GiveWell

TOP CHARITY REPORT

Helen Keller International's Vitamin A Supplementation Program

Version: February 2018

About GiveWell

GiveWell is a nonprofit dedicated to finding outstanding giving opportunities and publishing the full details of our analysis to help donors decide where to give.

Unlike charity evaluators that focus solely on financials, assessing administrative or fundraising costs, we conduct in-depth research aiming to determine how much good a given program accomplishes (in terms of lives saved, lives improved, etc.) per dollar spent. Rather than try to rate as many charities as possible, we focus on the few charities that stand out most (by **our criteria**) in order to find and confidently recommend high-impact giving opportunities (our **list of top charities**).

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This report was originally researched, written, and published by GiveWell. To view the latest version of this report on GiveWell's website, please visit **this page**.

Table of Contents

Summary

What do they do? Helen Keller International (HKI) supports programs focused on reducing malnutrition and averting blindness and poor vision; this review focuses only on HKI's work on **vitamin A supplementation** (VAS) in sub-Saharan Africa. HKI provides technical assistance, engages in advocacy, and contributes funding to government-run vitamin A supplementation programs. (**More**)

Does it work? There is strong evidence from many randomized controlled trials (RCTs) conducted in the 1980s and 1990s that VAS can substantially reduce child mortality, but weaker evidence on how effective VAS is in the places HKI would work with additional funding in the next few years. HKI has conducted studies to determine whether its mass distribution programs reach a large proportion of targeted children; many of these studies were targeted at areas with suspected low coverage and overall the surveys found moderately positive results. We have also investigated the question of what effect HKI's support has on programs and found a number of cases where it seems likely that HKI support is necessary for supplementation to occur. (**More**)

What do you get for your dollar? We estimate that it costs $0.75 to deliver a vitamin A supplement in HKI-supported programs. We have only seen limited information on the total expenditures of all actors involved with mass distribution programs, so we do not think that this estimate is as robust as the "cost per item delivered" estimates for our other top charities. It appears that HKI's vitamin A supplementation work is in the range of cost-effectiveness of our **top charities**, but there are several key factors about which we have limited information. (**More**)

Is there room for more funding? We believe that HKI's VAS work is highly likely to be constrained by funding next year. HKI has provided details of VAS programs that it could support with additional funding of up to about $45.0 million in 2018-2020. HKI appears to have limited prospects for funding these programs from other sources. (**More**) *December 2017 update: In November 2017, we recommended that Good Ventures give $7.2 million to Helen Keller International's vitamin A supplementation program. After accounting for this grant, we expect Helen Keller International to have a remaining funding gap of about $37.8 million for its vitamin A supplementation program.*

HKI's vitamin A supplementation program is recommended because:

- VAS is a program with a strong evidence base and strong cost-effectiveness.
- Track record – HKI has experience with supporting VAS programs in a large number of countries.
- Standout transparency – it has shared significant, detailed information about its programs with us.
- Room for more funding – we believe that HKI could productively use more funding than it expects to receive to scale up its VAS activities.

Major open questions include:

- We have not investigated HKI at the same level of depth as some of our other **top charities**. Our general experience has been that more investigation leads us to learn about more limitations and uncertainties associated with the impact of a program and charity.
- We remain highly uncertain about current rates of vitamin A deficiency among preschool-aged children in areas where HKI supports VAS programs. If rates of vitamin A deficiency are low, it is likely that the impact of HKI's VAS programs would be limited.
- Will HKI-supported VAS programs achieve high coverage rates? Will HKI's monitoring provide high-quality evidence of its programs' impact?

Our investigation process

In April 2017, we invited Helen Keller International (HKI) to apply to be considered for a top charity recommendation for its **vitamin A supplementation** program. To date, our investigation of HKI has consisted of:

- Conversations with HKI staff.[1]
- Reviewing documents HKI shared with us.
- A visit to Conakry, Guinea in October 2017 to meet with representatives of HKI.

What do they do?

Helen Keller International (HKI) supports programs focused on reducing malnutrition and averting blindness and poor vision in countries in Africa and Asia; it also provides vision screenings and distributes eyeglasses at schools in the United States.[2]

In this review, we focus only on HKI's **vitamin A supplementation** (VAS) programs, which operate in countries in sub-Saharan Africa.[3] The World Health Organization (WHO) recommends that all preschool-aged children (aged 6 to 59 months) in areas where vitamin A deficiency (VAD) is a public health problem receive vitamin A supplements two to three times per year.[4] HKI supports countries' VAS programs for preschool-aged children by providing technical assistance, engaging in advocacy, and contributing funding to governments for implementing the programs.

What is vitamin A supplementation?

Vitamin A is an essential nutrient that serves many purposes in the body; in particular, the immune and visual systems require it to function properly.[5] Essential nutrients must be obtained through diet since the body cannot produce them on its own.[6]

Vitamin A deficiency (VAD) can cause stunting, anemia, xerophthalmia (dry eyes, which can lead to blindness), increased severity of infections, and death.[7] WHO notes that people who have diets containing few animal products and little vitamin A-fortified food may be particularly susceptible to VAD.[8] WHO estimates that VAD is most common in its Africa and South-East Asia Regions.[9] Infants, children, and pregnant or lactating women with low vitamin A intake appear to have a particularly high risk of the negative health impacts caused by VAD.[10]

WHO notes that vitamin A from high-dose supplements can be stored in the liver and used as needed in the body for several months.[11] To prevent childhood morbidity and mortality, WHO recommends vitamin A supplementation (VAS) every four to six months for all children aged 6 to 59 months in areas where VAD is a public health problem.[12]

More information about VAS is available in our **vitamin A supplementation intervention report**.

How are vitamin A supplements distributed and administered to preschool-aged children?

Distribution

HKI-supported VAS programs in sub-Saharan Africa generally use one or more of the following methods to distribute vitamin A supplements to preschool-aged children:[13]

- **Mass distribution campaigns:** HKI supports delivery of vitamin A supplements through two different types of mass distribution campaigns:
  - *National Immunization Days:* VAS has been added to door-to-door mass campaigns for polio vaccination (often called "National Immunization Days") in many countries, which occur one or more times per year.[14] Due to recent progress in polio elimination, many National Immunization Day programs have been eliminated or scaled down.[15]
  - *Child Health Days:* Countries that have eliminated or scaled down National Immunization Days have often transferred VAS programs to national "Child Health Days," biannual events providing a package of health interventions for preschool-aged children.[16] Some Child Health Day programs implement outreach activities to encourage caregivers to bring their children to fixed sites to receive health services; others send healthcare workers door to door.[17]
- **Routine delivery:** HKI supports creating a "contact point" at six months of age for VAS in infants' immunization schedules.[18] In countries implementing a six-month contact point for routine delivery of VAS, caregivers can take their infants to health facilities to receive VAS when the infants turn six months old (rather than waiting for the next mass campaign to occur).[19] HKI also supports routine delivery for older infants and children under 5 (in which caregivers take their children to facilities to receive VAS every six months).[20]

HKI plans to primarily support mass campaigns for VAS with funding it receives due to GiveWell's recommendation (see **below**).[21] HKI may also continue to provide support for some routine programs in Sierra Leone and Mozambique with other sources of funding.[22]

Administration

Health workers implementing VAS programs are expected to cut vitamin A capsules open with scissors and squeeze the contents of the capsules directly into children's mouths.[23] Health workers are also expected to ask caregivers about the age of the child in order to provide the correct dosage of vitamin A: 100,000 IU for 6-11 month-old infants, and 200,000 IU to 12-59 month-old children.[24]

What is HKI's role in VAS programs?

HKI provides the following types of support to government-run VAS programs:[25]

- **Technical assistance:** HKI assists governments with monitoring and evaluation,[26] training health workers and managers,[27] policy design,[28] program supervision,[29] planning and budgeting,[30] and demand generation[31] for VAS programs (details in footnotes). HKI mainly focuses on providing technical assistance at the sub-national level, particularly to districts or regions that may have low VAS coverage rates.[32] UNICEF and **Nutrition International** (formerly Micronutrient Initiative) often provide additional technical assistance and financial support for VAS programs in some of the countries where HKI works.[33]
- **Advocacy:** HKI encourages national governments to prioritize budgeting for and implementing VAS mass campaigns,[34] and advocates for routine distribution of vitamin A supplements through health facilities.[35]
- **Funding:** HKI provides grants to governments to cover a portion of the implementation costs of VAS programs.[36]

Our understanding is that HKI's specific activities vary considerably by country; we have not yet investigated these differences in depth.[37]

HKI's spending on VAS programs

Global Affairs Canada has provided around 80 million CAD to HKI for its VAS programs in sub-Saharan Africa since 2006.[38] Most recently, Global Affairs Canada granted 29 million CAD to HKI to support VAS programs in thirteen countries in sub-Saharan Africa between 2013 and 2016.[39]

We have seen a full breakdown of how much funding from the most recent grant HKI spent in each country, and a breakdown of what general types of activities within countries the funding was used or budgeted for (e.g., monitoring and evaluation) for the second and third years of the grant. See **this spreadsheet** for details. In short:

- HKI spent between $0.8 to $5.9 million per country, $1.5 million per country on average, over the three and a half years of the grant.
- HKI spent 28% on personnel and administration, 26% on grants to governments for program implementation, 10% on monitoring, 6% on program planning, 5% on behavior change and mobilization, and 5% on training and capacity building. 12% went to indirect costs.
- Spending by category varied considerably across countries. For example, grants to governments for program implementation varied from 3% to 45% of total spending.

HKI has not used substantial amounts of funding from sources other than Global Affairs Canada for its recent VAS programs.[40]

Does it work?

There is strong evidence from many randomized controlled trials (RCTs) conducted in the 1980s and 1990s that VAS can substantially reduce child mortality, but weaker evidence on how effective VAS is in the places HKI would work with additional funding in the next few years.

We have several sources of uncertainty about how to apply evidence from VAS trials conducted in the 1980s and 1990s to the contexts in which VAS programs operate today, including:

- A 1999-2004 trial with more participants than all previous studies combined (the Deworming and Enhanced Vitamin A, or DEVTA, trial) did not find a statistically significant effect on mortality. We remain uncertain about what could explain this difference in results. Some researchers have suggested that DEVTA did not find a statistically significant effect because it actually reached fewer children than it reported reaching or because of methodological flaws in the study.
- More children in today's contexts may be receiving vitamin A through food fortification programs or improved diets than children in the earlier contexts did. There appears to be limited information available on current rates of vitamin A deficiency (VAD) in the populations targeted by VAS.
- Child mortality rates in developing countries have decreased substantially over the past few decades. It is possible that deaths that may have been averted by VAS in worse-off populations in the past may already be averted through other means (e.g., increased immunization rates) in today's contexts.

To estimate what effect we should expect from VAS in locations where HKI supports VAS programs, and to evaluate HKI's track record at expanding access to VAS, we have considered the following questions (see discussion in the sections below):

- Is HKI supporting VAS programs in areas where child mortality is high?
- How prevalent is vitamin A deficiency in areas where HKI works? Has vitamin A fortification (adding vitamin A to common foods) reduced the impact of supplementation?
- Is there evidence that a large proportion of targeted children receive vitamin A supplements?
- How does HKI's support affect program outcomes?

Is there independent evidence that the program is effective?

A large number of RCTs of VAS that were conducted in the 1980s and 1990s found that VAS greatly reduces child mortality. A 1999-2004 trial with more participants than all previous studies combined (the Deworming and Enhanced Vitamin A, or DEVTA, trial) did not find a statistically significant effect on mortality. We remain uncertain about what could explain this difference in results.

Further details on trials of VAS:

- A **Cochrane** systematic review and meta-analysis of sixteen randomized controlled trials and one quasi-randomized trial conducted in the 1980s and 1990s (**Imdad et al. 2010**) finds that VAS reduces mortality of 6 to 59-month-old children by 24% (95% confidence interval 17% to 31% reduction in mortality rates).[41] The Deworming and Enhanced Vitamin A (DEVTA) study, a more recent trial (taking place between 1999-2004 and published in 2013) in India with around one million participants, estimates that VAS reduced child mortality by 4% and cannot rule out the possibility that VAS did not affect child mortality at all (the 95% confidence interval ranged from a 3% increase in child mortality to an 11% decrease).[42] An updated version of the Cochrane review (**Imdad et al. 2017**) combined DEVTA and another smaller recent trial (**Fisker et al. 2014**) with previous trials.[43] Its fixed-effect meta-analysis finds that VAS causes a 12% reduction in child mortality (95% confidence interval 7% to 17% reduction) and its random-effects meta-analysis finds that VAS causes a 24% reduction in child mortality (95% confidence interval 17% to 31% reduction).[44] (See the following footnote for a description of the differences between fixed-effect and random-effects meta-analyses.)[45] Even though the overall effect found in the updated meta-analysis remains statistically significant, it is unlikely that differences between the results of DEVTA and earlier trials were due to random chance alone.[46]
- We are uncertain about what could explain why the earlier trials and DEVTA found such different results. Some potential explanations include:
  - The population treated by DEVTA had lower baseline child mortality rates and may have had better overall health than many previously studied populations.[47] Deaths averted by VAS in worse-off populations may have already been averted through other means (e.g., increased vaccination rates) in the DEVTA population.[48] This hypothesis is undermined

somewhat by the apparent lack of a correlation between how much mortality risk was reduced and baseline mortality rate in non-DEVTA trials.[49]

- Some researchers not involved in the study have pointed to evidence suggesting that DEVTA may have failed to achieve as high a coverage rate as it reported.[50]
- DEVTA may have had methodological weaknesses that caused it to fail to detect a statistically significant mortality effect, even if VAS had a real effect on mortality rates in the population studied (details in footnote).[51]

For more details, see our **vitamin A supplementation intervention report**. A shorter summary of our views is available in our **blog post** on vitamin A supplementation programs.

Are programs targeted at areas where they are likely to be effective?

How prevalent is vitamin A deficiency in areas where HKI works?

Our best guess, based on very limited data, is that the prevalence of vitamin A deficiency (VAD) among preschool-aged children in countries where HKI works may be around 17% on average (weighted by the amount of HKI's recent spending by country). We estimate that the prevalence of VAD in populations represented in the meta-analysis of the effect of VAS on mortality was roughly 59%. Based on these estimates, we expect that VAS has a smaller impact on child mortality rates in populations reached by HKI's programs today than the impact on mortality found in populations studied in VAS trials. We incorporate this adjustment into our cost-effectiveness analysis of HKI (see **below**).

It appears unlikely that low rates of vitamin A deficiency (VAD) explain the DEVTA results, but it is still plausible that low rates of VAD in an area may indicate that VAS programs will have a limited effect on mortality there.[52] (See footnote for arguments on ways in which VAD rates may not be indicative of the impact of VAS on child mortality; we have not yet evaluated these arguments carefully.)[53]

The prevalence of VAD in a population can be estimated using representative surveys of serum retinol concentrations or retinol-binding protein (measured in blood samples), clinically

assessed eye signs of VAD (e.g., Bitot's spots, xerophthalmia), or other measures.[54] WHO defines VAD as being indicated by a serum retinol concentration lower than 0.70 μmol/L, and severe VAD as a serum retinol concentration lower than 0.35 μmol/L.[55]

Our estimates for the prevalence of VAD among populations studied in trials included in **Imdad et al. 2017** are in **this spreadsheet** ("Imdad 2017 - VAD prevalence estimates" sheet). We consider our weighted average estimate of 59% prevalence of VAD in populations studied in VAS trials to be a rough best guess, based on limited data. Our process and sources for creating this estimate are outlined in the following footnote.[56]

We remain highly uncertain about the prevalence of VAD among preschool-aged children in areas where HKI works. To date, we have considered the following sources of information to learn more about VAD rates in areas where HKI works:

- **Vitamin A deficiency surveys:** We have listed the most recent serum retinol and retinol-binding protein surveys of preschool-aged children in countries where HKI supports VAS programs in **this spreadsheet**. Notes on these data:[57]
  - Of the thirteen countries where HKI has recently supported VAS programs, six have completed nationally-representative surveys of VAD (using serum retinol or retinol-binding protein biomarkers) among preschool-aged children in the past ten years, and two of those surveys were completed in the past five years (as of 2017). The remaining countries completed VAD surveys more than ten years ago, or have not ever completed any.
  - The majority of these surveys find VAD prevalence among preschool-aged children in the "severe" range as defined by WHO (above 20% prevalence). But the only two surveys implemented in the past five years, from Sierra Leone and Kenya, find prevalence rates in the "moderate" and "mild" ranges, respectively. Malawi and South Africa have not received support from HKI for VAS programs, but have implemented VAD surveys in the past five years—a very low prevalence of VAD among preschool-aged children was reported from a 2015-16 survey in Malawi (4%), and a high rate (44%) was found in South Africa in 2012.
  - VAS appears to have only a temporary impact on measures of serum retinol and retinol-binding protein concentrations.[58] Accordingly, measures of serum retinol or retinol-binding protein may not be useful for evaluating the impact of a VAS program—instead, they may reflect whether or not dietary vitamin A intake is adequate.[59]

    - We have not searched for recent surveys of the prevalence of Bitot's spots or other eye signs of VAD; our understanding is that these indicators of VAD may be responsive to VAS, and so would not be useful as an indicator of "underlying" VAD in a population reached by a VAS program, but we have not investigated this issue in depth.[60]
- **Stevens et al. 2015** incorporates the most recent available VAD surveys and other relevant information (e.g., availability of animal-source foods) into a mathematical model to estimate rates of VAD as of 2013.[61] We have not carefully reviewed the methodology used in this paper. **Stevens et al. 2015** concludes that VAD was likely to be high (above 40%) in 2013 throughout sub-Saharan Africa.[62] Three more recent vitamin A deficiency surveys from Sierra Leone, Malawi, and Kenya found considerably lower rates of VAD among preschool-aged children than the lower bound estimate for sub-Saharan African countries in **Stevens et al. 2015**.[63]
- **Vitamin A food fortification:** Excluding the Democratic Republic of the Congo, all countries in which HKI has recently supported VAS programs mandate that vegetable oil be fortified with vitamin A. A few others mandate or allow fortification of wheat flour or sugar with vitamin A as well. (Some countries also have programs encouraging the consumption of crops biofortified with vitamin A, but we have not investigated these programs in depth.)[64] See details in **this spreadsheet**. We are uncertain about whether these food fortification programs have had impacts on rates of VAD among preschool-aged children in these countries. Our key findings:
    - In most countries in which HKI has recently supported VAS programs, we have not seen any household- or market-level surveys testing whether food samples are adequately fortified.[65]
    - A market-level survey of vegetable oil in the city of Abidjan, Côte d'Ivoire, found that nearly all samples were adequately fortified, but other surveys we have seen found relatively low rates of adequately-fortified oil.[66]
    - **Engle-Stone et al. 2017** found that rates of VAD among preschool-aged children in two cities in Cameroon did not significantly decline between 2009 and 2012, despite vitamin A fortification of vegetable oil becoming mandatory in 2011.[67]
- **Conversations with HKI and experts on vitamin A deficiency:** We have discussed our concerns about the lack of recent data on vitamin A deficiency with HKI. HKI told us that it believes it would be very surprising if vitamin A deficiency were no longer a problem throughout sub-Saharan Africa, especially in countries with high child mortality and malnutrition rates.[68] Dr. Sherry Tanumihardjo, an expert on vitamin A status assessment,

> has told us that since many vitamin A oil fortification programs in countries in sub-Saharan Africa are relatively new, it would not be surprising if many of the programs were not yet functioning well enough to have an impact on VAD rates among preschool-aged children.[69]

Taking the sources of information above into account, we have created rough best-guess estimates for the current prevalence of VAD among preschool-aged children in countries where HKI works in **this spreadsheet** ("VAD in HKI-supported countries" sheet), and calculated an average estimate (weighted by the amount of HKI's recent spending in each country) of 17%.

