this result and sincerely believed it, they would strongly advocate that donors should fund bednets rather than cash transfers via a form dominance reasoning: not only are bed nets 4x better at reducing poverty, you also get to save lives 'for free'.

However, this is not a result that GiveWell draws much attention to or explains. It is based on their estimates of how a year of malaria prevention increases lifelong economic outcomes by 2.3%. The most information GiveWell provides for the reasoning behind these figures is in a note (row 109, sheet "AMF").

> *"This figure [2.3%] represents a midpoint between the findings of two natural experiments* (Bleakley, 2010; Cutler et al., 2010)[6]. *It should be interpreted as the expected increase in lifetime income from reducing the point in time probability of having malaria from 1 to 0 for one year.*
>
> *We are uncertain at what age range children would get long term benefits from malaria reduction ... We have not yet published the full rationale for choosing this figure."*

They first made this claim about malaria prevention's effect on income in the 2018 version of their CEA (row 79, sheet "Nets") and have not published their rationale since. We cannot detect any

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[5] For an arbitrary $100,000 donation, the income benefits of malaria prevention produce 3,971 * 0.34 = 1364 units of good (according to GiveWell's moral weight), which is 4 times more than the 335 units of good of GiveDirectly (for a donation of the same size).

[6] We will provide some additional context. These studies (Bleakley, 2010; Cutler et al., 2010) exploit the staggered rollout of malaria eradication campaigns through DDT spraying in the early to mid 20th century in India (Cutler et al., 2010), the United States, Mexico, Colombia and Brazil (Bleakley, 2010). The design in these studies is typically to compare regions that were treated earlier to those treated later, and people who were children in the decade before the programme began with those who were children in the decade after. The income data used is often recorded decades after the intervention, meaning that these effects can be understood as the effect of having malaria prevented in childhood on middle and late-age economic outcomes.

change in their analysis since then. While we cannot follow GiveWell's full rationale, we suggest some problems with GiveWell's present figures.

2. GiveWell's generalisability discount for malaria prevention's income effects is too small

An issue that GiveWell clearly recognises is that the evidence for the life-long income benefits comes from a very different context than the one the AMF works in and is thus is tricky to generalise:

> "*They [Bleakley 2010; Cutler et al. 2010] study* ***different malaria interventions*** *that operated in* ***different places and time periods*** *and* ***generated larger reductions in malaria prevalence*** *than the programs we are currently modelling. While they support the idea that suffering from malaria can have substantial impacts on long-term income, we are unsure if extrapolating the effect sizes they estimate is externally valid for our model [...] We therefore apply a subjective downward adjustment (70%) to the headline results of the studies.*"
> (row 110, sheet "AMF")

We agree with GiveWell's uncertainty, but think that adjusting the results by multiplying them by 0.7 (a 30% discount), seems insufficient, and inconsistent with GiveWell's other discounts. To explain why, let's walk through the ways in which the context differs between the evidence and AMF.

The first difference between the evidence and AMF is that the natural experiments studied permanent malaria eradication through mass spraying of DDT[7] – an infamous neurotoxin – in areas with a high prevalence of mosquitoes. This intervention is very different from the insecticide treated bednets distributed by AMF.

Another uncertainty is whether it is appropriate to extrapolate effects of *malaria eradication* (i.e., preventing exposure for the rest of one's life) to *malaria suppression* (i.e. protection for a single year) which is what AMF does (explained in a footnote[8]).

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[7] DDT likely has other negative effects. So these positive income effects are despite recipients likely being poisoned. In fact, Chang and Kan (2022) finds negative effects of exposure to DDT on employment and percent of the population earning minimum wage.

[8] GiveWell makes two assumptions to generalise from lifetime malaria eradication to malaria prevention. First, they assume that all the benefits are due to preventing malaria in the first 15 years of life (and that is why they divide the total effects by 15 to have the effect over a year, see our explanation of their calculations). However, if part of malaria eradication's benefits are driven by a reduction in exposure over the next few decades of their life (years 16 and older), this would shrink GiveWell's estimate of the yearly benefit. For example, if the life-long economic benefits of malaria prevention increased up until the age of 30, then the benefits would be split across a longer period of time so less of it will be concentrated in childhood (years 0-15). Second, they assume a linear dose-response relationship between malaria

The location and time period of the evidence also differs dramatically between the evidence and implementation contexts. The malaria eradication campaigns studied in Bleakley (2010) and Cutler et al. (2010) occurred in non-African countries in the early and middle part of the 20th century.