How high are child mortality rates in areas where HKI works?

Child mortality rates in countries where HKI works are lower than child mortality rates of some populations studied in trials of VAS in the 1980s and 1990s, but not so much lower that we would expect that HKI's programs would be unlikely to be effective on average. (See **above** for an explanation of why VAS may have a limited impact on preventing additional child mortalities in populations where baseline rates are already relatively low.)

For the thirteen countries where HKI has recently supported VAS programs, we estimate a weighted average child mortality rate of 10.5 per 1,000 child-years as of 2016.[70] This average is weighted by HKI's spending on VAS programs in these countries between 2013 and 2016—see **this spreadsheet** for details and calculations.[71] Some major VAS trials took place in contexts where baseline mortality rates were considerably higher than 10.5 per 1,000 child-years (see Table 1 below). Trials listed in Table 1 with baseline child mortality rates of 10.6 per 1,000 child-years or higher found that VAS significantly reduced child mortality, but the trials with lower baseline rates did not find statistically significant effects.[72]

Six out of the twelve countries where HKI would support VAS programs with additional funding have have mortality rates below 10.6 per 1,000 child-years, and of these, three (Kenya, Senegal, and Tanzania) have considerably lower rates.[73] The three countries where GiveWell most highly prioritizes HKI using additional funding (Burkina Faso, Guinea, and Mali) all have child mortality rates above 10.6 per 1,000 child-years (see **below** for details on GiveWell's prioritization).[74]

For comparison with our weighted average estimate of 10.5 deaths per 1,000 child-years, control group child mortality rates in the six main trials included in **Imdad et al. 2017** are presented in the following table. 19 trials are included in the all-cause mortality meta-analysis in **Imdad**

et al. 2017, but we focus on these six trials because they account for around 90% of **Imdad et al. 2017**'s weighted mean estimate of the effect of VAS on mortality.[75]

Table 1: Characteristics of the six main studies used in the Cochrane review's estimate of the effect of VAS on all-cause mortality

Study	Age group	Control group mortality per 1,000 child-years	Mortality risk ratio (95% CI)	Deaths/Child-years in treatment vs. control
Awasthi et al. 2013 (DEVTA)	12 to 72 months	5.3	0.96 (0.89 – 1.03)[76]	12,467/2,464,490 vs. 13,217/2,496,620[77]
Ross et al. 1993	6 to 90 months	29.9	0.81 (0.68 – 0.98)	397/16,508 vs. 495/16,779[78]
West et al. 1991	6 to 72 months	16.4	0.70 (0.56 – 0.88)	152/13,175 vs. 210/12,795[79]
Herrera et al. 1992	9 to 72 months	5.3	1.06 (0.82 – 1.37)	120/21,515 vs. 112/21,224[80]
Daulaire et al. 1992	1 to 59 months	126	0.74 (0.55 – 0.99)	138/1,480 vs. 167/1,323[81]
Sommer et al. 1986	0 to 71 months	10.6	0.73 (0.54 – 0.99)	101/12,991 vs. 130/12,209[82]

There are major limitations to our analysis so far of baseline child mortality rates in areas where HKI works. In particular:

- We have only reviewed data on national average child mortality rates. It would be more appropriate to use regional or local mortality data to evaluate the impact of HKI's sub-national technical assistance work. We have not yet looked into whether reasonably high-quality data exist at the sub-national level.
- It seems unlikely to us that there is a real baseline mortality rate "threshold" for the effectiveness of VAS (i.e., that VAS has an impact on child mortality when baseline rates are above 10.6 per 1,000 child-years, but no effect when baseline rates are below 10.6 per 1,000 child-years). We compare baseline mortality rates in areas where HKI works to 10.6 per 1,000 child-years because it may be useful as a general indication of where VAS programs are more or less effective at reducing mortality.
- We are comparing mortality rates from 2016 with control-group mortality rates from VAS trials. This comparison is flawed because VAS programs may have contributed to a reduction in mortality rates to their 2016 levels.

- We are uncertain whether VAS might have an impact on all mortalities caused by infectious diseases, or only a subset of specific infectious diseases. (It does not seem plausible to us that VAS could have an impact on other causes of child mortality, like accidents.) The only statistically significant cause-specific mortality reduction effect found in a meta-analysis of trials of VAS for preschool-aged children was for diarrhea.[83] The same meta-analysis found a statistically significant reduction in measles incidence, but not mortality.[84] Very roughly, we estimate that the proportion of child mortalities caused by infectious diseases generally (and diarrhea specifically) in sub-Saharan Africa has declined only slightly since 1990, but that the proportion of child mortalities caused by measles is now substantially lower than it was in 1990.[85]

Are vitamin A supplements delivered to and ingested by recipients?

We have seen coverage surveys from some of the locations where HKI has supported mass distribution campaigns for VAS. The surveys generally found moderately positive results, but cover only a relatively small portion of HKI's past work. Many of these surveys were conducted in areas where HKI expected coverage to be low. HKI told us that, if it had funding to do so in the future, it would like to conduct surveys that are representative of its work overall on mass distribution campaigns.[86] The evidence we have seen on coverage rates achieved through routine distribution systems is much more limited—for this reason, we have limited our consideration of HKI's room for more funding to mass distribution campaigns only (see **below**).

Mass distribution campaigns

HKI collaborates with governments to implement post-event coverage surveys (PECS) following VAS mass distribution events.[87] In each of the surveys, surveyors visit a sample of households and ask parents (or other caregivers) whether preschool-aged children in their household took vitamin A supplements during the recent campaign.[88] HKI sent us documents on the general guidelines used to design these surveys, as well as some example reports and academic papers on specific coverage surveys.[89] We have summarized the details of the methodologies of the recent coverage surveys we have reviewed in **this spreadsheet** ("Methods" sheet).[90] We note that we have reviewed detailed reports from only two of HKI's recent surveys so far.[91] (In

October 2017, HKI sent us reports on three additional coverage surveys, but we have not yet reviewed the methodologies for these coverage surveys in depth.)[92]

Our main concern about coverage surveys of this type (similar to surveys for other mass distributions) is whether what caregivers say is likely to be accurate—their ability to recall the information may be flawed, or their responses may be biased toward what they believe surveyors want to hear. The amount of time between distribution and survey may be important for accurate recall; HKI's guidelines for coverage surveys state that surveys should take place within six weeks of the distribution, but we have limited information on what has been done in practice.[93] There may be ways to check the accuracy of caregivers' recall (e.g., vaccination coverage surveys are often able to check child health cards), but we are not aware of a method for doing this for VAS mass distributions.[94]

HKI's post-event coverage surveys have often found lower coverage rates than administrative data (which is based on tally sheets submitted by distributors).[95] We have summarized the results of recent coverage surveys we have seen in **this spreadsheet**. Overall, coverage was above 80% (HKI's target) in around 60% of surveys and the median coverage rate across all surveys was 85%.[96] Coverage was above the 80% target in around 80% of surveys of door-to-door distributions, and was above the 80% target in around 30% of fixed and outreach Child Health Day distributions.[97]

We have seen coverage surveys (and estimates of total vitamin A supplements delivered from administrative data for corresponding distributions) representing around 19% of the total vitamin A supplements delivered with HKI support between 2013 and 2016 (details in footnote).[98] Many of the surveys we have seen results from were conducted in areas chosen because HKI thought that coverage might be low.[99]

We use coverage survey results in our cost-effectiveness analysis to estimate the number of children reached. We also look at past coverage surveys to determine whether HKI has a track record of monitoring its work such that, if we recommend additional funding to HKI for VAS, we could expect to learn whether the additional work was effective.

Routine delivery

HKI supports creating a "contact point" at six months of age for VAS in infants' immunization schedules (see **above** for details).

We currently have a limited understanding of how HKI measures coverage rates for these programs. We have seen some results from one set of surveys before and after the six-month contact points were implemented, but we are unsure whether HKI and governments continue to implement these surveys beyond the program's pilot phase.[100] We have not prioritized this question because we expect donations we direct to HKI to primarily support mass distribution campaigns.

How does HKI's support affect program outcomes?

We have found strong evidence in some cases that HKI's financial support enables VAS mass campaigns to occur.

HKI's support may impact the outcome of VAS mass campaigns in the following ways:

- **Increasing coverage rates:** HKI identifies districts or regions participating in mass campaigns that have low VAS coverage rates and provides sub-national governments in those regions with technical support.[101]
- **Causing VAS campaigns to occur:** In the absence of external technical assistance and funding, HKI told us that VAS campaigns and programs would not occur at all in some countries.[102]

We have completed case studies on the types of impact HKI's involvement may have on VAS mass campaigns for a selection of HKI's country programs. HKI selected the countries for these case studies based on the availability of in-country staff for phone interviews; we are uncertain how representative our five country case studies are of the thirteen countries in which HKI has recently supported VAS programs.

In our case studies, we found strong evidence in a few cases that HKI's financial support enables mass distributions of VAS to occur. We have not yet seen evidence we find convincing that HKI's technical assistance enables mass distribution programs to achieve higher coverage rates than the programs would achieve in HKI's absence, primarily because we lack information about coverage rates in areas without HKI-supported programs (details in footnote).[103] For this reason, in our ranking of HKI's funding gaps **below**, we prioritize gaps for country programs in which additional funding for HKI could enable additional distributions of VAS to occur.

The full details of our case studies are available in **this spreadsheet**.

Are there any negative or offsetting impacts?

We discuss a few possible considerations but do not see significant concerns.

- **Potential VAS interaction with vaccines and increased mortality in some groups: Benn et al. 2009** reanalyzed data from an earlier VAS trial in Ghana to test the hypothesis that VAS reduced mortality in children whose most recent vaccine was a live vaccine (e.g., measles), but could lead to increased mortality in children (particularly girls) whose most recent vaccine was an inactivated vaccine (e.g., DTP).[104] The data re-analysis found that VAS was associated with nonsignificant increases in mortality among girls who had received vaccinations.[105] The authors of **Fisker et al. 2014**, a 2007-2010 trial in Guinea-Bissau of VAS, intended for the trial to test for interactions between VAS, live or inactivated vaccines, and gender.[106] The trial found no significant effect on mortality overall, a nonsignificant increase in mortality for boys, and no evidence of a differential effect based on receiving live or inactivated vaccines.[107] Based on the results of **Fisker et al. 2014**, it does not appear that increased mortality following VAS and live or inactivated vaccinations for boys or girls is a substantial concern. We plan to investigate potential harms caused by the interaction between VAS and vaccines more fully in an update to our **vitamin A supplementation intervention report**.
- **Adverse side effects of vitamin A supplements:** Some preschool-aged children experience side effects after taking vitamin A supplements, including loose stools, headache, irritability, fever, nausea, and vomiting.[108] WHO cites an estimate of the prevalence of these types of side effects of 1.5% to 7%; we have not vetted this estimate.[109]
- **Potential vitamin A overdose:** Chronic excessive vitamin A intake can cause a serious condition called vitamin A toxicity (also known as hypervitaminosis A).[110] Our understanding is that cases of vitamin A toxicity are very rare globally, and that VAS programs are not thought to be a cause of cases of vitamin A toxicity.[111]
- **Diversion of skilled labor:** VAS mass campaigns involve Ministry of Health staff, nurses, and other health workers.[112] We are uncertain of the degree to which participating in VAS programs reduces their ability to complete other duties, but we note that our understanding is that VAS campaigns usually take between a few days and a few weeks to complete.[113]

What do you get for your dollar?

Cost per vitamin A supplement delivered

We estimate that on average the total cost to deliver a vitamin A supplement through HKI-supported mass distribution programs is $0.75. We have only seen limited information on the total expenditures of all actors involved with mass distribution programs, so we do not think that this estimate is as robust as the "cost per item delivered" estimates for our other top charities.

Our approach

For programs that distribute health commodities, our general approach for calculating a "cost per item delivered" estimate is to identify comparable data on costs and items delivered and take the ratio.

We try to include all costs incurred to carry out a project, not just those that the charity in question pays for itself. We start with this total cost figure and apply adjustments in our cost-effectiveness analysis to account for cases where we believe the charity's funds have caused other actors to shift funds from a less cost-effective use to a more cost-effective use ("leverage") or from a more cost-effective use to a less cost-effective use ("funging").

We prefer to calculate average "cost per item delivered" estimates using data from a broadly representative sample of mass distribution rounds, since costs may vary considerably in different contexts.

Although HKI sent us estimates of the total expenditures of all actors (HKI, other non-governmental organizations (NGOs), and governments) involved in all 13 VAS programs it supported between 2013 and 2016,[114] we have not incorporated this information into our average cost per supplement estimate because we have low confidence in the accuracy of the spending totals for governments and NGOs other than HKI.[115] These expenditure totals imply that each vitamin A supplement delivered during this period cost $0.21 on average.

We have instead used the following inputs to construct our cost per supplement estimate:

- HKI's cost per supplement estimates from two past VAS distribution rounds, with added adjustments to account for additional costs and coverage survey data;[116]
  - **Kagin et al. 2015** estimates that it cost $0.76 per vitamin A supplement delivered through a Child Health Day program in the HKI-supported Littoral Region of Cameroon in a distribution in 2013.[117] This estimate includes the fixed costs of the Child Health Day platform (e.g., training activities), but does not include the variable costs of additional programs other than VAS delivered through the platform (e.g., the costs of drugs for deworming).[118] More details on the costs included in this estimate are in the following footnote.[119]
  - **HKI cost-effectiveness analysis of VAS in DRC (French) 2016** estimates that it cost $0.35 to deliver a vitamin A supplement through a Child Health Day program, and $0.43 through a door-to-door approach in an HKI-supported distribution in Kasai-Oriental, Democratic Republic of the Congo (DRC) in 2015.[120] Costs included in this estimate are listed in the following footnote.[121]
- Our rough forward-looking estimate of the cost per supplement delivered in an HKI-supported program in Guinea in 2018, based on information HKI shared with us.

We do not believe this estimate is as robust as our cost per item delivered estimates for our other top charities.

Our cost per supplement estimate

Using the approach described in the section above, we estimate that it costs $0.75 on average to deliver a vitamin A supplement in HKI-supported VAS mass distribution programs. Full details are in **this spreadsheet**.

Cost-effectiveness

See our most recent **cost-effectiveness model** for estimates of the cost per life saved through HKI's VAS programs.

A major question we have for further investigation is whether Child Health Days lead to additional interventions being delivered that would not have been delivered in the absence of HKI's support. During our visit to Guinea in October 2017, we observed a Child Health Day that

delivered **deworming** in addition to vitamin A. We do not know how common this is across HKI VAS programs or whether a strong case can be made for HKI causing additional interventions to reach populations that would not have received them otherwise. If there is such a case to be made, this could led us to believe that HKI is substantially more cost-effective than our current model indicates.

There are limitations to this kind of cost-effectiveness analysis, and we believe that **cost-effectiveness estimates such as these should not be taken literally**, due to the significant uncertainty around them. We provide these estimates (a) for comparative purposes and (b) because working on them helps us ensure that we are thinking through as many of the relevant issues as possible.

Some of the key assumptions and limitations of our HKI CEA are listed in the following footnote.[122]

Is there room for more funding?

We estimate that HKI could use an additional $45.0 million to support VAS mass campaigns in countries in sub-Saharan Africa over the next three years.

In short, we calculate this from (more detail in the sections below):

- **Total opportunities to spend funds productively:** HKI has identified $46.1 million of opportunities to:
  - Enable additional VAS mass campaigns to occur in Burkina Faso, Guinea, and Mali ($7.5 million)
  - Increase the likelihood that additional VAS mass campaigns occur in Niger and Cote d'Ivoire ($9.0 million)
  - Improve coverage rates of VAS in Cameroon, Nigeria, Tanzania, Mozambique, Sierra Leone, Kenya, and Senegal ($29.6 million)
- **Cash on hand:** HKI does not currently hold any funding for VAS campaigns and does not expect to allocate any unrestricted funding to VAS, given low levels of unrestricted funding.
- **Expected additional funding:** HKI expects to receive around $150,000 from UNICEF and around $200,000 from Nutrition International to support VAS mass campaigns in 2018; HKI may receive contributions of similar sizes from these organizations in 2019 and 2020.

December 2017 update: In November 2017, we recommended that Good Ventures give $7.2 million to Helen Keller International's vitamin A supplementation program. After accounting for this grant, we expect Helen Keller International to have a remaining funding gap of about $37.8 million for its vitamin A supplementation program.

Below, we also discuss:

- **Past sources of funding for VAS programs:** Before 2016, HKI's VAS programs were primarily supported by Global Affairs Canada.
- **Global room for more funding for VAS programs:** Global Affairs Canada is now providing significantly less per year to VAS programs overall than it did between 2013 and 2016. It appears that there is now a substantial funding gap for VAS mass campaigns at the global level.

Available and expected funds

Our understanding is that HKI does not currently hold any funding restricted to VAS, that it does not expect to be able to allocate unrestricted funds to VAS, and that it expects to receive limited amounts of funding for VAS mass campaigns from sources other than GiveWell in the near future.

HKI expects to receive around $150,000 per year through UNICEF in the next few years for VAS mass campaigns in Burkina Faso, Côte d'Ivoire, and Guinea.[123] In Nigeria, HKI expects to receive around $200,000 from Nutrition International to support VAS mass campaigns in three states in 2018.[124]

HKI does not expect to have enough unrestricted funding available to be able to allocate unrestricted funding to mass VAS campaigns. HKI's unrestricted funding has covered around 5% of its total spending in the past few years (excluding the use of in-kind donations), and has been used to cover fundraising expenses and overhead expenses not covered through restricted grants.[125]

HKI told us that it has received limited interest from other potential funders for closing its funding gap for VAS programs.[126] It is possible that this will change over the next three years.

Past sources of funds for VAS programs

Since 2006, HKI's VAS programs have primarily been funded by Global Affairs Canada.[127] Most recently, Global Affairs Canada granted $29 million CAD to HKI to support VAS programs in 13 countries in sub-Saharan Africa between 2013 and 2016.[128] HKI submitted a concept note to Global Affairs Canada for the continuation of these programs between 2016 and 2021, but HKI did not receive a new grant.[129]

Global Affairs Canada has also made grants to UNICEF and Nutrition International to support VAS programs in sub-Saharan Africa.[130] HKI told us that, going forward, Global Affairs Canada planned to grant funds only to UNICEF for VAS programs in order to ease administrative burdens.[131]

Uses of additional funds

We ask top charities to consider GiveWell-directed funds to be multi-year grants. The amount of GiveWell-directed funding that a top charity receives can vary greatly from year to year, and spending the funds over two to three years can help smooth these fluctuations.

HKI is seeking funding for its programs supporting VAS mass campaigns in 12 countries in sub-Saharan Africa. For a full list of HKI's spending opportunities, see **this spreadsheet**.