Implication

While GiveWell recognizes these differences we discussed above, they only discount the effects by 30%. We think this discount is oddly small, given that GiveWell, to adjust for the differences between the contexts of the deworming studies and charities, applies uses a 90% discount[9], even though the evidence-implementation gap for deworming appears less severe, as we illustrate in Table 1 below.

Table 1: Summary of the evidence to implementation gap for malaria prevention and deworming

Intervention	Attribute	Evidence	Charity implementation
Malaria prevention	process	Spraying DDT in mosquito habitats (eradication)	Distributing insecticide treated bednets (prevention)
Malaria prevention	location	Americas and Asia	Sub-Saharan Africa
Malaria prevention	time period	1920s to 1970s	Present (2022)
Deworming	process	Distributing deworming pills to all school children in an area	Distributing deworming pills to everyone in an area
Deworming	location	Kenya	Sub-Saharan Africa (and Pakistan)
Deworming	time period	1990s to 2010s	Present (2022)

In GiveWell's analysis of deworming, they extrapolate the causal effects of evidence from one context to a slightly different context. The evidence and implementation for deworming share an intervention (pills), a continent (Africa), and have a smaller gap in the time period. When it comes to malaria prevention, all of these factors differ, yet it receives a smaller discount. This makes us sceptical that the generalizability discount for this effect would remain 30%. One precise reason for a larger discount is attempting to incorporate the differences in malaria prevalence between contexts. We turn to that in the next critique.

prevention and later increases in income. This seems plausible, but not the only option. The first few years of exposure reduction could be more beneficial (which would make GiveWell's estimates larger), or one may require multiple years of prevented exposure for the benefits to kick in (which would make GiveWell's estimates smaller).

[9] We've identified three factors that are related to generalisation in GiveWell's cost-effective analysis: an adjustment in relation to dosage (the charities provide deworming medication for more years), an adjustment based on how many children (vs adults) the charities target, and an adjustment based on the relationship between the worm prevalence in the study's context and the the contexts of the charities. Combined together, these result in an 90% discount (i.e., multiplied by 0.10). See rows 47 and 48 of columns B and C, sheet "DtW (external validity)" for more details.

3. Malaria prevention's income mechanism remains unclear

GiveWell does not explain or defend malaria prevention's mechanism for increasing incomes like they attempt to do for deworming (GiveWell, 2020). We tried to evaluate the case for its causal mechanisms – what about keeping children from getting malaria increases their future incomes? We think that malaria prevention can plausibly increase future income. This is important because the generalisability of malaria prevention's income evidence will strongly depend on the mechanism. Unfortunately, the details of the mechanisms are still unclear to us. We provide more details below.

We are inclined to believe that malaria eradication campaigns in the 20th century increased income for two reasons. First, the quasi-experimental studies we cited above appear to have been carefully performed and consistently find lasting changes to income: the effect of malaria prevention for a year ranges from 0.53% to 3.33% increases in adult income[10]. The magnitude these causal effects is roughly consistent with cross-sectional analyses comparing incomes in countries and regions with differences in malaria prevalence (Sarma et al., 2019)[11]. And at least one of the papers we cite, Bleakley (2010) has held up to replication (Roodman, 2018).

Second, whilst the general mechanism appears plausible, we are unsure about the detail. It's an established finding that negative shocks to childhood can have permanent economic consequences (see Schanzenbach, 2018, for a discussion), so we think the general mechanism is through protecting a child's development. The exact mechanism is unclear to us (we haven't rigorously reviewed the literature), but seems to plausibly be through improvements to educational attainment[12], health, or cognitive function[13]. There appears to be evidence supporting each of these mechanisms, but none seem to fully explain the results. Note that we only quickly reviewed this literature.

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[10] See the data extracted here.

[11] They found that "a 10% decrease in malaria incidence was associated with an increase in income per capita of nearly 0.3% on average" across countries. Naively, this would imply a boost to income per capita of 3% for eradication.