In short, HKI is seeking funding for, in the order of GiveWell's prioritization:

- **Enabling additional mass distributions of VAS to occur** ($7.2 million): In Burkina Faso, Guinea, and Mali, some Child Health Week programs, which are intended to be biannual, have been skipped in recent years due to a lack of funding. HKI is seeking funding to provide support to ensure that two Child Health Week campaigns, including VAS distribution, occur in each of these countries over the next three years.[132]
- **Increasing the likelihood that mass distributions of VAS occur** ($8.9 million): In Cote d'Ivoire and Niger, VAS has been delivered through polio National Immunization Days in recent years, but it is uncertain whether these campaigns will continue in 2018-2020. HKI is seeking funding to assist these countries in transitioning to Child Health Week distributions for VAS, which could prevent a biannual mass distribution of VAS from being skipped if polio National Immunization Days are stopped in the next few years.[133]
- **Increasing coverage rates in ongoing VAS mass campaigns and enabling "micro-campaigns" to occur in countries that are transitioning to routine VAS distribution** ($29.0 million): In Nigeria and Tanzania, HKI is seeking funding to raise coverage rates for ongoing Child Health Week VAS mass campaigns. In Mozambique, Senegal, and Sierra Leone, HKI is seeking funding to implement "micro-campaigns" to prevent losses in VAS coverage as these countries transition to routine distribution of VAS.[134]

Global room for more funding for VAS programs

Global Affairs Canada granted 70 million CAD to HKI and UNICEF for VAS programs between 2013 and 2016 and made a new grant of 70 million CAD to UNICEF for VAS programs between 2016 and 2020.[135] Due to declines in the value of the Canadian dollar relative to the US dollar, granting 70 million CAD over four years rather than three years, and an increase in the proportion of the grant intended to cover immunization activities, it appears that Global Affairs

Canada is now granting considerably less funding per year for VAS programs in total than it did between 2013 and 2016.[136]

Our understanding is that prior to 2016, Global Affairs Canada was the only large funder supporting the implementation of VAS programs, and that no other major funders have begun supporting VAS programs since 2016.[137]

HKI as an organization

We have spent significantly less time investigating HKI and have substantially less insight into its activities and track record than we do for **top charities** which we have followed for several years. As such, we have a limited view on the qualities below.

- **Track record:** HKI has experience with supporting VAS programs in a large number of countries for several years.
- **Self-evaluation:** HKI's self-evaluation is strong compared to the vast majority of organizations we have considered.
- **Communication:** We have not spent as much time communicating with HKI as we have with charities that we have recommended for several years. To date, HKI has generally communicated clearly with us.
- **Transparency:** HKI has shared significant, detailed information about its programs with us.

More on how we think about evaluating organizations at our **2012 blog post**.

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Charity Response

Helen Keller International (HKI) wrote the following in response to GiveWell's interim review of HKI. We have since updated our review of HKI so the below may not fully be up-to-date.

Published: November 2017

Helen Keller International (HKI) appreciates GiveWell's invitation to be considered for a top charity recommendation for its vitamin A supplementation program. We have appreciated the transparency and thoroughness of GiveWell's investigative process thus far. We also appreciate being named a standout charity based on the interim review while GiveWell undertakes additional investigation to determine if HKI qualifies as a top-rated charity.

We would like to offer the following statements in response to points made in GiveWell's interim review:

1. **Does vitamin A supplementation (VAS) work?** This is an important question and one that has received recent attention considering the shifting epidemiologic and programmatic landscape. The epidemiologic landscape has changed since the first VAS trials were published in the early 1990s. Overall, child mortality rates have declined by 49% since 1990 (Unicef 2014), but the rate of decline has been slowest in Oceania, sub-Saharan Africa and Asia. Likewise, the proportionate cause-specific mortality has also changed. In 1990, the three main killers were pneumonia (21% of under-5 mortality; U5MR), diarrhea (20%), and measles (7%) (van den Ent et al 2011), while in 2010 the main killers were pneumonia (18%), diarrhea (11%) and malaria (7%) (Liu L et al 2012).

   There is no question that in contexts exhibiting public health levels of vitamin A deficiency (VAD) and UFMR, VAS (and other interventions that improve the underlying vitamin A status of risk groups) is both sight- and life-saving. This conclusion stems from the results of large, rigorously conducted community trials in South Asia and Africa, which collectively provide incontrovertible evidence that vitamin A interventions, including 6-monthly VAS, reduce early childhood mortality and blindness in undernourished populations (Mayo-Wilson et al 2011). The impact is particularly striking on fatality not only from measles but also from more common diseases such as diarrhea, dysentery and other infectious illnesses. In contexts where uncertainly exists

about deficiency and mortality levels (due to the lack of recent data or other reasons) stopping or modifying VAS targets potentially puts children's lives at risk.

But even in countries with marked mortality declines and changes in causes of death, one cannot rule out a child survival benefit in many contexts. In all, 54 countries globally had a high U5MR (defined as ≥50 per 1000 live births) in 2012 (Unicef 2014). A large proportion of these deaths are caused by infections. Furthermore, in these high-mortality countries VAD is also likely to be high (Schultink 2002), thus reinforcing the need to maintain VAS and other vitamin A interventions. Where U5MR, VAD and infectious disease rates are low, the mortality effect of VAS will likely be reduced. Nevertheless, we must bear in mind two important facts (1) the original VAS studies observed mortality impacts in settings with a wide range of mortality and morbidity rates (Beaton et al 1993), and (2) one cannot rule out the role of VAS in helping to bring down U5MR (Bishai et al 2005; Masanja et al 2008).

2. **How to think about the Deworming and Enhanced Vitamin A (DEVTA) program evaluation?** GiveWell's report mentions several times the disputed and controversial DEVTA program evaluation study which suffered from important methodological limitations related to supplementation adherence and vital event monitoring systems, as acknowledged by other scientists (Mannar et al 2013; Mayo-Wilson et al 2013; Habicht et al 2013; Sommer et al 2013; Sloan et al 2013). In addition to weighing the methodological flaws of DEVTA, we feel the results of the DEVTA study should be viewed within the context of the larger body of evidence on VAS and child survival. Recently, the WHO examined evidence from all 17 trials (11 in Asia, 5 in Africa and 1 in Latin America) conducted to date for all-cause mortality. Findings revealed that VAS reduces the overall risk of death by 24% (risk ratio (RR) 0.76; 95% confidence interval (CI) 0.69–0.83). When adding the DEVTA findings to the analysis, the all-cause mortality benefit of VAS remained statistically and clinically significant at 12% (RR 0.88; 95% CI 0.84–0.94) (Mayo-Wilson et al 2011)

3. **The current best evidence indicates that VAD remains prevalent in south Asia and sub-Saharan Africa, but there is a need for more current, reliable**

and valid estimates of VAD prevalence. GiveWell raises the question, "How prevalent is vitamin A deficiency in areas where HKI works?". While HKI recognizes the urgent need for updated and valid estimates of vitamin A status in the countries and sub-regions where we work, HKI relies on the best available evidence from scientific sources to ensure that its VAS programs are targeting at risk populations. The most recent global and region-specific estimates of VA deficiency prevalence come from a pooled analysis of population-based surveys from 138 low- and middle-income countries between 1991 and 2013 and published in the Lancet Global Health Journal in 2015. In this publication, the authors estimated the prevalence of deficiency in 2013 to be highest in sub-Saharan Africa (48%) and south Asia (44%) (Stevens et al 2015). Region and country-specific VAD prevalence estimates should be updated as new data become available. Currently, many countries implementing VAS programs have no VAD data or the data do exist are >10 years old (Wirth et al 2017). Clearly, there is an urgent need to fill this data gap and for funders and host-country governments to invest in high-quality surveys to assess VA (and other micronutrient) status and program coverage in children.

4. **Achieving and sustaining high VAS coverage through HKI's technical assistance.** We provided GiveWell with evidence from two countries (Cameroon and Kenya) which demonstrated that HKI's technical assistance contributed to significantly higher coverage rates. We appreciate GiveWell's desire to understand HKI's added value by assessing VAS program performance using a counterfactual paradigm. Unfortunately, due to the lack of funding in Mali and Cote d'Ivoire in 2017, HKI has been unable to provide VAS technical support to either country providing counterfactual examples. Sadly, both countries missed a VAS distribution round in the first semester of 2017 suggesting that in the absence of HKI's support the VAS programs in both countries were negatively affected. During their planned country visit, we encourage GiveWell to look further into the added value HKI provides to VAS coverage.

5. **Cost per supplement delivered and cost-effectiveness of VAS.** We feel it is important to note that VAS often serves as the driver behind Child Health Days (CHDs) and Child Health Weeks onto which other vital health and nutrition services (such as deworming, measles immunization, distribution of insecticide-treated bednets,

screening for acute malnutrition, and others) are piggy-backed. For example, CHDs delivered nearly half of all global deworming treatments to preschool children in 2013, thus illustrating the strategic importance of this delivery mechanism for attaining high coverage of vital services targeting preschool-age children (Kumapley et al 2015). The design of CHDs and the package of interventions offered can be tailored to the local contexts; and in fragile health systems, CHDs serve as a major delivery platform for high-impact interventions targeted to preschool age children. Because the semi-annual delivery of VAS to preschool children is often the main driver behind CHDs, we feel it is important for cost per supplement delivered and cost-effectiveness models to consider these added benefits. The CHD delivery platform was largely propelled by the need to reach preschool-age children twice each year with a large dose of vitamin A.

6. **Questions that need more information.** HKI appreciates the rigor that GiveWell applies to organizations that are being considered for "top charity" selection. GiveWell's interim report identifies many remaining questions related to VAS and HKI that it hopes to answer or about which it wants to develop a deeper understanding. Some of these questions will require investments in new data collection. For example, the only way to assess levels of VA deficiency or U5MR in countries or sub-regions where HKI works is to measure these using reliable and valid methods. In low-resource and low-capacity settings, this will require significant investment by the global community and should be done. It is even more difficult to answer the question about the expected child survival impact of VAS given the changing epidemiologic landscape, especially since conducting placebo-controlled trials to address this question would be unethical given the weight of evidence of the benefit of VAS. HKI's view is to trust the scientific community's best estimates of benefit based on thoughtful and systematic meta-analyses. HKI keeps abreast of new scientific evidence as it emerges. If and when estimates of benefit are revised, HKI will revise impact expectations and program approaches.

   The question of HKI's added value with respect to VAS programs is, in our view clear. HKI remains a global leader, innovator, advocate and technical support to VAS programs in countries and contexts where VAS should remain a priority intervention. We look forward to GiveWell's site visits so they can learn more about the important role HKI has provided to VAS programs especially in Sub-Saharan Africa and the support it wishes to continue to provide until the scourge caused by VAD no longer plagues vulnerable

populations. VAD will not disappear until vulnerable populations have achieved normal vitamin A status by sustained changes in dietary vitamin A intake. HKI strives to improve the diets through its fortification, nutrition education and food production programs. Until the time when the diets of vulnerable populations are replete with adequate intake of vitamin A, HKI believes periodic high-dose vitamin A has a vital public health role in protecting child health and survival, and thus remains committed to this sight- and life-saving intervention.

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1. We have published notes from one of our conversations with HKI staff: **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**.

2.
- "Founded in 1915, Helen Keller International is dedicated to saving and improving the sight and lives of the world's vulnerable by combatting the causes and consequences of blindness, poor health and malnutrition.

  "We currently have more than 120 programs in 20 African and Asian countries.

  "Part of this work is focused on preventing blindness and vision loss for millions of vulnerable people through cataract surgery, vision correction, vitamin A supplementation, screening and treatment for diabetic retinopathy, and distribution of treatments and cures for neglected tropical diseases."We also work to reduce malnutrition by promoting solutions aimed at improving nutrition practices for millions of families. These include vitamin A supplementation, maternal and child nutrition education, fortification of staple foods with essential nutrients, globally recognized family-led agricultural programs and community-based management of acute malnutrition." **HKI website About Us**

- "United States: We provide the gift of clear vision to tens of thousands of children every year by providing free school-based vision screenings, prescription eyeglasses, and referral for further care through our innovative ChildSight program." **HKI website Where we work**

3.
- "Helen Keller International (HKI) has been on the forefront of the development and scaling up of strategies to effectively deliver micronutrients, starting with our programs in vitamin A supplementation (VAS) in the early 1970s. Historically most of HKI's work in combating vitamin A deficiency (VAD) and other micronutrient deficiencies began in Asia. Since 1997, HKI has aggressively built the program base in sub-Saharan Africa and currently operates 13 country programs in Sub-Saharan Africa." **HKI VAS project year 3 report 2016**, Pg 1.
- "The current project provides technical assistance to 13 countries identified as suffering from chronic vitamin A deficiency. These countries are Burkina Faso, Mali, Senegal, Tanzania, Cameroon, Mozambique, Kenya, Niger, Nigeria, Sierra Leone, Côte d'Ivoire, the Democratic Republic of the Congo, and Guinea." **HKI External Evaluation and HKI Response - Canada DFATD VAS Project 2015**, Pg vi.

4.
- **WHO Guideline: Vitamin A supplementation in infants and children 6-59 months of age 2011**:
  - "In settings where vitamin A deficiency is a public health problem, vitamin A supplementation is recommended in infants and children 6–59 months of age as a public health intervention to reduce child morbidity and mortality (strong recommendation). The quality of the available evidence for all-cause mortality was high, whereas for all other critical outcomes it was moderate to very low. The quality of the available evidence for outcomes in human immunodeficiency virus (HIV)- positive children was moderate for all-cause mortality." Pg 1.
  - One dose of 100,000 IU of vitamin A is recommended for infants aged 6 to 11 months of age, and a 200,000 IU dose of vitamin A is recommended for children 12 to 59 months of age every four to six months. Table 1, Pg 5.
- WHO defines vitamin A deficiency to be of mild public health importance when rates of vitamin A deficiency (defined as a measure of serum or plasma retinol <0.70 μmol/l) among preschool-aged children or pregnant women are between 2% and 10%, moderate public health importance when rates of vitamin A deficiency among preschool-aged children or pregnant women are between 10% and 20%, and severe public health importance when rates of vitamin A deficiency among preschool-aged children or pregnant women are greater than or equal to 20%. **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pg 8, Table 5.

5.
- "Vitamin A is an essential nutrient needed in small amounts for the normal functioning of the visual system, and maintenance of cell function for growth, epithelial integrity, red blood cell production, immunity and reproduction.

Essential nutrients cannot be synthesized by the body and therefore must be provided through diet." **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pg 1.

- "Vitamin A is required for normal functioning of the visual system, maintenance of cell function for growth, epithelial integrity, red blood cell production, immunity, and reproduction (Sommer 1996)." **Imdad et al. 2017**, Pg 8.
  - See **Sommer and West 1996** (cited in **Imdad et al. 2017** in the bullet point above) chapters 8 and 9 for a detailed description of how vitamin A is understood to function in visual, immune, and other bodily systems.

6.

"Vitamin A is an essential nutrient needed in small amounts for the normal functioning of the visual system, and maintenance of cell function for growth, epithelial integrity, red blood cell production, immunity and reproduction. Essential nutrients cannot be synthesized by the body and therefore must be provided through diet." **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pg 1.

7.

- **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**:
  - "Deficiency of sufficient duration or severity can lead to disorders that are common in vitamin A deficient populations such as xerophthalmia (xeros = dryness; -ophthalmia = pertaining to the eye), the leading cause of preventable childhood blindness, anaemia, and weakened host resistance to infection, which can increase the severity of infectious diseases and risk of death." Pg 1.
  - "The term xerophthalmia encompasses the clinical spectrum of ocular manifestations of VAD, from milder stages of night blindness and Bitot's spots, to potentially blinding stages of corneal xerosis, ulceration and necrosis (keratomalacia). . . . The stages of xerophthalmia are regarded both as disorders and clinical indicators of VAD, and thus can be used to estimate an important aspect of morbidity and blinding disability as well as the prevalence of deficiency. As corneal disease is rare, the most commonly assessed stages are night blindness, obtainable by history, and Bitot's spots, observable by handlight examination of the conjunctival surface. Standard procedures exist for assessing xerophthalmia (17). Although night blindness and Bitot's spots are considered mild stages of eye disease, both represent moderate-to-severe systemic VAD, as evidenced by low serum retinol concentrations (19), and increased severity of infectious morbidity (i.e. diarrhoea and respiratory infections) and mortality in children (5) and pregnant women (6, 20)." Pgs 2-3.
- "Vitamin A deficiency (VAD) impairs body functions and may cause death. Adverse health consequences may also include xerophthalmia (dry eyes), susceptibility to infection, stunting, and anaemia (Sommer 1996; Rice 2004)." **Imdad et al. 2017**, Pg 8.

8.

WHO Global prevalence of vitamin A deficiency in populations at risk 2009:

- "The main underlying cause of VAD as a public health problem is a diet that is chronically insufficient in vitamin A that can lead to lower body stores and fail to meet physiologic needs (e.g. support tissue growth, normal metabolism, resistance to infection)." Pg 1.
- "Dietary deficiency can begin early in life, with colostrum being discarded or breastfeeding being inadequate, thereby denying infants of their first, critical source of vitamin A (1). Thereafter, into adulthood, a diet deficient in vitamin A lacks foods containing either preformed vitamin A esters, such as liver, milk, cheese, eggs or food products fortified with vitamin A or lacking its carotenoid precursors (mainly beta-carotene), such as green leaves, carrots, ripe mangos, eggs, and other orange-yellow vegetables and fruits. Where animal source or fortified foods are minimally consumed, dietary adequacy must rely heavily on foods providing beta-carotene. However, while nutritious in many ways, a diet with modest amounts of vegetables and fruits as the sole source of vitamin A may not deliver adequate amounts, based on an intestinal carotenoid-to-retinol conversion ratio of 12:1 (2). This ratio reflects a conversion efficiency that is about half that previously thought, leading to greater appreciation for why VAD may coexist in cultures that heavily depend on vegetables and fruits as their sole or main dietary source of vitamin A.

"Usually, VAD develops in an environment of ecological, social and economical deprivation, in which a chronically deficient dietary intake of vitamin A coexists with severe infections, such as measles, and frequent infections causing diarrhoea and respiratory diseases that can lower intake through depressed appetite and absorption, and deplete body stores of vitamin A through excessive metabolism and excretion (3, 4). The consequent 'synergism' can result in the body's liver stores becoming depleted and peripheral tissue and serum retinol concentrations decreasing to deficient levels, raising the risks of xerophthalmia, further infection, other VADD and mortality." Pg 1.

9.

- "WHO regional estimates indicate that the highest proportion of preschool-age children affected by night blindness, 2.0%, is in Africa, a value that is four times higher than estimated in South-East Asia (0.5%). This also means that Africa has the greatest number of preschool-age children affected with night blindness (2.55 million), and corresponds to almost half of the children affected globally (Table 10). A comparable and high proportion of pregnant women affected by night blindness are in Africa (9.8%) and South-East Asia (9.9%), each of which is estimated to have over 3 million pregnant women affected, or one third of the pregnant women affected globally. The estimates show that the Africa and South-East Asia regions also contain the highest proportions of preschool-age children with biochemical VAD, as indicated by a serum retinol concentration <0.70 μmol/l, with South-East Asia having the greatest number of children and pregnant women affected." **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pgs 10-11.
- See **WHO regional offices** for countries included in the Africa and South-East Asia Regions.

10.

"Low vitamin A intake during nutritionally demanding periods in life, such as infancy, childhood, pregnancy and lactation, greatly raises the risk of health consequences, or vitamin A deficiency disorders (VADD)." **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pg 1.

11.

- "Provision of high doses of vitamin A every 6 months until the age of 5 years was based on the principle that a single, large dose of vitamin A is well absorbed and stored in the liver, and then mobilized, as needed, over an extended period of time (11). A dose of 100 000 International Units (IU) in infants 6–11 months of age and 200 000 IU in children 12–59 months of age is considered to provide adequate protection for 4–6 months, with the exact interval depending on the vitamin A content of the diet and the rate of utilization by the body (8, 12)." **WHO Guideline: Vitamin A supplementation in infants and children 6-59 months of age 2011**, Pg 3.
- "Vitamin A is a term used for a subclass of retinoic acids, a family of lipid-soluble compounds (Bates 1995). Vitamin A is found in two main forms: provitamin A carotenoids and preformed vitamin A. Provitamin A carotenoids are found in plants; beta-carotene is the only one that is metabolised by mammals into vitamin A. Though fruits and vegetables are nutritious in other ways, normal dietary intake of plants may not deliver adequate amounts of vitamin A because the intestinal carotenoid-to-retinol conversion ratio varies with type of food, ranging from 6:1 to 26:1 (US Institute of Medicine, Food and Nutrition Board; Van Lieshout 2005). Consequently, VAD can exist in places with high vegetable and fruit consumption (West 2002). Preformed vitamin A (retinol, retinal, retinoic acid, and retinyl esters), is the most active form of vitamin A and is found in animal sources. Supplements usually use preformed vitamin A (Shenai 1993; Bates 1995)." **Imdad et al. 2017**, Pg 8.

12.

- **WHO Guideline: Vitamin A supplementation in infants and children 6-59 months of age 2011**:
  - "In settings where vitamin A deficiency is a public health problem, vitamin A supplementation is recommended in infants and children 6–59 months of age as a public health intervention to reduce child morbidity and mortality (strong recommendation). The quality of the available evidence for all-cause mortality was high, whereas for all other critical outcomes it was moderate to very low. The quality of the available evidence for outcomes in human immunodeficiency virus (HIV)- positive children was moderate for all-cause mortality." Pg 1.
  - One dose of 100,000 IU of vitamin A is recommended for infants aged 6 to 11 months of age, and a 200,000 IU dose of vitamin A is recommended for children 12 to 59 months of age every four to six months. Table 1, Pg 5.

- WHO defines vitamin A deficiency to be of mild public health importance when rates of vitamin A deficiency (defined as a measure of serum or plasma retinol <0.70 μmol/l) among preschool-aged children or pregnant women are between 2% and 10%, moderate public health importance when rates of vitamin A deficiency among preschool-aged children or pregnant women are between 10% and 20%, and severe public health importance when rates of vitamin A deficiency among preschool-aged children or pregnant women are greater than or equal to 20%. **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pg 8, Table 5.

13.

HKI country situation matrix for VAS, "Country Summary" sheet describes the distribution methods for each HKI-supported VAS program in sub-Saharan Africa in 2015:

- Burkina Faso: Child Health Days (door-to-door) coupled with National Immunization Days
- Cameroon: Child Health Days (door-to-door) coupled with National Immunization Days
- Cote d'Ivoire: Child Health Days (door-to-door) coupled with National Immunization Days
- Democratic Republic of the Congo: Child Health Day pilots and door-to-door National Immunization Days
- Guinea: Polio National Immunization Days
- Kenya: Routine delivery and Child Health Days (fixed sites and outreach)
- Mali: Polio National Immunization Days
- Mozambique: Child Health Days (fixed sites and outreach)
- Niger: Polio National Immunization Days and Child Health Day pilots
- Nigeria: Child Health Days (fixed sites and outreach)
- Senegal: Child Health Days (door-to-door) and routine delivery (8 districts)
- Sierra Leone: Child Health Days (door-to-door)
- Tanzania: Child Health Days (fixed sites and outreach)

14.

- "Mass distribution campaigns are the main delivery mechanism for VAS. These campaigns are organized at least every 6 months (sometimes much more often) and have been instrumental in reaching more than 95% of the children targeted. National Immunization Days are the most common strategy, organized as nationwide door-to-door events. Health workers leave their facilities and go in communities to administer vitamin A in people's homes. The events require intensive planning and coordination by national and district level authorities." **HKI VAS overview brochure**, Pg 2.
- "HKI establishes systems to assess the quality of the technical assistance it provides using the tools and methods described under question four including pre-post-tests as part of training programs, supervision checklists, and the post-event coverage surveys. In countries where door-to-door VAS distribution 'piggy-backs' on National Immunization Days, vitamin A capsule coverage has achieved sustained high-coverage, and therefore could be judged as a 'success'. However, as polio is eradicated from Africa (only 4 cases were reported in the past 2 years, and they were from the conflict-ridden area in Borno in Northeastern Nigeria), the externally supported infrastructure (i.e. vehicles, per diems, etc.) will disappear and countries must find alternative platforms for delivering vitamin A to preschool-age children. In many countries, the weak link, distance and infrequent contact between health facility-based services and the community will present a major challenge for VAS delivery." **HKI VAS documents guide for GiveWell 2017**, Pg 7.
- "In 2000, yearly polio campaigns were estimated to cost US$1 per child, and estimates of the incremental cost of adding VAS ranged from 2% to 10%, with the higher incremental costs incurred in smaller countries. Despite these benefits, the integrated campaigns have also long been recognized as introducing additional challenges, including the need for increased logistical coordination of the additional supplies, training of additional workers/volunteers/supervisors and the streamlining of the actual event processes (e.g., the setup of the vaccine/VAS delivery location). By 1998, 22 countries in Africa had added vitamin A distribution to their NIDs, and in the same year 60% of children under 5 received a vitamin A supplement through this or another means. Early on, it was expected that polio NIDs and sub- national immunization days would provide the opportunity to deliver VAS until 2002 or 2003, at which point measles immunization campaigns or

others could be used instead. However, it is also recognized that the provision of vitamin A with routine immunization services is a more sustainable, longer-term solution." **HKI External Evaluation and HKI Response - Canada DFATD VAS Project 2015**, Pg 3.

- "Our analysis shows that the implementation of effective and sustained policies and programs for the control of vitamin A deficiency can bring about a reduction of up to 25% in child mortality rates in sub-Saharan Africa, compared with the mortality rates in 1995, before the onset of large-scale vitamin A supplementation with National Immunization Days for polio eradication. In many countries in sub-Saharan Africa, one high-dose vitamin A capsule is given annually on National Immunization Days for polio eradication, thus ensuring a vitamin A reserve of four to six months to more than 80% of children 6 to 59 months old." **Aguayo and Baker 2005**, Pg 353.
- We note that some of the sources above discuss National Immunization Days as annual events, but the **HKI VAS overview brochure** states that they occur every six months or more. We have not yet investigated how often National Immunization Days occur in each country in sub-Saharan Africa with HKI-supported VAS programs.

15.

- "Approximately 80 countries currently implement VA programs—the vast majority of which are centered on supplementation. Early VAS programs generally achieved high once-annual coverage of children by being 'piggy backed' onto National Immunization Day campaigns for polio eradication. In some African countries, this remains a mode of VA delivery. But in most other countries, as polio eradication activities ceased or became subnational, VAS delivery has transitioned to semiannual Child Health Weeks." **Klemm et al. 2016**, Pg 3.
- "In countries where door-to-door VAS distribution 'piggy-back' on National Immunization Days, vitamin A capsule coverage has achieved sustained high-coverage, and therefore could be judged as a “success”. However, as polio is eradicated from Africa (only 4 cases were reported in the past 2 years, and they were from the conflict-ridden area in Borno in Northeastern Nigeria), the externally supported infrastructure (i.e. vehicles, per diems, etc.) will disappear and countries must find alternative platforms for delivering vitamin A to preschool-age children." **HKI VAS documents guide for GiveWell 2017**, Pg 7.

16.

- "The transition towards a Child Health Day (CHD) approach was a point of discussion early on in the implementation of NIDs, given that this approach had been successfully implemented in Latin America around the same time. CHDs are a type of selective primary health care, the structure of which varies by country but generally consists of biannual events that deliver a package of public health interventions to children under the age of five. These are combined with extensive awareness-raising and social mobilization efforts, particularly in areas considered 'hard to reach' or with otherwise reduced access to the health system.

  "CHDs go by different names in different countries, and are sometimes referred to as Regular Events to Advance Child Health (REACH). Depending on the context of the country, the package of preventive services offered can include VAS, deworming, immunization, malaria prophylaxis, antenatal care, growth monitoring, promotion of family practices/behaviors and nutrition education. Importantly, these events build on the existing primary health care infrastructure and staff through the use of fixed sites and outreach. The degree of centralization of the health system in the country implementing the CHD has implications for how it is carried out, with decentralized systems having greater flexibility in the timing and duration of CHDs than those with centralized systems (UNICEF, 2008). CHDs can also vary in duration, ranging from a few days to an entire month. In a 2006 evaluation of CHDs in six sub-Saharan African countries, CHDs contributed to improvements in VAS coverage ranging from 15 to 90 percentage points and were the basis for the inclusion of deworming programs in many of these countries, which had previously achieved low coverage through government and private sector projects aimed at preschool aged children (UNICEF, 2008)." **HKI External Evaluation and HKI Response - Canada DFATD VAS Project 2015**, Pgs 3-4.

- "Several countries in Sub Saharan Africa have been implementing Child Health Days (or weeks) delivering a package of health and nutrition services targeting mothers and children, either through a door-to-door approach or a mix of facility-based and outreach activities. As a cost effective way to reach mothers and children with essential services when access to

routine health system services is limited, Child Health Days constitute an intermediary model between NiD's and routine delivery." **HKI VAS overview brochure**, Pg 2.

17.

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- **HKI country situation matrix for VAS**, "Country Summary" sheet describes the distribution methods for each HKI-supported VAS program in sub-Saharan Africa in 2015:
  - Burkina Faso: Child Health Days (door-to-door) coupled with National Immunization Days
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  - Niger: Polio National Immunization Days and Child Health Day pilots
  - Nigeria: Child Health Days (fixed sites and outreach)
  - Senegal: Child Health Days (door-to-door) and routine delivery (8 districts)
  - Sierra Leone: Child Health Days (door-to-door)
  - Tanzania: Child Health Days (fixed sites and outreach)

18.

"Because mass campaigns take place only every 4 to 6 months, children who reach the age of 6 months between two campaigns, may have to wait several months before they get their first dose of Vitamin A despite being the most vulnerable age group.

"To remedy this, HKI is working closely with country-level health sector experts to add a contact point in national immunization calendars – at 6 months, when no other vaccination is scheduled.

"Additionally, HKI supports routine facility-based and outreach delivery of vitamin A for all children under 5 in countries where stronger health systems offer sufficient access to quality services. Few countries are ready for this approach and these still need to develop social mobilization actions to create demand to match the capacity to offer services." **HKI VAS overview brochure**, Pg 2.

19.

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  "Additionally, HKI supports routine facility-based and outreach delivery of vitamin A for all children under 5 in countries where stronger health systems offer sufficient access to quality services. Few countries are ready for this approach and these

still need to develop social mobilization actions to create demand to match the capacity to offer services." **HKI VAS overview brochure**, Pg 2.

- "In the past, most VAS programs in Sub-Saharan Africa have delivered supplements to children in door-to-door mass campaigns tied to polio immunization campaigns, but countries need to find alternative methods of delivering VAS, since many polio campaigns are ending due to progress in polio elimination. Transitioning to 'routine delivery' (in which caregivers bring children to facilities combined with periodic outreach/delivery posts within communities to receive VAS at appropriate ages) appears to be the most sustainable long-term option." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**, Pg 5-6.

20.

"Because mass campaigns take place only every 4 to 6 months, children who reach the age of 6 months between two campaigns, may have to wait several months before they get their first dose of Vitamin A despite being the most vulnerable age group.

"To remedy this, HKI is working closely with country-level health sector experts to add a contact point in national immunization calendars – at 6 months, when no other vaccination is scheduled.

"Additionally, HKI supports routine facility-based and outreach delivery of vitamin A for all children under 5 in countries where stronger health systems offer sufficient access to quality services. Few countries are ready for this approach and these still need to develop social mobilization actions to create demand to match the capacity to offer services." **HKI VAS overview brochure**, Pg 2.

21.

"In response to a request by GiveWell, HKI reached out to its twelve country offices in Africa and requested each to develop a list of activities HKI could pursue with additional funding and a rough 'ideal' budget estimate to implement those activities over a three-year period. Country offices were asked to focus on activities needed to improve and/or sustain high coverage of vitamin A supplementation (VAS) using mass distribution approaches such as Child Health Days (CHDs) or similar campaigns." **HKI proposed VAS activities October 2017**, Pg 3

22.

- **HKI proposed VAS activities October 2017**:
  - "Recently, the MoH and donors have decided to phase out these campaigns in favor of providing VAS through routine health services using UNICEF's Reaching Every Child (REC) strategy. Delivery of VAS through routine services in Mozambique draws on three delivery platforms: (1) health facilities (for people living <5 km from facility), (2) mobile brigades (outreach events for people living 5 to 8 km from facility), and (3) community-delivery through CHWs (for people living 8 – 25 km from facility). With UNICEF funding and MoH collaboration, HKI has been requested to support the country as it transitions its VAS distribution strategy." Pg 7.
  - "Recently, the MoH, HKI and other stakeholders have committed to integrate VAS into routine services [in Sierra Leone]. This transition process will still take four more years." Pg 9.
- "HKI has not received much interest in VAS from other potential funders, even when proposing embedding it in more comprehensive health system support programs. It does have support in some specific cases (e.g. Irish Aid is supporting HKI in Sierra Leone to cover a gap for scale-up to routine service delivery)." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**

23.

- "For distribution sites visited by an independent HKI supervisor, 86% met the criteria for minimum quality threshold for service delivery defined as 1) health worker used scissors to cut the capsule 2) health worker asked the age of the child 3) health worker squeezed the drops into the child's mouth 4) health worker used the correct dose of VAS and 5) were there no stock-outs of VAC." **HKI VAS project year 1 report 2014**

- See the guidelines for health workers in **HKI VAS supervision checklist: universal** and **HKI Tanzania social mobilization toolkit: VAS administration guide**.

24.

- **HKI Tanzania social mobilization toolkit: VAS administration guide**:
  - "Ask the age of the child to determine the appropriate dose of vitamin A (6-59 months) and whether the child is old enough for a deworming tablet (12-59 months)."
  - "If the distribution point runs out of red (200,000 IU) capsules, two blue (100,000 IU) capsules can be given in place of one red capsule. If the distribution points runs out of blue capsules squeeze half the number of drops from a red capsule into the mouth of a child aged 6-11 months."
- See additional guidelines for dosage selection in **HKI VAS supervision checklist: universal**.

25.

- "To date, HKI's VAS project has undertaken three main types of activities, which can roughly be categorized as disbursing sub-grants to the government, providing technical assistance, and engaging in advocacy efforts." **HKI External Evaluation and HKI Response - Canada DFATD VAS Project 2015**, Pg 35.
- "HKI provides a package of interventions and services that include training, policy development, advocacy, monitoring & evaluation, service delivery, behavior change communication, social mobilization and supervision in all 13 countries where HKI assists host-country governments to implement universal preschool vitamin A supplementation programs." **HKI country-level technical support related to vitamin A supplementation**, Pg 1.
- "In concrete terms, HKI, in consultation with national government counterparts, directs its support to low performing areas to help local program managers identify and solve VAS coverage barriers. This involves organizing workshops with state and district health authorities to analyze what worked and what did not. HKI teams then spend time with health managers to help them identify feasible and cost-effective solutions to improve performance of the targeted services and accompany them through the whole programming cycle (i.e. planning, budgeting, implementation, real time supervision and monitoring, and finally evaluation of the progress made). One cycle sometimes proves insufficient so the HKI teams continue working with each targeted health district until minimum thresholds of performance are met. Funds are used to support deployment of HKI teams in remote areas, to support financing workshops and joint field supervisions, to provide training for field actors, or to organize coverage surveys and review meetings at the end of the exercise. In some cases, HKI provides funds directly to the local authorities to fill financial gaps they may experience ensuring rigorous financial accountability. When conditions for a change of approach are met, HKI provides technical assistance to local authorities to design, implement and monitor with them innovative approaches such as the 6-month contact point or SMS messaging." **HKI VAS documents guide for GiveWell 2017**, Pg 4.

26.

- Coverage surveys:
  - HKI assists governments with implementing surveys to assess coverage (i.e., the percentage of targeted children who actually received vitamin A supplements) following VAS mass distribution campaigns:
    - "Since 2010, HKI has developed a methodology to assess the true coverage of vitamin A supplementation and identify barriers and determinants of high coverage. Based on a cross sectional survey methodology, the Post-Event Coverage Surveys (PECS) are conducted by health system personnel using mobile phones and allow multiple indicators to be collected. More than 50 surveys have been conducted in 15 countries and provide data to improve performance of VAS programs and ensure that all children have equitable access to essential child survival services." **HKI VAS overview brochure**, Pg 2.
  - See **this spreadsheet** for a summary of the results and methodology of HKI's recent coverage surveys.
- Administrative data:
  - "HKI helps to track national VAS coverage through the governments tally-sheet system (also referred to as 'Administrative Data')." **HKI VAS documents guide for GiveWell 2017**, Pg 6.
  - We have not yet seen specific descriptions of how HKI assists governments with tracking administrative data.

27.

- Developing training materials:
  - "In all countries, HKI developed comprehensive training packages to allow governments conduct training and organized training of trainers." **HKI country-level technical support related to vitamin A supplementation**, Pgs 1-2.
  - "All of HKI's work in VAS/CHDs programs focuses on alignment with and use of existing national systems. This requires significant engagement of human resources at national and decentralized levels and a sound understanding of national systems, and how they can be leveraged to achieve program scale. Critical entry points for HKI engagement include supporting development of national policy, catalyzing national and district level planning, training front-line delivery agents and program managers, supporting formative supervision and strengthening monitoring systems and encouraging use of data for program quality improvement and management for results." **HKI VAS project year 3 report 2016**, Pg 2.
  - Specific examples we have seen of this type of activity:
    - **HKI Tanzania social mobilization toolkit: VAS administration guide**
    - **HKI Tanzania social mobilization toolkit: VASD job aids for district health management team**
    - **HKI VAS administration guide: Guinea (French)**
- Direct training of health workers:
  - "Facilitate refresher training of 62786 Community workers and health worker (24747 in 1st Round and 38039 in second Round)" **HKI VAS project year 1 report 2014**, Pg 42 (in list of HKI's activities in Democratic Republic of the Congo during the year).

28.

- HKI assists governments with designing "6-month contact point" policies:
  - "Because mass campaigns take place only every 4 to 6 months, children who reach the age of 6 months between two campaigns, may have to wait several months before they get their first dose of Vitamin A despite being the most vulnerable age group.

    "To remedy this, HKI is working closely with country-level health sector experts to add a contact point in national immunization calendars – at 6 months, when no other vaccination is scheduled." **HKI VAS overview brochure**, Pg 2.

  - See **HKI 6-month contact point standard methodology** for a detailed description of the policy.

29.

- "Capacity development was also commonly conducted through supportive supervision, organized jointly with local health managers to help field actors identify their strengths and weaknesses and find solutions by themselves." **HKI country-level technical support related to vitamin A supplementation**, Pg 2.
- HKI sent us its "supervision checklists" used during VAS campaigns and routine distribution:
  - **HKI monitoring tools: quality of care checklist for supportive supervision of VAS services**
  - **HKI VAS supervision checklist: DRC (French)**
  - **HKI VAS supervision checklist: Mali (French)**
  - **HKI VAS supervision checklist: Tanzania**
  - **HKI VAS supervision checklist: universal**
- We have not yet investigated how often health workers implementing VAS programs are supervised using these checklists.

30.