[12] Barofksy et al. (2015), Mora-Garcia (2018), Rawlings (2016), and Lucas (2010) find that a malaria eradication campaign increased time spent in school by around half a year. Work on more recent efforts at malaria prevention also finds positive effects on educational outcomes (Kuecken et al., 2014; Klejnstrup et al., 2018; Jukes et al., 2006). But Cutler (2010) finds no evidence of malaria prevention impacting educational attainment. However, Bleakley (2010) and Mora-Garcia (2018) find that increases in education account for, at most, 25% and 10% of their income results. While this means that most of the income results are unaccounted for, this seems to be a relatively high share of the effects to be explained.

[13] Chang et al. (2014), Venkataramani (2012), and Jain (2021) find that malaria prevention predicts better health and cognitive function later in life in Taiwan, Mexico, and India – which is in line with the correlation between malaria prevalence and cognitive function (Fernandez, 2018).

If - as appears to be one plausible pathway supported by the evidence - malaria prevention increased school attendance which then boosted incomes, then that may be less relevant for today's malaria prevention actions because schooling is much more common everywhere – even in Africa (OWID, 2022). On the other hand, schooling may be much more necessary for the present and future labour markets. A similar challenge faces cognitive function as a pathway. IQ scores rose dramatically in the 20th century (OWID, 2022), so relative increases in cognitive function will be smaller, but a greater share of work may reward intelligence.

While we think the case that malaria eradication campaigns improved income is relatively sound, we are ***much*** less sure how well this predicts future malaria prevention efforts for reasons we've enumerated in critiques 1 and 2.

4. GiveWell omits relative prevalence adjustments between evidence and AMF

We now show that the discount might be closer to 64% if we adjust for differences in malaria prevalence (using fatality rates as a proxy), which would reduce the overall cost-effectiveness of malaria prevention by 17%. Prevalence is only one factor amongst many that differs between the evidence and charities interventions so the discount is likely different from exactly 64%.

GiveWell mentions in a comment (see row 110 of the "AMF" tab) that the malaria income studies they use (Bleakley, 2010; Cutler et al., 2010) *"study different malaria interventions that operated in different places and time periods and* ***generated larger reductions in malaria prevalence than the programs we are currently modelling"***.

As we highlighted above, it seems like previous attempts at malaria prevention led to more dramatic reductions in malaria prevalence than occur today. We can try to estimate some of these differences, such as the difference in prevalence between contexts. While we can't find prevalence information across the countries studied, we use malaria fatality rates as a proxy to compare the study countries with countries where AMF currently operates.

In the countries that AMF operates in, the average malaria fatality rate (if they don't provide bednets) is 73 per 100,000 people (OWID, 2022). However, the average death rate in the pre-eradication era across the causal studies is 203[14]. If death rates are a suitable proxy for prevalence, then we can expect that the countries AMF operates in have about 73/203 = 36% the level of malaria that was experienced in the areas from the evidence GiveWell relies on for the

[14] Four of these studies had fatality rate data: Taiwan (250; Chang et al., 2014; Figure 2), Mexico (80, Venkataramani, 2012; Table 1), India (250; Cutler et al., 2010; p. 74), and Costa Rica (250; Mora-Garcia, 2018; Table 1).

income estimates. If we adjust for this difference in prevalence, then the generalisability discount would increase from GiveWell's subjective guess of 30% to 1 - 36% = 64%. Adding this adjustment, the income effect is nearly halved, reducing the overall cost-effectiveness of AMF by 17%[15] (see row 202 of the "AMF t3" tab). One caveat to this is that there's probably good reason to mistrust malaria death rate as a proxy for prevalence – basic healthcare has obviously improved across the world in the past 70 years or so (OWID, 2022).