- "In concrete terms, HKI, in consultation with national government counterparts, directs its support to low performing areas to help local program managers identify and solve VAS coverage barriers. This involves organizing workshops with state and district health authorities to analyze what worked and what did not. HKI teams then spend time with health managers to help them identify feasible and cost-effective solutions to improve performance of the targeted services and accompany them through the whole programming cycle (i.e. planning, budgeting, implementation, real time supervision and

monitoring, and finally evaluation of the progress made). One cycle sometimes proves insufficient so the HKI teams continue working with each targeted health district until minimum thresholds of performance are met. Funds are used to support deployment of HKI teams in remote areas, to support financing workshops and joint field supervisions, to provide training for field actors, or to organize coverage surveys and review meetings at the end of the exercise. In some cases, HKI provides funds directly to the local authorities to fill financial gaps they may experience ensuring rigorous financial accountability. When conditions for a change of approach are met, HKI provides technical assistance to local authorities to design, implement and monitor with them innovative approaches such as the 6-month contact point or SMS messaging." **HKI VAS documents guide for GiveWell 2017**, Pg 4.

- Specific example of this type of work:
  - "Meeting with State Director of Public Health to initiate the VAS workplan development in 8 States" and "Obtain annual costed workplan from HKI-supported states" are listed as activities completed by HKI in 2013 in Nigeria. **HKI VAS project year 1 report 2014**, Pg 96, Table 72.

31.

- "Creating demand by promoting healthy behaviors:
  "HKI promotes social mobilization campaigns that inform caregivers of children aged 6 to 59 months of the importance of VAS and that a supplementation campaign is taking place in their neighborhood. Some of HKI's achievements include:

  - Using of SMS reminders sent to every caregiver;
  - Cooperating with religious and traditional leaders;
  - Involving community health workers and volunteers to organize regular population census that ensure that each child is reached at home;
  - Developing with health authorities and rolling-out comprehensive social mobilization toolkits that include multi-media communication and sensitization tools and messages; and
  - Associating social mobilization with comprehensive social & behavior change strategies."

    HKI VAS overview brochure, Pg 3.

- Examples of social mobilization and marketing materials:
  - **HKI Tanzania social mobilization toolkit: VASD posters**
  - **HKI Tanzania social mobilization toolkit: mobilization script**
  - **HKI Tanzania social mobilization toolkit: mobilization script (Swahili)**
  - **HKI VAS television commercial: DRC (French)**

32.

"HKI teams work closely with national governments to support the policy, strategy and tool development mentioned above, but HKI's major added value is its capacity to rapidly deploy technical support to the sub national level to assist local health authorities with implementing national VAS strategies. HKI focus its efforts sub-nationally because local level (at state and/or district level) health system performance is key to ensuring high VAS coverage. It also allows HKI to support other health system functions that also improve the delivery of other maternal and child health services.

"In concrete terms, HKI, in consultation with national government counterparts, directs its support to low performing areas to help local program managers identify and solve VAS coverage barriers. This involves organizing workshops with state and district health authorities to analyze what worked and what did not. HKI teams then spend time with health managers to help them identify feasible and cost-effective solutions to improve performance of the targeted services and accompany them through the whole programming cycle (i.e. planning, budgeting, implementation, real time supervision and monitoring, and finally evaluation of the progress made). One cycle sometimes proves insufficient so the HKI teams continue working with each targeted health district until minimum thresholds of performance are met. Funds are used to support deployment of HKI teams in remote areas, to support financing workshops and joint field supervisions, to provide training for field actors, or to organize coverage surveys and review meetings at the end of the exercise. In some cases, HKI provides funds directly to the

local authorities to fill financial gaps they may experience ensuring rigorous financial accountability. When conditions for a change of approach are met, HKI provides technical assistance to local authorities to design, implement and monitor with them innovative approaches such as the 6-month contact point or SMS messaging." **HKI VAS documents guide for GiveWell 2017**, Pgs 3-4.

33.

- "Micronutrient Initiative (MI) (the name of the organization changed ~1 month ago to Nutrition International or NI) is only active in 4 of the 13 countries were HKI is operational, however MI provides the needed number of vitamin A capsules to all countries where HKI works. MI's role essentially takes place at the national level, providing technical and policy guidance to governments. In most cases, MI delivers the vitamin A capsules to UNICEF, who organizes their management with the national government and ensures that they reach the field. UNICEF's role is mainly at national level to support all aspects of maternal and child health. This large portfolio gives them the capacity to weigh strongly on decisions at national level but also prevents them from providing specific technical assistance, especially at the sub-national and district levels, where needed. HKI, being more flexible and specialized, takes on this technical support role, and builds evidence, and adjusts its activities to the evolving needs of the program." **HKI country-level technical support related to vitamin A supplementation**, Pg 2.
- UNICEF may also provide funding for the implementation of VAS programs to governments. For example, UNICEF directly provided funding to the government of Guinea for recent VAS campaigns:
  - "UNICEF has continued to receive funding for supporting VAS campaigns in Guinea between 2016 and 2020. In 2016, no mass campaign in the first half of the year occu rred, because UNICEF only had enough funding available to support one campaign. In 2017, the situation was similar, with only one Child Health Day campaign occurring in the year, during October." **GiveWell's notes from a site visit with HKI to Conakry, Guinea, October 9-11, 2017**, Pg 11.

34.

"In most countries, HKI teams spent around 10% of their time working with the national government to advocate for VAS. HKI advocated for domestic budgets to take a greater proportion of the costs of VAS, to integrate VAS in national health and nutrition policy documents and in pluriannual strategies or action plans, supporting coordination between actors and sectors and promoting monitoring of VAS at national level to provide the government with a comprehensive vision of the services for the whole country." **HKI country-level technical support related to vitamin A supplementation**, Pg 1.

35.

"Because mass campaigns take place only every 4 to 6 months, children who reach the age of 6 months between two campaigns, may have to wait several months before they get their first dose of Vitamin A despite being the most vulnerable age group.

"To remedy this, HKI is working closely with country-level health sector experts to add a contact point in national immunization calendars – at 6 months, when no other vaccination is scheduled." **HKI VAS overview brochure**, Pg 2.

36.

- "In concrete terms, HKI, in consultation with national government counterparts, directs its support to low performing areas to help local program managers identify and solve VAS coverage barriers. This involves organizing workshops with state and district health authorities to analyze what worked and what did not. HKI teams then spend time with health managers to help them identify feasible and cost-effective solutions to improve performance of the targeted services and accompany them through the whole programming cycle (i.e. planning, budgeting, implementation, real time supervision and monitoring, and finally evaluation of the progress made). One cycle sometimes proves insufficient so the HKI teams continue working with each targeted health district until minimum thresholds of performance are met. Funds are used to support deployment of HKI teams in remote areas, to support financing workshops and joint field supervisions, to provide training for field actors, or to organize coverage surveys and review meetings at the end of the exercise. In some cases, HKI provides funds directly to the local authorities to fill financial gaps they may experience ensuring rigorous financial accountability." **HKI VAS documents guide for GiveWell 2017**

- "To date, HKI's VAS project has undertaken three main types of activities, which can roughly be categorized as disbursing sub-grants to the government, providing technical assistance, and engaging in advocacy efforts." **HKI External Evaluation and HKI Response - Canada DFATD VAS Project 2015**, Pg 35.
- Spending categorized as "Service Delivery" is funding HKI has granted to governments for program implementation. See **this spreadsheet**, "By category" sheet, for details.
- Our understanding is that the proportion of funding provided by different actors (HKI, other non-profit organizations, national and sub-national governments) varies for different VAS programs. We have not yet seen complete information on funding contributions from HKI and other actors for most of HKI's recent VAS programs (see **here** for more details).

37.

"In general, HKI's technical assistance for VAS includes training, policy development, advocacy, monitoring & evaluation, service delivery, behaviour change communication, social mobilization and supervision. However, in each country, the level of effort for each component varies based on context and capacity. HKI has grouped counties into these categories:

- Category 1. Weak health systems capacity and door-to-door VAS delivery: These are countries where VAS is delivered through door-to-door National Immunization Days (NiD's) and where capacity of the health system is limited: Mali, Niger, Burkina Faso, Guinea, Cameroon, DRC. In these countries, training and service delivery represented the largest components in terms of funding and level of efforts. Such countries offered little capacity for innovation as most efforts aimed at ensuring that coverage would reach minimum standards. Advocacy takes longer in these countries than in others to promote sustainable approaches to governments showing little interest for them.
- Category 2. Moderate health systems capacity and mixed VAS approaches: These are countries with slightly better health systems capacity: Cote d'Ivoire, Sierra Leone, Senegal. In these three countries, campaigns were still using door-to-door delivery piggy-backed onto National Immunization Days, but HKI and its partners managed to create a strong momentum towards more sustainable approaches. The 6-month contact point was piloted as an integrated approach to VAS delivery along with immunizations in health facilities (in Senegal, Sierra Leone and Cote d'Ivoire), and then scaled up in Senegal and Sierra Leone. These activities represented most of HKI's level of effort.
- Category 3. Countries where VAS delivery has changed to fixed site and facility-based VAS distribution: Mozambique, Kenya, Tanzania, Nigeria. In such countries, a larger diversity of activities is implemented. Innovative approaches were tested in all countries."

HKI VAS documents guide for GiveWell 2017, Pg 8.

38.

- In this review, we refer to the agency with its current name, Global Affairs Canada. Documents we cite may refer to former name of the agency, the Department of Foreign Affairs, Trade and Development of Canada (DFATD), or the Canadian International Development Agency (CIDA), which was absorbed into DFATD in 2013.
  - "The names of several departments are being changed as follows:
    […]
    Foreign Affairs, Trade and Development Canada to Global Affairs Canada" **Canada Privy Council Office Machinery of Government Changes 2015**
  - "The agency that handles Canada's international aid is going to be brought into the Department of Foreign Affairs, the government announced Thursday in the federal budget.

    > "It's not yet clear how the move will affect the work of the Canadian International Development Agency, which is currently the responsibility of International Co-operation Minister Julian Fantino, but the fact the minister's powers are about to be enshrined in law is seen as a positive sign for its future.
    >
    > "In the past, ministers in charge of CIDA haven't had the same enshrinement in law as other federal cabinet ministers.

"The new department will be known as the Department of Foreign Affairs, Trade and Development." **CBC News 2013**

- HKI plays a range of technical assistance roles to national vitamin A supplementation programs in Africa. These have been almost exclusively supported from grants from the Canadian Government, the most recent being a grant entitled, “Scaling Up Nutrition through Integrated Life-saving Interventions Project-2013-2016.” **HKI VAS documents guide for GiveWell 2017**, Pg 1.
- "Annex 1 - History of grants devoted to VAS implemented by HKI with support from GAC [Global Affairs Canada]" lists five grants from GAC to HKI, beginning in January 2006, totaling around $80 million CAD in total funding. **HKI VAS concept note**, Pg 22.

39.

- "Since 2002, Helen Keller International (HKI) has partnered with UNICEF and the Department of Foreign Affairs, Trade and Development of Canada (DFATD), formerly the Canadian International Development Agency (CIDA), to work towards increasing and sustaining vitamin A supplementation (VAS) coverage in countries with a high burden of child mortality and nutrition-related disease. The partnership started in five sub-Saharan countries, and expanded during the 2005–2008 period to nine countries, where it focused primarily on shifting to twice-yearly distribution, sustainability and building national capacity. The subsequent project (Scaling up Child Health and Nutrition in Sub-Saharan Africa) ran from 2009–2013 and operated in 13 countries.
  "The current grant amounts to CDN$29,000,000 over a three-year period (2013–2016) and is entitled “Scaling Up Nutrition through Integrated Life-Saving Interventions.” The two primary anticipated outcomes of the project are:

  1. enhanced healthy nutritional practices for children 6–59 months through maintained high coverage of child health and nutrition services; and
  2. increased national ownership of child survival activities (in transitioning countries)."

  HKI External Evaluation and HKI Response - Canada DFATD VAS Project 2015, Pg 1.

- "Annex 1 - History of grants devoted to VAS implemented by HKI with support from GAC [Global Affairs Canada]" lists a grant of $29 million CAD from Global Affairs Canada to HKI for 13 countries in sub-Saharan Africa implemented between February 2013 and May 2016. **HKI VAS concept note**, Pg 22.

40.

- "HKI plays a range of technical assistance roles to national vitamin A supplementation programs in Africa. These have been almost exclusively supported from grants from the Canadian Government, the most recent being a grant entitled, 'Scaling Up Nutrition through Integrated Life-saving Interventions Project-2013-2016 **HKI VAS documents guide for GiveWell 2017**, Pg 1.
- "Annex 1 - History of grants devoted to VAS implemented by HKI with support from GAC [Global Affairs Canada]" lists five grants from GAC to HKI, beginning in January 2006, totaling around $80 million CAD in total funding. **HKI VAS concept note**, Pg 22.
- HKI also notes that its funding "is largely project-based with minimal availability of unrestricted funds." Comment provided in response to a draft of this page in August 2017.
- Unrestricted funding HKI receives has historically not been available for potential use for VAS programs. Instead, unrestricted funding has been used to cover fundraising expenses and overhead expenses not covered through restricted grants. **Patricia Manyara, HKI Chief Financial Officer, and Sobana Prasad, HKI Controller, conversation with GiveWell, October 4, 2017**

41.

Imdad et al. 2010:

- “Vitamin A was associated with a 24% reduction in all-cause mortality (RR = 0.76 (95% CI 0.69 to 0.83)), though there was moderate heterogeneity.” **Imdad et al. 2010**, Pg 18.

- "One [additional randomized trial] reported no events [i.e. deaths] (Lin 2008)" and therefore had zero weight in the analysis. Pg 18.
- "Post hoc, we included two studies in which participants were assigned using a quasi-random method (Herrera 1992; Stansfield 1993)." Pg 10.
- Only one of these, **Herrera et al. 1992**, was included in the analysis of all-cause mortality. Pg 18.
- The quasi-randomized trial included in the all-cause mortality meta-analysis, **Herrera et al. 1992**, "reported no effect (RR = 1.06 (95% CI 0.92 to 1.37)), indicating that these trials were not likely to influence [Cochrane's] results in a positive direction." Pg 19.

42.

- **Awasthi et al. 2013**:
  - "Deaths per child-care centre at ages 1.0–6.0 years during the 5-year study (the primary trial endpoint) were 3.01 retinol versus 3.15 control (absolute reduction 0.14 [SE 0.11], mortality rate ratio [RR] 0.96, 95% CI 0.89–1.03, p=0.22), suggesting absolute risks of death between ages 1.0 and 6.0 years of approximately 2.5% retinol versus 2.6% control. Although this finding suggests that overall child mortality was 4% lower in vitamin A than in control blocks, this 4% reduction includes the possibility of no benefit and the possibility of appreciable benefit (95% confidence limit for reduction 11%)." Pg 1473.
  - "In these 72 blocks, 8338 child-care centres were followed up, with total population at ages 1·0–6·0 years 1 million and 5 million child-years at risk in the 5 years between May, 1999, and April, 2004." Pg 1470.
- "DEVTA trial 2013...
  Eligibility: children aged 1-6 years were eligible for inclusion in the review
  Sample: total clusters were 72, of which 36 clusters received vitamin A supplementation while 36 acted as control. Authors claimed to include 1 million children in the trial." **Imdad et al. 2017**, Pg 55.

43.

Imdad et al. 2017, Pg 18, Figure 3.

44.

Imdad et al. 2017:

- "At longest follow-up, there was a 12% observed reduction in the risk of all-cause mortality for vitamin A compared with control using a fixed-effect model (risk ratio (RR) 0.88, 95% confidence interval (CI) 0.83 to 0.93; high-quality evidence)." Pg 2.
- "A sensitivity analysis using a random-effects model found a 24% reduction in mortality, essentially the same as our original estimate (RR 0.76, 95% CI 0.69 to 0.83), published previously (Imdad 2010a)." Pg 25.

45.

Cochrane Handbook section 9.5.4: Incorporating heterogeneity into random-effects models:

- "A fixed-effect meta-analysis provides a result that may be viewed as a 'typical intervention effect' from the studies included in the analysis. In order to calculate a confidence interval for a fixed-effect meta-analysis the assumption is made that the true effect of intervention (in both magnitude and direction) is the same value in every study (that is, fixed across studies). This assumption implies that the observed differences among study results are due solely to the play of chance, i.e. that there is no statistical heterogeneity."
- "When there is heterogeneity that cannot readily be explained, one analytical approach is to incorporate it into a random-effects model. A random-effects meta-analysis model involves an assumption that the effects being estimated in the different studies are not identical, but follow some distribution. The model represents our lack of knowledge about why real, or apparent, intervention effects differ by considering the differences as if they were random. The centre of this distribution describes the average of the effects, while its width describes the degree of heterogeneity. The conventional choice of distribution is a normal distribution. It is difficult to establish the validity of any distributional assumption, and this is a

common criticism of random-effects meta-analyses. The importance of the particular assumed shape for this distribution is not known."

- "If variation in effects (statistical heterogeneity) is believed to be due to clinical diversity, the random-effects pooled estimate should be interpreted differently from the fixed-effect estimate since it relates to a different question. The random-effects estimate and its confidence interval address the question 'what is the average intervention effect?' while the fixed-effect estimate and its confidence interval addresses the question 'what is the best estimate of the intervention effect?' The answers to these questions coincide either when no heterogeneity is present, or when the distribution of the intervention effects is roughly symmetrical. When the answers do not coincide, the random-effects estimate may not reflect the actual effect in any particular population being studied."

46.

The DEVTA researchers conducted a meta-analysis of DEVTA and eight previous large trials where pre-school children were provided with multiple doses of VAS per year. They found "heterogeneity between DEVTA and subtotal of eight previous trials p = 0.0010." **Awasthi et al. 2013**, Pg 1475.

47.

See our **vitamin A intervention report** for sources and details.

48.

- "The biggest specific cause of death that VAS reduces is diarrhea. Deaths from diarrhea are falling but still a leading cause of childhood mortality globally." **GiveWell's non-verbatim summary of a conversation with Evan Mayo-Wilson, June 10, 2013**, Pg 2.
- "In a reanalysis of one of the original eight trials, the beneficial effect was limited to unvaccinated children and there were strong sex-differential effects of vitamin A supplementation in vaccinated children. Hence, the roll-out of the vaccination programme might be one environmental factor that has modified the effect of vitamin A." **Benn, Fisker, and Aaby 2013**, Pg 593.

49.

- **Beaton et al. 1993**:
  - "The second consideration might be overall mortality rates. Figure 5.3 portrays the relative effectiveness of vitamin A supplementation in relation to control group mortality rates (a poor proxy for baseline mortality rate). No particular relationship is apparent and none could be detected in statistical analyses involving a variety of models in which individual projects were weighted (see Technical Annex)." Pg 67.
  - See Figure 5.3, Pg 68.
- **Beaton et al. 1993**'s analysis includes eight VAS trials. We have not completed an up-to-date analysis of this type for all the VAS trials that measured all-cause mortality included in **Imdad et al. 2017**.

50.

- "Coverage was ascertained from logbooks of overworked government community workers (anganwadi workers), and verified by a small number of supervisors who periodically visited randomly selected anganwadi workers to question and examine children who these workers gathered for them. Both anganwadi worker self-reports, and the validation procedures, are fraught with potential bias that would inflate the actual coverage . . . Although 76% of children aged 0–71 months in 2005–06 lived in areas covered by an anganwadi worker, only 22% of children received any service from the anganwadi worker. Thus, it is hard to understand how DEVTA ramped up coverage to extremely high levels (and if it did, why so little of this effort was sustained). DEVTA provided the anganwadi workers with less than half a day's training and minimal if any incentive." **Sommer, West, and Martorell 2013**, Pg 591.

51.

- In our vitamin A supplementation intervention report, we note that DEVTA did not target children in remote areas, who may have been more likely than other children to suffer from VAD (see **here** and **here**). We also note that some control group members may have received some doses of vitamin A (see **here**).
- Additionally, HKI told us the following:

- "DEVTA represented an earnest attempt to evaluate the impact of Anganwadi delivery of vitamin A capsules on preschool child mortality and vitamin A deficiency. The DEVTA trial included about a million children and found a small mortality benefit (~4%) for vitamin A supplementation, although not statistically significant. The DEVTA findings generated controversy because many experts believe that the methods for the delivery of the intervention and the assessment of the primary outcome (i.e. all-cause mortality) were not rigorous (Habicht 2013; Mannar 2013; Mayo-Wilson 2013; Sloan 2013; Sommer 2013). For example, investigators did not count children at baseline or obtain informed consent, and methods of follow up and data collection were not [r]igorous (Mannar 2013; Sommer 2013). In this cluster-randomized trial, vitamin A capsules were distributed by Anganwadi workers who had contact with only 26% of the children living in the study area (Sommer 2013). In reply to [t]his extensive criticism, authors of DEVTA emphasized that results of this trial need to be interpreted alongside previously published studies (Peto 2013)." **HKI responses to GiveWell's questions May 2017**, Pg 6.
- We have not yet vetted the sources cited in the bullet point above.

52.

- See our **vitamin A supplementation intervention report** for details about rates of VAD among DEVTA participants.
- "There is likely a threshold of VAD prevalence below which VAS is unlikely to have much impact on mortality. If there is high-quality data showing low VAD in a region, HKI thinks it is reasonable not to expect VAS to have a mortality impact there.
  "Organizations in the Global Alliance for Vitamin A (GAVA) currently use 10% VAD as the threshold at or above which VAS programs ought to be maintained in a region. The World Health Organization (WHO) classifies VAD rates of 20% or greater among preschool-aged children as a serious public health problem. VAD rates of less than 5% are accepted as not much of a concern." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**, Pg 2.
- WHO only recommends VAS programs in areas where VAD is a public health concern. **WHO Guideline: Vitamin A supplementation in infants and children 6-59 months of age 2011**:
  - "In settings where vitamin A deficiency is a public health problem, vitamin A supplementation is recommended in infants and children 6–59 months of age as a public health intervention to reduce child morbidity and mortality (strong recommendation). The quality of the available evidence for all-cause mortality was high, whereas for all other critical outcomes it was moderate to very low. The quality of the available evidence for outcomes in human immunodeficiency virus (HIV)- positive children was moderate for all-cause mortality." Pg 1.
  - One dose of 100,000 IU of vitamin A is recommended for infants 6 to 11 months of age, and a 200,000 IU dose of vitamin A is recommended for children 12 to 59 months of age every four to six months. Table 1, Pg 5.
- WHO defines vitamin A deficiency to be of mild public health importance when rates of vitamin A deficiency (defined as a measure of serum or plasma retinol <0.70 μmol/l) among preschool-aged children or pregnant women are between 2% and 10%, moderate public health importance when rates of vitamin A deficiency among preschool-aged children or pregnant women are between 10% and 20%, and severe public health importance when rates of vitamin A deficiency among preschool-aged children or pregnant women are greater than or equal to 20%. **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pg 8, Table 5.

53.

- "A threshold like this might not be observed if vitamin A had a pharmacological effect (i.e., if a large dose of vitamin A directly primed the immune system in some way, regardless of deficiency). However, Dr. Klemm thinks there is not any clear evidence to substantiate this hypothesis." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**, Pg 2.
- "Studies from the 1980s and early 1990s showed that vitamin A deficiency (VAD) was associated with increased overall child mortality and high-dose vitamin A supplementation (VAS) reduced overall mortality. This has led to the long-lived and strong assumption that VAS works by preventing VAD. Though intuitive, this assumption is contradicted by several facts. "First, high-dose VAS has no sustained effect on VAD, as measured by serum retinol or other biochemical markers. Frequent

intakes of vitamin A in physiological doses—e.g., through food-based approaches, including fortification, and through regular low-dose supplementation—are highly effective in increasing serum retinol and reducing VAD. However, when the dose of vitamin A is as high as 200,000 IU (about 100 times the daily allowance), the liver may not be able to store it, and the excess is broken up and excreted. Thus, the rise in serum retinol resulting from 6-monthly VAS is small, transient, and lasts only for 1–3 months.

"Second, if VAS worked by preventing VAD, then one would expect a clear linear association between the degree of underlying VAD and the effect of VAS: the higher the prevalence of VAD in a community, the larger the effect of VAS. However, this is not the case. Already, the first meta-analysis of the initial eight studies of the mortality effect of VAS noted that there was no association between the effect of VAS on mortality and the degree of underlying VAD at the population level. As presented in a recent review, this conclusion is substantiated when more recent studies are included." **Benn 2017**, Pg 1.

54.

- "The main objective of assessing vitamin A status is to determine the magnitude, severity and distribution of VAD in a population. Most surveys assess its prevalence in young children and, with increasing frequency, in pregnant or lactating women, as reported here. Although VAD is likely to be widespread following the preschool years, few data exist to reveal the extent of VAD in school-age and young adolescent children (16). Estimating the national prevalence is to be encouraged as such data aids in targeting regions for interventions, and provides baseline values for monitoring population trends and intervention programme impact over time.

- "Two sets of indicators of VAD are commonly used for population surveys: clinically assessed eye signs and bio-schemically determined concentrations of retinol in plasma or serum. The term xerophthalmia encompasses the clinical spectrum of ocular manifestations of VAD, from milder stages of night blindness and Bitot's spots, to potentially blinding stages of corneal xerosis, ulceration and necrosis (keratomalacia) (17), as listed in Table 1. The stages of xerophthalmia are regarded both as disorders and clinical indicators of VAD, and thus can be used to estimate an important aspect of morbidity and blinding disability as well as the prevalence of deficiency. As corneal disease is rare, the most commonly assessed stages are night blindness, obtainable by history, and Bitot's spots, observable by handlight examination of the conjunctival surface. Standard procedures exist for assessing xerophthalmia (17). Although night blindness and Bitot's spots are considered mild stages of eye disease, both represent moderate-to-severe systemic VAD, as evidenced by low serum retinol concentrations (19), and increased severity of infectious morbidity (i.e. diarrhoea and respiratory infections) and mortality in children (5) and pregnant women (6, 20).

  "Measuring serum retinol concentrations in a population constitutes the second major approach to assessing vitamin A status in a population, with values below a cut-off of 0.70 μmol/l representing VAD (21), and below 0.35 μmol/l representing severe VAD. Although there is not yet international consensus, a serum retinol concentration below a cut-off of 1.05 μmol/l has been proposed to reflect low vitamin A status among pregnant and lactating women (22). While the distribution of serum retinol concentrations below appropriate cut-offs are considered to reflect inadequate states of vitamin A nutriture, a low biochemical concentration of retinol in circulation is not considered a VADD. Also, while an inadequate dietary intake of vitamin A or beta-carotene likely reveals an important and preventable cause of VAD in a population, it is not an indicator of vitamin A status." **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pg 2.

- Measures of the concentration of serum retinol-binding protein (RBP) are used as a "proxy" for concentrations of serum retinol. Complications of using RBP as a proxy for serum retinol are described in **Tanumihardjo et al. 2016**:
  - "Serum RBP is used as a proxy for serum retinol concentrations in the identification of vitamin A deficiency. As discussed above, serum retinol correlates with liver vitamin A stores only when liver stores are very low. When stores are replete, serum retinol concentrations are homeostatically regulated and do not correlate with liver stores. Because the

RBP-retinol complex is released by the liver as part of this homeostatic process, serum RBP correlates closely with serum retinol concentrations, at least in subjects with normal kidney function who are not obese." Pg 19S.

- "RBP is not always 100% saturated with retinol; therefore, a 1:1 molecular equivalence between retinol and RBP in the blood does not usually occur. Thus, one cannot generally use the retinol cutoffs for RBP unless liver stores are hypervitaminotic, as discovered in Zambian preschool children (85) in whom the ratio was 1.0 (144). In addition, the added variability in differences in kidney function (e.g., low glomerular filtration rate can cause an increase in RBP but not retinol) among subjects as well as the apparent contribution of adipose tissue to serum RBP (which may not reflect tissue stores in the same way as liver-derived RBP) make it unlikely that the same retinol-RBP correlation that might be observed in 1 population would be appropriate for another. It is possible that certain populations, such as young children not at risk of obesity and with normal kidney function, may be relatively homogeneous with regard to this association, but such associations have not been systematically examined." Pg 19S.
- See Table 6, Pg 15S, for a list of all vitamin A biomarkers.

55.

"Measuring serum retinol concentrations in a population constitutes the second major approach to assessing vitamin A status in a population, with values below a cut-off of 0.70 µmol/l representing VAD (21), and below 0.35 µmol/l representing severe VAD." **WHO Global prevalence of vitamin A deficiency in populations at risk 2009**, Pg 2.

56.

Our process for creating our weighted average estimate of VAD prevalence in populations studied in VAS trials is as follows:

- We downloaded **Imdad et al. 2017 RevMan data** to find the weight of each study included in Analysis 1.1. Comparison 1 Vitamin A versus Control, Outcome 1 All-cause mortality at longest follow-up when analyzed as a random-effects model.
  - "A meta-analysis for all-cause mortality included 19 trials (1,202,382 children). At longest follow-up, there was a 12% observed reduction in the risk of all-cause mortality for vitamin A compared with control using a fixed-effect model (risk ratio (RR) 0.88, 95% confidence interval (CI) 0.83 to 0.93; high-quality evidence). This result was sensitive to choice of model, and a random-effects meta-analysis showed a different summary estimate (24% reduction: RR 0.76, 95% CI 0.66 to 0.88); however, the confidence intervals overlapped with that of the fixed-effect model." **Imdad et al. 2017**, Pg 2.
  - **Imdad et al. 2017** completed a random-effects meta-analysis on all-cause mortality (see bullet point above, but did not report on the weights of each individual study in the meta-analysis.
- See our most recent **cost-effectiveness analysis** of HKI for a description of why we prefer the random-effects estimate of the mortality effect of VAS.
- We then reviewed the original papers for the trials included in **Imdad et al. 2017** to see whether the researchers had taken any measurements of serum retinol levels among trial participants at baseline, or in the control group at baseline or during the course of the study. We also noted if measures of the prevalence of xerophthalmia among trial participants had been recorded.
- For trials for which serum retinol concentrations among trial participants had not been measured, we used a combination of the following sources to create a best-guess estimate of the prevalence of VAD:
  - Rates of xerophthalmia, if measured in the trial.
  - Data on the most recent (as of 1995, close to the time of many of the trials) national-level surveys on serum retinol levels recorded in **WHO Global Prevalence of Vitamin A Deficiency 1995**.
  - Regional-level (e.g., sub-Saharan Africa) estimates of the prevalence of VAD in 1991 (close to the time of many of the trials) in **Stevens et al. 2015**.
- We then created a weighted average of the VAD prevalence estimates, weighting each estimate by its weight in the overall estimate of the effect of VAS on mortality in the random-effects meta-analysis.

57.

See **this spreadsheet** for details and sources for these notes:

58.

- "Repeated measures of a population's SROL distribution provide an effective tool for tracking the adequacy of dietary VA intakes over time. High-potency VA supplementation is intended to boost liver stores, enabling the gradual release and delivery of VA to tissues in children with dietary VA deficits. However, semi-annual supplementation does not resolve underlying dietary inadequacies. Thus we see only a transient shift in the SROL distribution. Overall, experimental data suggest that high-potency VA supplements protect children aged 6–59 months from hyporetinolaemia for approximately 8 to 10 weeks(19–23)." **Palmer et al. 2012**, Pg 1207.
    - See **Palmer et al. 2012**, Pgs 1202-1207, for details on the data from trials of vitamin A supplementation used to support this claim.

59.

- "Serum retinol distribution curves are used to evaluate program impact (111). However, the lack of change in serum retinol distribution over time in several countries that have sustained >70% coverage with vitamin A supplementation has raised the concern about the appropriate indicator (219). For this reason, the impact of supplementation programs is not measured by a change in the prevalence of low serum retinol concentrations but may be better served by evaluating coverage rates. Retinol concentrations may respond to sustained, improved dietary intakes and therefore can guide programmatic decisions about whether to maintain or change interventions (219). Thus, the use of serum retinol distributions among preschool children from cross-sectional surveys to assess the need for vitamin A interventions is still recommended." **Tanumihardjo et al. 2016**, Pgs 16S-17S.
- "There is a growing interest in measuring the impact of VA programs in countries that have implemented national-scale programs for several years. Serum retinol concentrations do not respond to VAS, except in a transient manner (ie, for 1-2 months). While the kinetics of this transient effect have not been well characterized, it presumably reflects the rapid use of VA to support its biological functions when background dietary intake is low and/or VA losses resulting from infections. Serum retinol concentration is therefore not recommended as an impact indicator where VAS is the only strategy for addressing VAD. For this reason, the impact of VAS programs is not measured by a change in VAD prevalence in the population, and the mortality impact is instead modeled using coverage data. Serum retinol concentrations are, however, responsive to improved dietary intakes, sustained over time, and therefore can guide programmatic decisions about whether to maintain or change intervention mixes. Thus, using serum retinol distributions among preschool-aged children— in conjunction with other vitamin A status markers or demographic/ecologic risk factors—from cross-sectional surveys to assess the need for VA interventions is still recommended, even in countries that have sustained high semiannual VAS coverage over several years." **Klemm et al. 2016**, Pgs 5-6.

60.

Incidence of Bitot's spots was significantly lower in treatment groups in trials of VAS included in the meta-analysis **Imdad et al. 2017**: RR 0.42, 95% CI 0.33 to 0.53. Pg 5.

61.

Stevens et al. 2015:

- "We collated 134 population-representative data sources from 83 countries with measured serum retinol concentration data. We used a Bayesian hierarchical model to estimate the prevalence of vitamin A deficiency, defined as a serum retinol concentration lower than 0·70 μmol/L. We estimated the relative risks (RRs) for the effects of vitamin A deficiency on mortality from measles and diarrhoea by pooling effect sizes from randomised trials of vitamin A supplementation. We used information about prevalences of deficiency, RRs, and number of cause-specific child deaths to estimate deaths attributable to vitamin A deficiency. All analyses included a systematic quantification of uncertainty." Pg e528.
- "The hierarchical model shares information to a greater degree where data are non-existent or weakly informative (ie, have large uncertainty), and to a lesser degree in countries or regions and in years with more data. We modelled trends over time as a linear trend. We did not include a non-linear term, as done for stunting, underweight, or anaemia,28–30 because fewer countries had several data sources for vitamin A deficiency than for other nutritional indicators; this data scarcity limits robust estimation of non-linear trends. The estimates were also informed by covariates that might help to predict vitamin A

deficiency at the population level, including national income (logarithm of per-person gross domestic product [GDP] in inflation-adjusted international dollars), maternal education, proportion of population that lived in urban areas, mean weight-for-age Z score, and an aggregate metric of availability of calories and animal-source foods.31,32 The model included a variance term that accounted for unobserved design factors (sample design, season, retinol measurement method, etc) that led to variability in the data beyond that expected because of sample size. Finally, the model accounted for the fact that subnational data might have larger variation than national data by including an additional, empirically estimated, random effect for subnational data." Pg e530.

62.

Stevens et al. 2015:

- "Regional prevalences in 1991 ranged from more than 40% in sub-Saharan Africa, south Asia, and east and southeast Asia and Oceania, to less than 25% in Latin America and the Caribbean, and in the region of central Asia, the Middle East, and north Africa. Nationally, the prevalence of vitamin A deficiency was at least 8% in every country; 100 countries had a prevalence of at least 20%, and hence would be classified as having a public health problem by WHO. Trends in the prevalence of deficiency from 1991 to 2013 varied by region, with a slight improvement at the worldwide level to 29% (17–42; PP of being a true decline=0·81). Deficiency significantly decreased in only one region: east and southeast Asia and Oceania, from 42% (19–70) to 6% (1–16; PP=0·99). The prevalence of deficiency might have decreased in Latin America and the Caribbean to 11% (4–23) in 2013 (PP=0·89) and in central Asia, Middle East, and north Africa to 11% (2–27) in 2013 (PP=0·76). In sub-Saharan Africa and south Asia, little change in prevalence occurred during the analysis period; both regions had prevalences of more than 40% for all years during the analysis period." Pg e532.
- "In 1991, 39% (95% credible interval 27–52) of children aged 6–59 months in low-income and middle-income countries were vitamin A deficient. In 2013, the prevalence of deficiency was 29% (17–42; posterior probability [PP] of being a true decline=0·81). Vitamin A deficiency significantly declined in east and southeast Asia and Oceania from 42% (19–70) to 6% (1–16; PP>0·99); a decline in Latin America and the Caribbean from 21% (11–33) to 11% (4–23; PP=0·89) also occurred. In 2013, the prevalence of deficiency was highest in sub-Saharan Africa (48%; 25–75) and south Asia (44%; 13–79). 94 500 (54 200–146 800) deaths from diarrhoea and 11 200 (4300–20 500) deaths from measles were attributable to vitamin A deficiency in 2013, which accounted for 1·7% (1·0–2·6) of all deaths in children younger than 5 years in low-income and middle-income countries. More than 95% of these deaths occurred in sub-Saharan Africa and south Asia." Pg e528.

63.

See footnote above and results for Sierra Leone, Malawi, and Kenya in **this spreadsheet**

64.

See **Wirth et al. 2017**, Pgs 6-7, for a list of countries in which biofortified crop programs have been implemented.

65.

See **this spreadsheet** for sources and details.

66.

See **this spreadsheet** for sources and details.

67.

Engle-Stone et al. 2017:

- "We conducted representative surveys in Yaoundé and Douala, Cameroon, 2 years before and 1 year after the introduction of a mandatory national program to fortify cooking oil with VA. In each survey, 10 different households were selected within each of the same 30 clusters (n = ~300). Malaria infection and plasma indicators of inflammation and VA (retinol-binding protein, pRBP) status were assessed among women aged 15–49 years and children aged 12–59 months, and casual breast milk samples were collected for VA and fat measurements. Refined oil intake was measured by a food frequency questionnaire, and VA was measured in household oil samples post-fortification." Pg 1.

- Adjusted prevalence of VAD among preschool-aged children (26.6%) and unadjusted prevalence of VAD among preschool-aged children (41.2%) in 2012 reported in Engle-Stone et al. 2017, Pg 10, Table 4.
  - Differences between 2009 and 2012 surveys of VAD prevalence and mean RBP among preschool-aged children were not statistically significant.

68.

"There is likely a threshold of VAD prevalence below which VAS is unlikely to have much impact on mortality. If there is high-quality data showing low VAD in a region, HKI thinks it is reasonable not to expect VAS to have a mortality impact there.

"Organizations in the Global Alliance for Vitamin A (GAVA) currently use 10% VAD as the threshold at or above which VAS programs ought to be maintained in a region. The World Health Organization (WHO) classifies VAD rates of 20% or greater among preschool-aged children as a serious public health problem. VAD rates of less than 5% are accepted as not much of a concern.

"Despite a lack of recent micronutrient analyses in many African countries, HKI is confident that VAD is prevalent enough in many places for VAS to remain an impactful intervention. For instance, while HKI is not aware of any recent micronutrient deficiency data in Mali, it would be surprising if VAD were not prevalent there, given Mali's child mortality and malnutrition rates." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**, Pg 2.

69.

"Despite the lack of data, Dr. Tanumihardjo thinks it is unlikely that oil fortification programs across sub-Saharan Africa are working well enough to render VAS programs unnecessary in most countries, given that many of the oil fortification programs are relatively new. Over the next few years, we may gain enough data on rates of VAD to make an informed decision about whether to continue or scale back VAS programs. If there were strong evidence that a country's vitamin A fortification program was effectively fortifying food and reaching target populations, it may be appropriate to scale back the programs. Dr. Tanumihardjo thinks it would be premature to start scaling back VAS programs before we have these data." **GiveWell's non-verbatim summary of conversations with Sherry Tanumihardjo, October 17 and 27, 2017**, Pg 2.