5. GiveWell's malaria prevention analysis misses relevant data

As already stated, GiveWell estimates that long-term increases in income comprise 34% (see row 141 of "AMF" tab) of the value of malaria prevention. We found four studies of the income-increasing benefit of malaria prevention, in addition to the two that GiveWell uses: (Shih & Lin, 2019; Rawlings, 2016; Mora-garcía, 2018; Venkataramani, 2012). These studies are, like Bleakley (2010) and Cutler (2010), primarily focused on malaria eradication campaigns and none are clearly more relevant in context to AMF. These studies show that the lifelong income benefits of malaria prevention are lower than estimated by GiveWell. Including this new information decreases the lifetime income effect from 2.3% to 1.4% (a 39% decrease), which, by itself, leads to a decline in the cost-effectiveness of the Against Malaria Foundation (AMF) by 14% (see row 200 of 'AMF t1') – which is about what we'd expect since GiveWell estimates that income benefits make up about a third of the total value of AMF (39% * 14% = 13%).

6. GiveWell may underestimate the sex differences in income benefits

The income effects GiveWell use only considers the effect on men. GiveWell notes that:

> "*The studies primarily report outcomes for males. We would guess that there would also be effects on income for females, but that these would be lower due to females having lower rates of labor force participation. We apply a further discount of 25% [i.e., multiplying the original figure by 0.75] to account for this consideration.*" (see row 110 of 'AMF').

We take this to imply that GiveWell think the effect on women's income is 25% lower than that for men's. We do not have a view about how to implement generalisability to women's income. However, if this is how GiveWell wants to implement it, then by using more data they can come to a larger and more informed discount.

[15] This is about what we'd naively expect from increasing the discount by 64% for a part of the analysis that makes up 34% of the final value (64% * 34% = 22%). We aren't sure what explains the further discrepancy between the expected 22% and the actual 17% decrease in the overall cost-effectiveness.

We can estimate this with the four studies we found with regression specifications including a dummy variable representing sex. We can take the ratio of the male and female income effects and average them to get the average ratio of female-to-male income effects. The interpretation of this ratio is that, for example in Mora-Garcia (2018), the effect on women's income is 62% smaller than what is for men.

Table 2: Ratio of female-to-male income effects

Study	Country	ratio of male to female effects	source
Shih & Lin, 2019	Taiwan	-16.67% [16]	model 3, table 5, p 15
Mora-garcía, 2018	Costa Rica	61.95%	models 4 & 5, table 2, p 604
Venkataramani, 2012	Mexico	37.07%	model 2, table 2, p 772
Cutler et al., 2010	India	2.11%	model 3, table 3, p 85

Averaging these effects, we find that the effect on women's income is only 21% of what it is for men (i.e., 79% lower)[17]. As this concerns half the population, this implies a 79/2 = 39% discount, which is larger than the 25% discount that GiveWell assumes and will lead to smaller effects. If we plug this into GiveWell's CEA, this reduces the cost-effectiveness of AMF by 23% (see row 200 of 'AMF t2').

7. GiveWell assumes, without a clear rationale, that bed nets have the same long term income effects as deworming.

To account for how many years the income benefits of malaria prevention last, GiveWell appears to use the same model that they use for deworming. The most important component of this model is how long the benefits last and whether they decay[18]. When estimating the duration of the benefits (40 years), they say "For consistency, we use the same figure here as we do for our deworming CEA." (row 117, sheet "AMF").

We have previously argued for an alternative modelling of deworming's long-term benefits (McGuire et al., 2022) that GiveWell has said that, if incorporated, "will reduce our estimate of the cost-effectiveness of deworming by 10%-30%." (GiveWell, 2022). The income benefits make up

[16] This suggests that, in this study, the income effect is higher for women than for men.

[17] Presumably this is because women participate in the labour force at lower rates than men (OWID, 2022). However, women likely participate at higher rates now than 70 to 100 years ago, when the evidence was gathered. But there doesn't appear to be long-run data for the countries studied in the malaria-income evidence (OWID, 2022).

[18] GiveWell also considers other features such as the discount rate, which they estimate to be 4%.

34% (see row 141 of "AMF" tab) of the benefit of malaria prevention whilst almost[19] all of the benefits of deworming come from income gains. So naively, we can predict that if GiveWell incorporated our previous critique of deworming's decay, then the cost-effectiveness of AMF would drop by between 10% * 0.34 = 3.4% and 30% * 3.4 = 10.2%.