70.

See **this spreadsheet** for our weighted average calculations.

71.

We have chosen to create a weighted average of child mortality rates using HKI's past spending in each country in its most recent Global Affairs Canada grant between 2013 and 2016, rather than an average weighted by HKI's planned use of additional funding in these countries going forward. We have made this choice because we think that the amounts that HKI has stated it expects to use in country programs going forward are relatively rough estimates, as compared to its recent actual spending.

72.

See the "**Improved overall health conditions**" and "**Interpreting the evidence in light of DEVTA**" sections of our vitamin A supplementation intervention report for more information on baseline child mortality rates in VAS trials.

73.

- See **this spreadsheet** for full details.
- Kenya, Senegal, and Tanzania, have mortality rates that are roughly half (around 40% to around 60%) as high as 10.6 per 1,000 child-years.

74.

See **this spreadsheet** for full details.

75.

Imdad et al. 2017, Pgs 111-112, Analysis 1.1.

76.

"Deaths per child-care centre at ages 1.0–60 years during the 5-year study (the primary trial endpoint) were 3.01 retinol versus 3.15 control (absolute reduction 0.14 [SE 0.11], mortality rate ratio [RR] 0.96, 95% CI 0.89–1.03, p=0.22), suggesting absolute risks of death between ages 1.0 and 6.0 years of approximately 2.5% retinol versus 2.6% control." **Awasthi et al. 2013**, Pg 1473

77.

Inputs to mortality rate in DEVTA (xlsx)

78.

- Table 2, **Ross et al. 1993**, Pg. 10
- "The 21 906 children who entered the Survival Study were followed up for 33 287 child-years (16 508 vitamin A group, 16 779 placebo group)." **Ross et al. 1993**, Pg. 10
- "There were 892 deaths among the children in the Survival Study, which gave an overall mean mortality rate for all clusters of 27.11 per 1,000 child-years of follow-up. 397 of the deaths were in vitamin A clusters (mean mortality rate 24.4 per 1000 child-years) and 495 in placebo clusters (29.9 per 1000 child-years)." **Ross et al. 1993**, Pg 10

79.

Table III, **West et al. 1991**, Pg. 68

80.

- Table III, **Herrera et al. 1992**, Pg. 269
- "During the 18 months of follow-up, there were 120 deaths (8.4/1000) in the vitamin A group and 112 deaths (7.9/1000) in the placebo group (RR 1.06, 95% CI 0.82-1.37) (table II)." **Herrera et al. 1992**, Pg. 269

81.

Table III, **Daulaire et al. 1992**, Pg. 208

82.

- Table VI, **Sommer et al. 1986**, Pg. 1171
- "Teams first visited villages between September, 1982, and August, 1983, and follow-up visits were made by the same team in the same sequence 9-13 months later." **Sommer et al. 1986**, Pg. 1169

83.

"Nine trials reported mortality due to diarrhoea and showed a 12% overall reduction for VAS (RR 0.88, 95% CI 0.79 to 0.98; 1,098,538 participants; high-quality evidence). There was no significant effect for VAS on mortality due to measles, respiratory disease, and meningitis. **Imdad et al. 2017**, Pg 2.

84.

"There was no significant effect for VAS on mortality due to measles, respiratory disease, and meningitis. VAS reduced incidence of diarrhoea (RR 0.85, 95% CI 0.82 to 0.87; 15 studies; 77,946 participants; low-quality evidence) and measles (RR 0.50, 95% CI 0.37 to 0.67; 6 studies; 19,566 participants; moderate-quality evidence)." **Imdad et al. 2017**, Pg 2.

85.

See our rough analysis in **this spreadsheet**.

86.

David Doledec, HKI Regional VAS Program Manager, email to GiveWell, November 2, 2017

87.

- "Since 2010, Helen Keller International (HKI) has conducted post-event coverage (PEC) surveys in several African countries to estimate VAS and deworming coverage. These surveys provide a method to validate administrative figures and are important for identifying barriers to achieving high coverage." **Janmohamed and Doledec 2017**, Pg 822-823.
- "HKI helps to track national VAS coverage through the governments tally-sheet system (also referred to as 'Administrative Data'. It also assesses VAS coverage in HKI "catchment areas" which for some countries is national scale and in other

countries focuses on special high-risk or hard-to-reach regions and/or districts not assisted by other partners. HKI also conducts “Post-Event Coverage Surveys” or PECS, which are population-based representative coverage surveys which provide a more valid estimate of VAS coverage relative to the tally sheet system." **HKI VAS documents guide for GiveWell 2017**, Pg 2.

- In all of the reports on post-event coverage surveys HKI shared with us, HKI worked in collaboration with the government to implement the survey:
  - "C’est dans ce contexte que Helen Keller International en collaboration avec le Ministère de la Santé à travers le Programme National de Nutrition a organisé une enquête de couverture de la vitamine A après la campagne de supplémentation en vitamine A intégrée à la vaccination contre la poliomyélite et le déparasitage de Mai 2012." **HKI post-event coverage survey report Côte d'Ivoire (French) 2012**, Pg 10.
    - Translated into English by Google Translate:
      "It is in this context that Helen Keller International, in collaboration with the Ministry of Health through the National Nutrition Program organized a survey of coverage of Vitamin A after the campaign for vitamin A supplementation in vaccination against polio and deworming in May 2012."
  - "The PEC survey in Ekiti and Katsina state Nigeria for the November/ December 2014 MNCHW campaign for children 6-59 months was conducted by Helen Keller International (HKI) with the support of the National Primary Health Care Development Agency (NPHCDA) and Federal Ministry of Health (FMOH)." **HKI post-event coverage survey report Nigeria - Ekiti and Katsina states 2014**, Pg 3.
  - "The PEC survey in Ekiti and Katsina state Nigeria for the November/ December 2014 MNCHW campaign for children 6-59 months was conducted by Helen Keller International (HKI) with the support of the National Primary Health Care Development Agency (NPHCDA) and Federal Ministry of Health (FMOH)." **HKI post-event coverage survey report Sierra Leone 2013**, Pg 3.
  - "In February 2014, Helen Keller International (HKI) and Tanzania Food and Nutrition Centre (TFNC) conducted a Post Event Coverage survey (PECS) following the January 2014 distribution event in Dar es Salaam." **HKI post-event coverage survey report Tanzania 2015**, Pg 5.
  - Authors of **Clohossey et al. 2014**, an academic paper on a post-event coverage survey following a child health week in Kenya in 2012, are listed as being affiliated with Helen Keller International and Kenya's Ministry of Public Health and Sanitation. Pg 169.
  - Authors of **Dhillon et al. 2013**, an academic paper on a post-event coverage survey following a VAS campaign in 2010, are listed as being affiliated with Helen Keller International and Tanzania's Food and Nutrition Centre, as well as other organizations. Pg 1.
  - "To validate VAS coverage and inform strategic planning of the MCHWs, the MoHS [Ministry of Health and Sanitation] and HKI conducted a national PEC survey immediately after the November 2011 MCHW [in Sierra Leone]." **Hodges et al. 2013**, Pg 173.
  - Authors of **Sesay et al. 2015**, an academic paper on a post-event coverage survey following a Maternal and Child Health Week in Sierra Leone in 2012, are listed as being affiliated with Helen Keller International and Sierra Leone's Ministry of Health and Sanitation. Pg 26.
  - **HKI presentation: Reaching the hard to reach with vitamin A supplementation in low-performing health zones of DR Congo**, a presentation on a post-event coverage survey conducted in Democratic Republic of the Congo (DRC) in 2012, lists authors from HKI and DRC's PRONANUT (National Nutrition Department).

88.

"Stage 2: Implementation:

- Travel to survey sites;
- Meet with local health officials and village leaders;
- Map the cluster to be surveyed and divide the cluster into four quadrants;

- Select a starting point at random in each quadrant and identify the first house to be surveyed;
- Administer questionnaires to the target population (e.g., caretakers of children 6-59 months)."

HKI post-event coverage survey manual 2014, Pg 4.

89.

- Guidelines:
  - **HKI post-event coverage survey manual 2014**
  - **HKI post-event coverage survey data analysis manual 2014**
- Example reports:
  - **HKI post-event coverage survey report Tanzania 2015**
  - **HKI post-event coverage survey report Sierra Leone 2013**
  - **HKI post-event coverage survey report Nigeria - Ekiti and Katsina states 2014**
  - **HKI post-event coverage survey report Côte d'Ivoire (French) 2012**
  - **HKI presentation: Reaching the hard to reach with vitamin A supplementation in low-performing health zones of DR Congo**
- Academic papers on HKI's post-event coverage surveys:
  - **Clohossey et al. 2014**, on a post-event coverage survey following a child health week in Kenya in 2012
  - **Dhillon et al. 2013**, on a post-event coverage survey following a VAS campaign in Tanzania in 2010
  - **Hodges et al. 2013**, on a post-event coverage survey following a child health week in Sierra Leone in 2011
  - **Sesay et al. 2015**, on a post-event coverage survey following a child health week in Sierra Leone in 2012

90.

To date, we have only analyzed documents HKI sent us on coverage surveys that took place during the period of its most recent grant from Global Affairs Canada (April 2013 to September 2016). See **here** for more information on Global Affairs Canada's most recent grant to HKI.

91.

- We have reviewed detailed reports on two of these coverage surveys: **HKI post-event coverage survey report Nigeria - Ekiti and Katsina states 2014** and **HKI post-event coverage survey report Tanzania 2015**. See **this spreadsheet**, "Methods" sheet.
- We note that we have also seen reports and academic papers on earlier HKI coverage surveys (see footnote above), but we have not yet reviewed them in depth.

92.

- **HKI DRC PECS report 2014**
- **HKI DRC PECS report 2015**
- **HKI Nigeria PECS report 2016**

93.

- "PECS should be conducted within six weeks of VAS, deworming and immunization events." **HKI post-event coverage survey manual 2014**, Pg 5.
- For both of the coverage surveys that took place during HKI's most recent grant from Global Affairs Canada and for which we have seen detailed reports, surveys were reported to have taken place within six weeks of the distribution, but we have not yet seen information on when other recent surveys have taken place. See **this spreadsheet**, "Methods" sheet, for more information.

94.

- HKI notes: "All PECs conducted by HKI or supervised by HKI are conducted within 6 weeks of the VAS distribution event to minimize recall bias. In addition, when asking about VAS receipt a vitamin A capsule is shown to the respondent so that it is not confused with other products a child may have been given (e.g. oral polio vaccine or a deworming pill). These procedures

are part of the training and supervision of PECS data collectors." Comment provided in response to a draft of this review in August 2017.

- Child Health Cards have been used in some HKI-supported routine distribution systems, but our understanding is that they have not been used in mass distributions.
- For example, in Sierra Leone, Child Health Cards were revised to include vitamin A supplementation at six months as part of an expanded routine immunization program:
  - "Since 2004, twice-yearly mass vitamin A supplementation (VAS) has equitably reached over 85 % of children 6–59 months old in Sierra Leone. However infants who turn 6 months after the event may wait until they are 11 months old to receive their first dose. The effectiveness of integrating VAS at 6 months into the Expanded Program of Immunization (EPI) in a revised child health card was studied. Health facilities matched according to staff cadre and work load were assigned to provide either a 'mini package' of VAS and infant and young child feeding (IYCF), a 'full package' of VAS, IYCF and family planning (FP), or 'child health card' only." **Hodges et al. 2015**, Pg 1985.

95.

- **Janmohamed and Doledec 2017**:
  - "Since 2010, Helen Keller International (HKI) has conducted post-event coverage (PEC) surveys in several African countries to estimate VAS and deworming coverage. These surveys provide a method to validate administrative figures and are important for identifying barriers to achieving high coverage. Comparisons of administrative and PEC survey data have revealed sizable discrepancies in VAS coverage in the African context [7,8]. However, this has not been rigorously evaluated and little is known about coverage differences between data sources for specific VAS delivery strategies and child age groups." Pg 2.
  - "Administrative coverage data were compared with PEC survey estimates for 52 VAS and 34 deworming dyads. Health system-reported coverage was higher than PEC estimates in 47 of 52 (90%) VAS campaigns and was 50% higher in three comparisons (Table 1). Discrepancies >30% were observed in 8 of 12 (67%) countries." Pg 3.
- See our comparisons between administrative data and coverage surveys between 2013 and 2016 in this spreadsheet ("Results" sheet).

96.

See our summary of the results of recent coverage surveys we have seen in **this spreadsheet** ("Results summary" sheet).

97.

See our summary of the results of recent coverage surveys we have seen in **this spreadsheet** ("Results summary" sheet).

98.

- The total number of vitamin A supplements delivered in catchment areas receiving direct HKI support during HKI's recent 2013-2016 Global Affairs Canada grant is 192,281,849. Calculated from **HKI VAS summary table**, "VAS coverage" sheet.
- 35,673,646 / 192,281,849 = ~19%.
- Note that we are only counting "catchment areas receiving direct HKI support" in our denominator. **HKI VAS summary table**, "VAS coverage" sheet also reports on total vitamin A supplements delivered at a national level, but our understanding is that HKI only supports coverage surveys in regions where it directly supports VAS programs.
- Note that there are several coverage surveys that we have seen results from, but for which we have not seen estimates of number of VAS doses delivered according to administrative data (see spreadsheet linked above). Supplements delivered in distributions monitored by these coverage surveys are not included in our estimate of the total number of vitamin A supplements monitored through coverage surveys (35,673,646).
- Our understanding is that the totals included in **HKI VAS summary table**, "VAS coverage" sheet include vitamin A supplements delivered through routine distributions, which are not monitored through post-event coverage surveys (see **here**). We don't know what proportion of the totals listed were delivered through routine mechanisms.

99.

- **HKI analysis of PECS data March 2017** includes a column stating the primary reason for each survey. We have copied this information into **our spreadsheet** on HKI's coverage surveys ("Results" sheet). We have not seen more detailed descriptions of the reasons why these areas were chosen for surveys. We note that the stated reason for a survey in Ekiti and Katsina States reported in **HKI analysis of PECS data March 2017** differs from the description in the report we have seen (see below).
- We have seen detailed reports on two coverage surveys from distributions conducted under HKI's most recent grant from Global Affairs Canada. See our summary of the methodologies of these surveys in **this spreadsheet** ("Methods" sheet).
- Ekiti and Katsina states in Nigeria were chosen to be surveyed in 2014-15 because they had not yet been surveyed by HKI:
  - "Ekiti and Katsina are among the states supported by HKI for VAS implementation during MNCHW in Nigeria. According to tally sheet data the two states have recorded a considerably good VAS coverage rate over a 5 year period. However, there has not been any validation of this data before. Therefore, in order to validate VAS coverage in Ekiti and Katsina, PECS was conducted in January 2015 among caregivers of children aged 6-59 months who attended the November 2014 MNCH Week." **HKI post-event coverage survey report Nigeria - Ekiti and Katsina states 2014**, Pg 8.
- The city of Dar es Salaam in Tanzania was chosen to be surveyed in 2015 because it had a history of low VAS coverage:
  - "In 2014, we opted to target the PECS data collection to areas which had historically performed poorly with VASD. Dar es Salaam, the countries business capital and largest city has a history of low VAS coverage, and 2014 proved to be no exception." **HKI post-event coverage survey report Tanzania 2015**, Pg 6.
- We have seen results for 28 surveys taking place under HKI's most recent grant from Global Affairs Canada (see **this spreadsheet**, "Results" sheet), but, with the exceptions of the Ekiti and Katsina states survey and the Dar es Salaam survey mentioned above, we do not know why HKI or its partners chose to conduct surveys in those particular areas.
- HKI notes: "The reasons can vary from one country to another. In some countries, PECS are undertaken to validate coverage in HKI-assisted regions. In others, the scope of a PECS depends on host country government and national working group interests or requests which might result in a survey implemented to provide a national, sub-national or area-specific (e.g.hard-to-reach) coverage estimate. PECs are NOT implemented for all VAS distribution rounds partly due to funding limitations but also because they are not warranted after each round. For example, if a PECs reveals low VAS coverage, only when demonstrable steps are taken to address the reasons for low coverage would a follow-on PECs be justified." Comment provided in response to a draft of this review in August 2017.

100.

- **HKI 6-month contact point standard methodology**, Pgs 2-3:
  - "Prior to the introduction of the 6-month contact point activities, a baseline survey must be conducted.
  - "Review the '6107 baseline survey' for both caretakers of children age 9-12 months and for healthcare workers
  - "Modify the 6107 baseline survey to include country specific factors and messaging. Indicators which should not be modified include:
    - Age of first receipt of VAS
    - Age of first receipt of Measles vaccine
  - "For Methodology of the 6107 baseline survey, please refer to the cluster selection handout. The EPI cluster sampling methodology has been selected for the baseline with a minimum of 30 clusters from the targeted region randomly selected, where the probability of a cluster being selected proportional to the population size. A minimum of 10 households with children 9-12 months will be selected to complete the baseline.
    […]
    "After a minimum of 7 months, the 6107 end line survey should be conducted with caretakers of children age 9-12 months and to healthcare workers."
- HKI notes: "The 6-mo contact point has been a recent innovation piloted in several countries. During the pilot phase in Sierra Leone, Senegal, Cote d'Ivoire and elsewhere, HKI set up robust systems for monitoring receipt of VAS among children

at 6-7 m of age. This was done to assess coverage changes as a result of this new contact point. HKI would like to assist governments to scale up the 6 m contact point and, in the process, integrate VAC receipt at 6 m into the Child Health Cards (as a means to record VAC receipt) and into the country's routine health information system as a means to assess coverage." Comment provided in response to a draft of this review in August 2017.

- We have seen a presentation on the results of one of these studies (**HKI 6-month contact point presentation Sierra Leone 2012**), but we have not yet reviewed the results in detail.

101.

"HKI teams work closely with national governments to support the policy, strategy and tool development mentioned above, but HKI's major added value is its capacity to rapidly deploy technical support to the sub national level to assist local health authorities with implementing national VAS strategies. HKI focus its efforts sub-nationally because local level (at state and/or district level) health system performance is key to ensuring high VAS coverage. It also allows HKI to support other health system functions that also improve the delivery of other maternal and child health services.

"In concrete terms, HKI, in consultation with national government counterparts, directs its support to low performing areas to help local program managers identify and solve VAS coverage barriers. This involves organizing workshops with state and district health authorities to analyze what worked and what did not. HKI teams then spend time with health managers to help them identify feasible and cost-effective solutions to improve performance of the targeted services and accompany them through the whole programming cycle (i.e. planning, budgeting, implementation, real time supervision and monitoring, and finally evaluation of the progress made). One cycle sometimes proves insufficient so the HKI teams continue working with each targeted health district until minimum thresholds of performance are met. Funds are used to support deployment of HKI teams in remote areas, to support financing workshops and joint field supervisions, to provide training for field actors, or to organize coverage surveys and review meetings at the end of the exercise. In some cases, HKI provides funds directly to the local authorities to fill financial gaps they may experience ensuring rigorous financial accountability. When conditions for a change of approach are met, HKI provides technical assistance to local authorities to design, implement and monitor with them innovative approaches such as the 6-month contact point or SMS messaging." **HKI VAS documents guide for GiveWell 2017**, Pg 2.

102.