Cash transfers

8. GiveWell misses evidence for transfer recipients' baseline consumption

GiveWell only uses one study to calculate the effect of GiveDirectly cash transfers on recipients' consumption. Adding other relevant studies leads to the conclusion that GD's recipients are 70% richer than GW assumes, which reduces the cost-effectiveness of GiveDirectly by 38%.

GiveWell estimates that 88% of GiveDirectly's benefits come from gains to consumption (see row 130, sheet "GD"). The rest of the benefit is taken to be from effects to health, mortality, and child development (see rows 119 to 121, sheet "GD"). GiveWell distinguishes between consuming the cash now, or later (saving and investment). They estimate that 39% of GiveDirectly cash transfers are saved and invested (row 12, sheet "GD") and this represents 42% of the total value to consumption (because investments generate returns). GiveWell estimates that the remaining 58% of the cash transfers' consumption benefits[20] (see row 81 of the 'GD' tab) come from increasing present consumption. They estimate that immediate consumption increases by around 37% (see row 20).

To work out the 37% increase figure, GiveWell goes through several steps. First, GiveWell takes the baseline monthly consumption of the control group in purchasing power parity adjusted (i.e., PPP, see IMF, 2022 for an explanation) US dollars ($24), annualizes this to $286, and estimates how much per person income would increase if the non-invested portion of a $1,000 cash transfer was evenly divided amongst 4.7 household members. However this $286 figure has two problems. First, it is not based on the difference between the control group and the treatment group[21], despite there

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[19] GiveWell adjusts the benefits of deworming upwards by 17% to account for their guess at reductions in mortality and morbidity (rows 93 to 97, sheet "DtW").

[20] These are 58% of the consumption benefits see row 20 and 28 of the 'GD' tab. This is provided by the greater part of the transfer that isn't invested (GiveWell estimate 39% is invested using figures from Haushofer & Shapiro, 2013).

[21] If GiveWell wants to use the actual treatment effects, then Haushofer and Shapiro (2016) estimates that household consumption increases from $157.6 (PPP USD) to $214 for a $1,000 cash transfer (see model 5 in Table 2). This represents an increase in economic benefits of 0.31 log-units, which is smaller than the 0.37 GiveWell estimated

being some available because of the RCTs of GiveDirectly cash transfers. You don't need to run an RCT to acquire the information GiveWell uses.

Second, it is only based on the 2013 version (see row 19, sheet "GD") of Haushofer and Shapiro's (2016) study of GiveDirectly cash transfers. There are many other RCTs that study GiveDirectly cash transfers, most of which are conveniently summarised on GiveDirectly's website. We collected the average annual consumption data from a convenience sample of other GiveDirectly RCTs (Haushofer & Shapiro, 2016; Haushofer et al, 2020; Egger et al, 2020; Banerjee et al., 2020; McIntosh & Zeitlin, 2020; Cooke et al., 2019). We extracted the relevant data in the "GD consumption data" tab. The average per capita consumption figure from these samples is $485, which is much higher than the $286 estimated from Haushofer and Shapiro (2013) alone.

We are not surprised that additional evidence indicates that GiveDirectly's recipients are richer for two reasons. First, Africa has become wealthier in the past decade by $657 PPP per capita (World Bank, 2022). Second, as GiveDirectly scales, it will naturally run out of the poorest recipients. The new, higher figure of baseline consumption means a $1,000 cash transfer increases consumption *relatively* less. Since relative income changes are how GiveWell assesses the value of consumption increases, this translates into GiveDirectly being less effective.

When we include the baseline consumption, the relative increase in consumption decreases from 0.35 to 0.22 log-units (row 20) a decrease of 27%. Consequently, the effectiveness of GiveDirectly drops by 38% (see row 89, column d of the "GD" tab). But we are confused why the resulting overall cost-effectiveness changes by more than the benefits (-27% versus -38%).

GiveWell uses GiveDirectly as its baseline for cost-effectiveness analyses and will recommend charities that are 8 to 10 times more cost-effective than GiveDirectly (it has varied between 8 and 10 over the years). If GiveDirectly's cost-effectiveness goes down, this implies that, relative to it, other things are now comparatively more cost-effective, which makes it easier for other things to clear GiveWell's 'bar'.

Deworming

9. Another study of deworming's effect on income

GiveWell's deworming analysis notably relies solely on evidence related to the Primary School Deworming Project (PSDP) studied in Miguel and Kremer (2004) and its follow-ups (Baird et al.,

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without recourse to the causal findings of the study (see row 20 of the 'GD' tab). How this would influence the overall cost-effectiveness depends on if this difference in consumption is being invested – which we didn't have time to check.

2016; Hamory et al., 2021). We found an additional study that estimates the long-term causal effects of childhood deworming on income (Liu & Liu, 2019) and seems to find slightly larger effects of deworming on income.

At first glance, this should increase GiveWell's model of the cost-effectiveness of deworming. However, we want to strongly caveat this because (1) we have not had time to explore this new study in depth, and (2) this new study is from a different context to that of the PSDP, so it is unclear how generalizable the effects are (cf the issues mentioned in our critique of Malaria above). Liu and Liu (2019) happened in a different country and continent (China, Asia vs. Kenya, Africa), happened at a different time (late 1950s rather than late 1990s-2000s), occurred in a context with different worm burdens, and had a different goal (eradication of schistosomiasis rather than control of schistosomiasis burden). There are likely other differences in the details of the deworming programs being compared. For instance, the average of respondents in Liu and Liu (2019) is in their 50s, while the eldest respondents in the PDSP are in their 30s.

For GiveWell (2018), the main impact of deworming is the long-term income benefits for children receiving deworming medication, calculated in relative economic gains (how much more the treatment group earns compared to the control group[22]). In their calculations, they average the summary data about relative earnings and relative consumption gains for the treatment group and find that deworming leads to economic gains of 0.109 natural logs (or a 11.5% increase).

Liu and Liu (2019) estimate the causal effects of a schistosomiasis eradication campaign in China on life-long income by exploiting quasi-random differences in worm burden prevalence in worm burden across regions and reductions in burden across cohorts. The campaign started in 1957 and the survey they used was from 2010, allowing them to capture the effects of childhood deworming on the incomes of adults who are at the end of their careers. The main finding is:

> *If a county that had a 10 percent pre-control infection rate eradicated schistosomiasis, men (women) could earn [...] about a 10 percent (40 percent) increase in personal income [...] In terms of pure consumption, the effect equals [...] an 8.8 percent increase in consumption per capita.*

We compared and combined these results with GiveWell's calculations for the PSDP. If we average across the genders, the earnings increase is (10 + 40) / 2 = 25%. If we average this with the consumption gains - as GiveWell does in their calculations - then the economic gains are (25 + 8.8) / 2 = 17%, or ln(1.17) = 0.16 natural logs. This is higher than GiveWell's calculation for the PSDP's

[22] The control group being a group that received 'less deworming', not 'no deworming'.

treatment effect. When we average the two together, we get (0.11 + 0.16) / 2 = 0.133 natural logs. If we plug this into the calculation spreadsheet, we find that it increases deworming's total cost-effectiveness by 22% (see row 222 of "DW t1")[23].

Additionally, the 10% worm burden reduction (going from 10% to 0%) cited in Liu and Liu, is lower than the 25% worm burden reduction that occurred in the PSDP (Miguel & Kremer, 2004). Naively, to correct for differences in worm burden, we adjust the Liu and Liu effect upwards by 25/10 = 2.5 to get 0.156 * 2.5 = 0.39. Additionally, the income effect in the PSDP is due to 2.41 years of deworming, whereas Liu and Liu (2019) looked at eradication, which would be a much larger dose. We do not know exactly what dosage this would involve, but, if we follow GiveWell's logic about lifelong economic benefits in malaria (see our malaria critiques), then we would conclude that all the effects are concentrated in the 15 first years of life. On this assumption, 2.41 years of treatment for the Liu and Liu (2019) study would lead to an economic benefit of 0.39/(15/2.41) = 0.06. If we average the two together, we get (0.109 + 0.06) / 2 = 0.09 natural logs (which is *lower* than the naive average). If we plug this into the calculation spreadsheet, we find that it *reduces* deworming's cost-effectiveness by 22% (see row 222 of "DW t2"). In the next section we consider how adjusting the replicability adjustment increases the cost-effectiveness of deworming.

However, as aforementioned, this is only one of the differences in context and we wouldn't be surprised if other factors play different roles (large or small, negative or positive). We are unsure as to how well Liu and Liu (2019) generalises to the context of GiveWell's charities and the PSDP study.

10. Deworming's replicability adjustment

An important part of GiveWell's modelling of deworming is their 'replicability adjustment' (see row 11 of "DW"; discussion between HLI and GiveWell in McGuire et al., 2022). GiveWell have a prior belief that the effects of deworming are lower than what the PSDP study suggests, and the PSDP findings are uncertain and only from one study, so they adjust the results down towards their prior. Given that another study finds similar results for deworming, we think it is reasonable to reduce the replicability discount by some amount. We are unsure how much it would be reasonable to decrease this by. But even a relatively small change could make a large difference to the overall cost-effectiveness of deworming. For instance, if we decrease the replicability discount slightly from 87% to 80% (a complete guess) then this would increase the overall cost-effectiveness of deworming

[23] In this example we take GiveWell's modelling at face value. However, we have previously argued that this model fails to account for the fact that the PSDP data suggests that the income benefits decay over time (McGuire et al., 2022). We don't know what Liu and Liu's study suggests about the trajectory of the relative economic benefits of deworming over time.

by 55% (row 220, sheet "DtW t2.5"). Combining this with the higher estimated economic benefit (see above), increases the cost-effectiveness of deworming by 21% (see row 222 of "DW t3").

Criticism about country-level analyses

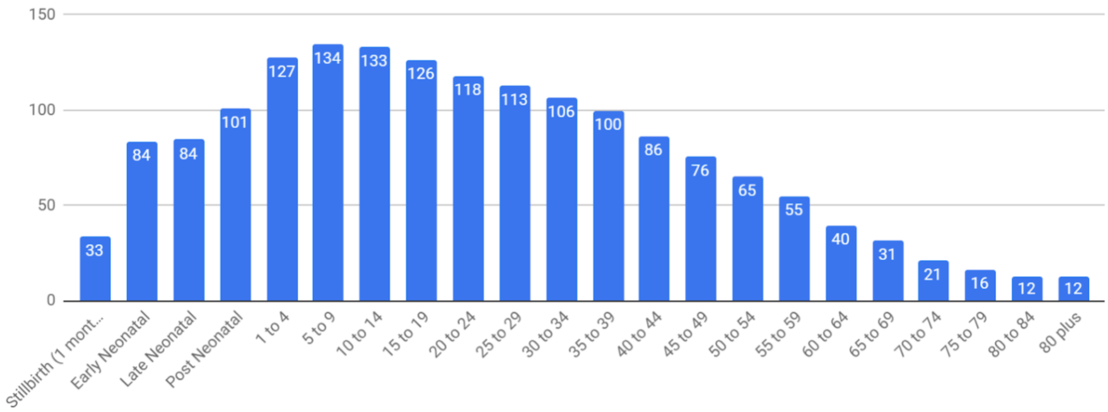
GiveWell applies their cost-effectiveness analyses to different countries in which the charities operate. By adding this level of analysis detail they can capture how the cost-effectiveness of charities vary across different countries. We think GiveWell's analysis lacks granularity at the country level in two areas: (1) age of death and moral weights, and (2) household size and spillovers.

11. Age of death and moral weights

GiveWell attaches different values to saving lives at different ages (this is more complicated than simply that the youngest are most valuable; see GiveWell's 2020, moral weights). However, in their analyses, they split the life-saving effects simply into under-5s and over-5s 'buckets'; Hence, they treat saving the life of a six-year old as the same as an eighty-six year old. This inconsistency matters for two important reasons.

First, because their moral weights relate to age in more detail than only the two categories of 'under-5-year-olds' and 'over-5-year-olds'. See Figure 1 below for GiveWell's distribution of moral weights across ages.

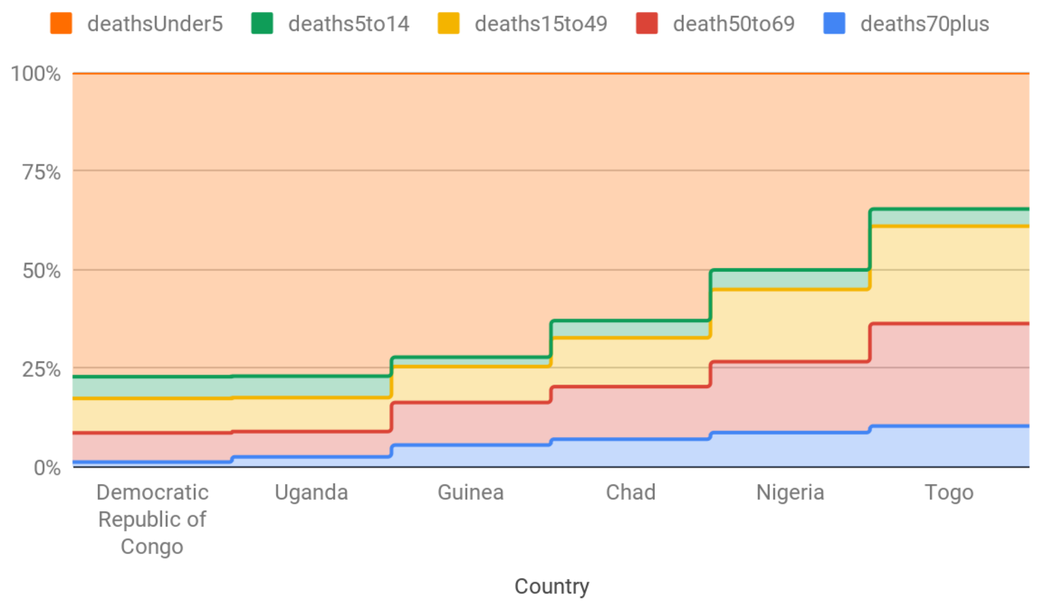
Figure 1: GiveWell's disvalue of death at different ages in units of doubling consumption



Note: This graph comes from GiveWell (2020). Plant (2022) discusses these weights in more depth.

Second, the age composition of people who die from a certain cause shifts by country - and thus by charity - which could plausibly affect the cost-effectiveness of the charities. The age of people who die from malaria who are over 5 years old shifts considerably across countries (see Figure 2). This means the average disvalue of the death should shift too – but in GiveWell's CEA, each over-5 saved is given the same value. We haven't yet calculated how much difference this could make, but we guess country specific cost-effectiveness figures could shift considerably.

Figure 2: The share of deaths from malaria per age for AMF countries



12. Household size and spillovers

Household spillovers are the benefits an intervention has on the members of the recipient's household. For example, a cash transfer to an individual might benefit the rest of the household if the money is shared or if household goods are purchased. GiveWell's household spillovers model lacks granularity across the interventions and the countries in which they operate.

For all non-cash transfer interventions that lead to economic benefits, GiveWell assigns a blanket 2x 'household resource sharing' multiplier[24]. The model for this multiplier assumes a 4.5 person household that transitions to a 2 person household after 18 years. We suggest that GiveWell should update this model with country-specific household sizes; the data is easily accessible. As it stands, their current model overestimates the cost-effectiveness of interventions in areas where the average household is less than 4.5, and vice versa when the average household is over 4.5. For example, if we update Deworm the World's Pakistan programme with the household multiplier that comes out of Pakistan having a household size of 6.8 (UN, 2019), this increases its cost-effectiveness by 47% (see row 220, "DtW t4" sheet). Note that Pakistan has an unusually large average household size, so this

[24]For cash transfers, GiveWell divides the potential consumption benefit (i.e., a $1,000 transfer) equally across household members.

shift is an upper bound. We did not have time to explore how implementing this change would affect other country-charity cost-effectiveness combinations.

Conclusion

In this document, we demonstrated a range of critiques of GiveWell's cost-effectiveness calculations that substantially alter the results. These were shallow explorations, so we expect the numbers to change with further scrutiny. That being said, we think taken together, these critiques make a case that GiveWell should consider investing relatively more resources into updating their CEAs, reviewing their past research, and setting higher standards for future research that will guide the allocation of millions of dollars.

There are many areas of GiveWell's analyses we have not reviewed. We did not review GiveWell's analysis of vitamin-A supplementation, conditional cash transfers for vaccines, how they calculate costs, nor how they make their various other adjustments.