"Many African countries are facing funding shortfalls around VAS, and some planned VAS mass campaigns have had to be cancelled. For instance, in Mali (which HKI does not currently have funds to support, but which received support from HKI for VAS programs in 2013-16), it is not clear whether VAS mass campaigns will occur at all without external technical assistance from HKI. HKI still expects vitamin A capsules to be provided to countries in sufficient numbers, but there is a risk of millions of capsules remaining undistributed if campaigns are underfunded." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**, Pg 7.

103.

- As evidence that its support of VAS program leads to higher coverage rates, HKI has sent us several examples of cases in which it provided support to a Child Health Day VAS mass distribution program, and in which VAS coverage rates above 80% were achieved. In **Rolf Klemm, HKI Vice President of Nutrition, email to GiveWell, October 19, 2017**, HKI pointed us to:
  - A 2014 Child Health Day program in Bas Congo Province, DRC, that achieved 91.1% VAS coverage using a fixed distribution strategy, according to HKI's coverage survey:
    - See row 12 in the "Full results" sheet in **this spreadsheet**.
    - Details (in French) in **HKI DRC PECS report 2014**. We have not reviewed this report carefully.
  - A 2015 Child Health Day program in Kasai Oriental, DRC, that achieved 90% coverage using a fixed strategy and 89% coverage using a door-to-door strategy, according to HKI's coverage surveys:
    - See rows 13-14 in the "Full results" sheet in **this spreadsheet**.
    - Details (in French) in **HKI DRC PECS report 2015**. We have not reviewed this report carefully.

- Increases in coverage rates in the Littoral Region in Cameroon, where HKI supported door-to-door VAS mass distributions, between 2011 and 2014. In 2011, HKI's coverage survey found 53% coverage of VAS, and its coverage survey in 2014 found 90% coverage.
  - See **HKI analysis of PECS data March 2017** for coverage survey results.
  - These surveys are also discussed in **HKI lessons learned on VAS in six urban health districts in Cameroon 2014**. We have not reviewed this report carefully.
- HKI's national-level coverage surveys in Mozambique, which found that coverage levels were above 80% through a Child Health Day fixed distribution strategy:
  - See rows 20-21 in the "Full results" sheet in **this spreadsheet**.

- We believe these examples are useful for showing that coverage rates above 80% can be achieved with HKI's support in Child Health Day programs using a fixed and outreach distribution strategy. But we do not find this evidence to be convincing, on its own, that HKI's support causes VAS coverage rates to increase above what they would be in HKI's absence, since we lack appropriate comparisons for these examples (e.g., coverage rates in similar districts or regions that did not have support from HKI.)

104. "We reanalyzed the data to explore the hypothesis that VAS reduces mortality in children who had bacille Calmette-Guerin or measles vaccine as their most recent vaccine but increased mortality when diphtheria-tetanus-pertussis vaccine (DTP) was the most recent vaccine. On the basis of previous studies, we expected the effects to be strongest in girls." **Benn et al. 2009**, Pg 629.

105. "As hypothesized, the reanalysis suggests important interactions between VAS, sex, and vaccines. VAS was associated with a strong beneficial effect in children with no record of vaccination, whereas there was almost no effect for those who had been vaccinated. This differential effect was due to a difference in girls, in whom VAS was associated with a decrease in mortality in the unvaccinated but in whom VAS was associated with a nonsignificant increase in mortality in the vaccinated (Table 2). This was due to a differential effect of VAS according to vaccination type. Among girls who had already received MV at enrollment, VAS was associated with significantly higher mortality. This was only seen in girls who were missing doses of DTP at enrollment and were therefore likely to receive them during follow-up (Table 5)." **Benn et al. 2009**, Pg 635.

106. **Fisker et al. 2014**:

- "We have hypothesized that the effect of VAS is modified by vaccines, VAS amplifying the non-specific immune-modulating effects of vaccines, thus being beneficial when provided with live vaccines but potentially harmful with inactivated vaccines." Pg e740.
- "As prespecified, all analyses considered interaction between VAS and gender and, in addition, previous VAS and season." Pg e741

107. "Between August 2007 and November 2010, 7587 children were enrolled. Within 6 months of follow-up 80 non-accident deaths occurred (VAS: 38; placebo: 42). The mortality rate ratio (MRR)comparing VAS versus placebo recipients was 0.91 (95% confidence interval 0.59–1.41) and differed significantly between boys (MRR1.92 [0.98–3.75]) and girls (MRR 0.45 [0.24–0.87]) (P= .003 for interaction between VAS and gender). At enrollment, 42% (3161/7587) received live measles vaccine, 29% (2154/7587) received inactivated diphtheria-tetanus-pertussis–containing vaccines, and 21% (1610/7587)received both live and inactivated vaccines. The effect of VAS did not differ by vaccine group." **Fisker et al. 2014**, Pg e739.

108. "When the correct age-specific dose of vitamin A is given with immunization, mild side-effects or adverse events may be observed. However, they are rare and transient. Occasionally, some children experience loose stools, headache, irritability,

fever, nausea, and vomiting. Depending on age and the dosage given, the excess rate of occurrence of these mild symptoms of intolerance has shown be in the range of 1.5-7% (Florentino et al., 1990; West et al., 1992; Agoestina et al., 1994). These side-effects disappear in practically all children within 24-48 hours (Florentino et al., 1990; West et al., 1992; Agoestina et al., 1994)." **WHO vitamin A supplements adverse events**, Pgs 1-2.

109.

"When the correct age-specific dose of vitamin A is given with immunization, mild side-effects or adverse events may be observed. However, they are rare and transient. Occasionally, some children experience loose stools, headache, irritability, fever, nausea, and vomiting. Depending on age and the dosage given, the excess rate of occurrence of these mild symptoms of intolerance has shown be in the range of 1.5-7% (Florentino et al., 1990; West et al., 1992; Agoestina et al., 1994). These side-effects disappear in practically all children within 24-48 hours (Florentino et al., 1990; West et al., 1992; Agoestina et al., 1994)." **WHO vitamin A supplements adverse events**, Pgs 1-2.

110.

WHO vitamin A supplements adverse events:

- "The administration of excessive amounts of vitamin A can lead to toxicity, known as hypervitaminosis A. The amount required to cause toxicity will vary among individuals." Pg 1.
- "Worldwide, the incidence of hypervitaminosis A is a very minor problem compared with the incidence and effects of vitamin A deficiency. An estimated 200 cases of hypervitaminosis A occurs annually..." Pg 1.
- "Hypervitaminosis does not result from public health intervention programs. Rather toxicity has been associated with the abuse of vitamin A supplements and with diets extremely high in preformed vitamin A (i.e., foods of animal origin). Toxic reactions provoked by large doses of vitamin A are well-known to occur following either intake of liver rich in vitamin A (e.g., polar bear, halibut or whale) or by excessive administration of vitamin A preparations (Miller & Hayes, 1982)." Pg 2.
- "**Acute vitamin A toxicity** (single ingestion of 25,000 IU per kg or more): Signs and symptoms may be delayed for 8 to 24 hours and include manifestations such as nausea, vomiting, diarrhea, changes in humour (irritability, drowsiness, dizziness, lethargy), increased intracranial pressure (headache, bulging of fontanelle, diplopia, papilloedema), skin changes (erythema, pruritus, desquamation). Peeling of skin around mouth may be observed from 1 to several days after ingestion and may spread to the rest of the body (Miller & Hayes, 1982; Bendich & Langseth, 1989; Hathcock et al., 1990; CPS, 1999; Parfit, 1999)." Pg 2.

111.

- "Hypervitaminosis does not result from public health intervention programs. Rather toxicity has been associated with the abuse of vitamin A supplements and with diets extremely high in preformed vitamin A (i.e., foods of animal origin). Toxic reactions provoked by large doses of vitamin A are well-known to occur following either intake of liver rich in vitamin A (e.g., polar bear, halibut, or whale) or by excessive administration of vitamin A preparations (Miller & Hayes, 1982)." **WHO vitamin A supplements adverse events**, Pg 2.
- HKI told us that receiving two doses of vitamin A supplements within a short time period would not meet toxicity thresholds:
  - "[GiveWell:] In countries where six-month contact points have been initiated, is there a risk of a child receiving a 'double dose' of VAS in a short time period (one from a facility visit when the infant is six months old, and another at the next biannual Child Health Day or door-to-door campaign)? Would receiving a double-dose potentially be dangerous? (Even if they aren't dangerous, we're also concerned about double-doses because they wouldn't be an effective use of resources.)
    "[HKI:] This is a legitimate question and one we have had to think about carefully as we started to promote and support the 6 month contact point (6MCP). First, receiving two doses in a short time frame poses some, but minimal, risks for children as the toxicity thresholds go far beyond receiving two doses (see attached document on Adverse events following administration of VAS)."
    HKI responses to GiveWell's questions May 2017

112.

For example, see discussion of GiveWell staff's observations in October 2017 Maternal and Child Health Week in Guinea, **GiveWell's notes from a site visit with HKI to Conakry, Guinea, October 9-11, 2017**, Pgs 11-14.

113.

For example, see discussion of GiveWell staff's observations in October 2017 Maternal and Child Health Week in Guinea, **GiveWell's notes from a site visit with HKI to Conakry, Guinea, October 9-11, 2017**, Pgs 11-14.

114.

- **David Doledec, HKI Regional VAS Program Manager, email to GiveWell, October 3, 2017**
- A copy of the table from the email listed above is **here**

115.

- "It is very difficult to obtain information on costs allocated by other partners in VAS. The percentages we provided in the annual report for year 2 of our grant with GAC are estimated from discussions with partners, as none of them provide a detailed analysis of their costs." **David Doledec, HKI Regional VAS Program Manager, email to GiveWell, October 3, 2017**
- A copy of the table from the email listed above is **here**

116.

We have added in costs to account for HKI's overhead expenses and the costs of the capsules themselves

117.

Kagin et al. 2015:

- "The CHD implementation in most of the regions was managed by the Ministry of Health, UNICEF, and other partners. However, the Littoral region (located in Southwest Cameroon and including the city of Douala) was managed by HKI." Pg S176
- In Table 2, "Summary of the Costs of CHD for VA capsules only, Fall of 2013 (1st round), by Region and Macro-Region," "Cost per Child Reached 6 to 59 Months of Age, US$" for the Littoral Region is listed as $0.76. Table 2, Pg S178.

118.

Kagin et al. 2015:

- "Before getting into specific costs related to VA interventions in Cameroon, it is important to define and differentiate different types of costs. Fixed costs are costs that must be paid to run the program, independent of the number of units of services delivered. These costs do not depend on the number of children or WRA reached by the interventions but are necessary for their implementation. Examples of fixed costs are the initial planning meetings and other costs associated with program advocacy, which are required regardless of number of children served. Additionally, some related office rental or salary costs are incurred. Costs that change according to the number served are also known as variable costs. These costs include the number of VA capsules given during CHDs or amount of premix needed in LSFF (note 2). Operating costs are costs associated with operating the programs, and they come after start-up costs and may include both variable and fixed costs. Finally,in the context of this article, marginal costs are additional costs required when adding an intervention onto an existing set of interventions. For example, if the cost for reaching a child with VA capsules during a CHD is US$1.09, the marginal cost of adding an intervention such as DW tablets to the CHD may be lower than US$1.09 per child reached due to program costs already paid for by delivering VA. Subsequently we will calculate the marginal costs of adding interventions to an existing VA delivery platform. We will refer to these terms throughout the text." Pg S174.
- The estimate of $0.76 per child reached in the Littoral Region is from Table 2, "Summary of the Costs of CHD for VA capsules only, Fall of 2013 (1st round), by Region and Macro-Region." Based on the title of the table and the description of the cost methodology in the bullet point above, our interpretation is that this estimate includes fixed costs of the Child Health Day programs and the variable costs of delivering vitamin A, but does not include the variable costs of other interventions delivered through the Child Health Day.

119.

Kagin et al. 2015:

- "The CHD implementation in most of the regions was managed by the Ministry of Health, UNICEF, and other partners. However, the Littoral region (located in Southwest Cameroon and including the city of Douala) was managed by HKI. This made differences in how costs were allocated across categories. To avoid making assumptions about how costs were allocated to similar activities across Cameroon, we instead grouped costs separately for the Littoral region and for the other regions and then aggregated up to the national level. We divided the costs of the Littoral region into 7 categories: (1) distribution, the actual distribution of the VA capsules to the children through door-to-door visits or through fixed points as well as direct communication to households about the program itself; (2) the VA capsule costs including freight and delivery costs; (3) supervision, the labor per diems, transportation, and other costs related to managing the project at different levels. This also includes costs of supervision, for example, management by HKI and their overhead costs; (4) training activities, given to all the teams and schools involved in the CHDs; (5) other communication of the program via TV and radio; (6) evaluation of the program and data collection activities; and (7) central administrative costs divided among the different regions." Pg S176.
- "To determine the costs of VA programs in Cameroon, we used budgets from existing S174 Food and Nutrition Bulletin 36(Supplement 3) programs, where available. Those obtained were for CHDs that delivered VA capsules and DW tablets and edible oil fortified with VA. In some cases, the budgets were adjusted or adapted to isolate certain interventions or to estimate the costs of a similar intervention, as described subsequently. When actual budgets were not available, we constructed the costs using known unit costs of program components combined with expert knowledge." Pgs S174-175.

120.

HKI cost-effectiveness analysis of VAS in DRC (French) 2016:

- "Le coût de l'enfant supplémenté pour l'approche JSE et pour l'approche porte à porte se présente respectivement à 0,35 $ et 0,43$. Tandis que pour l'ensemble de deux approches, les coûts par enfant supplémenté est de 0,40$ pour les 4 Zones de Santé enquêtées. Pris isolément, le coût de supplémentation par enfant dans les 4 Zones de Santé varie de 0,35$ à 0,43 $ selon le milieu de résidence avec une moyenne de 0,40 $." Pg 17.
  - Translated into English by Google Translate: "The cost of the child supplemented for the JSE [Child Health Day] approach and the door-to-door approach is $ 0.35 and $ 0.43, respectively. While for all two approaches, the costs per child supplemented is $ 0.40 for the 4 Health Zones surveyed. Taken separately, the cost of supplementation per child in the 4 Health Zones varies from $ 0.35 to $ 0.43 depending on the residential environment with an average of $ 0.40."
- "Les coûts spécifiques du programme ont été estimés de la campagne des supplémentation de décembre 2015(JSE et porte à porte)."
  - Translated into English by Google Translate: "The specific costs of the program were estimated from the December 2015 supplementation campaign (JSE [Child Health Day] and door to door)."
- HKI contributed 65% of the total cost of the program, UNICEF contributed 12%, and DRC's Ministry of Health contributed 22%. Pg 20, Table 7.

121.

Types of costs included in this total (translated from French to English using Google Translate): "planning meetings, capsule distribution, social mobilization and CCC, supervision, training/briefing, technical assistance coverage survey post-event (PECS), scissors and prints, transport of capsules, coordination, staff of PRONANUT [DRC nutrition program]." Pg 14, Table 1.

122.

- Our CEA simply treats 2015 child mortality rates as a "baseline," even though VAS programs have been ongoing in many countries in sub-Saharan Africa since the 1990s and early 2000s. Our current model may underestimate the impact of VAS since it does not account for the fact that lower mortality rates in 2015 may be in part due to the VAS program itself.

- We currently assume that monthly mortality rates are constant across the 29- to 364-days of age period; we would guess that mortalities are actually likely to be more concentrated towards the beginning of this period.
- Our current CEA uses a simple average of mortality rates in countries in which HKI supported VAS programs in 2013 to 2016. A weighted average, using more specific information on HKI's plans for the use of additional funding, would likely be more accurate.
- The only benefit counted in our CEA is child mortalities averted. VAS may also have an impact on child morbidity.
- VAS may be delivered alongside other child health interventions, such as deworming. We have not yet determined how or whether to account for benefits from other interventions delivered alongside vitamin A in our cost-effectiveness analysis.

123.

- HKI expects to receive some funding through UNICEF for VAS in Burkina Faso, Cameroon, Cote d'Ivoire, Guinea, Mozambique, and Sierra Leone, but it only expects that funding from UNICEF would support VAS mass campaigns in Burkina Faso, Cameroon, and Cote d'Ivoire.
- **David Doledec, HKI Regional VAS Program Manager, email to GiveWell, November 2, 2017**:
  - "The funding from UNICEF is a below:"
    - Burkina Faso: around 50,000 usd per year, not yet confirmed
    - Cameroon: around 150,000 usd per year, only first year confirmed
    - Cote d'ivoire: around 50,000 usd per year, not yet confirmed
    - Guinea: around 50,000 usd for first year, future not confirmed
    - Mozambique: around 250,000 usd per year, future not confirmed
    - Sierra Leone: around 250,000 usd per year, future not confirmed
  - "I have indicated above what we are expecting to receive from UNICEF, but have only signed a PCA with Mozambique for a two years period, and this is only to support routine 6 month contact point. There is a plan to conduct campaigns in the coming years but no funds for it. We have been in discussion in other countries with UNICEF since beginning of 2017, but so far no agreement has been signed. We hope to finalize discussions soon with Sierra Leone but this will only be to support the routine 6 month contact point. In Cameroon, it is also mostly for routine, as UNICEF indicated not having funds for HKI to support campaign despite many areas showing low coverage. We are not expecting much in Guinea, Cote d'Ivoire and Burkina Faso as UNICEF already indicated in these three countries not having sufficient funds."

124.

"In Nigeria we just signed a grant with Nutrition International for around 200,000 usd for 5 months, which will aim at supporting campaign in 3 states, but this amount is very low for three states that represent more than 20 million people and we have no visibility for the future." **David Doledec, HKI Regional VAS Program Manager, email to GiveWell, November 2, 2017**

125.

- **Patricia Manyara, HKI Chief Financial Officer, and Sobana Prasad, HKI Controller, conversation with GiveWell, October 4, 2017**
- See **this spreadsheet** for an analysis of HKI's spending of unrestricted and restricted funds in FY2015 and FY2016.

126.

GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017:

- "There are several other global trends that cause concern for the future of funding VAS programs:
  - HKI is concerned that over recent years, global attention to and funding for VAS has waned, most likely due to competition with other pressing priorities and interventions emerging to address broader maternal-newborn-child-adolescent health and nutrition needs.
  - 'Donor fatigue' may be contributing to declining interest in supporting VAS.

- Due to the changing political landscapes in the U.S., Europe, and the U.K., HKI anticipates major reductions in development aid for maternal and child health programs, including for nutrition and VAS. This may further threaten the long-term funding situation for child survival interventions such as VAS in countries where the need remains high, including many of those in which HKI has a presence." Pg 7.

- "HKI has not received much interest in VAS from other potential funders, even when proposing embedding it in more comprehensive health system support programs. It does have support in some specific cases (e.g. Irish Aid is supporting HKI in Sierra Leone to cover a gap for scale-up to routine service delivery). HKI thinks potential funders may not recognize the importance of maintaining VAS as current platforms for it (e.g. polio programs) disappear." Pg 8.

127.

- In this review, we refer to the agency with its current name, Global Affairs Canada. Documents we cite may refer to former name of the agency, the Department of Foreign Affairs, Trade and Development of Canada (DFATD), or the Canadian International Development Agency (CIDA), which was absorbed into DFATD in 2013.
  - "The names of several departments are being changed as follows:
    […]
    Foreign Affairs, Trade and Development Canada to Global Affairs Canada" **Canada Privy Council Office Machinery of Government Changes 2015**
  - "The agency that handles Canada's international aid is going to be brought into the Department of Foreign Affairs, the government announced Thursday in the federal budget.
    "It's not yet clear how the move will affect the work of the Canadian International Development Agency, which is currently the responsibility of International Co-operation Minister Julian Fantino, but the fact the minister's powers are about to be enshrined in law is seen as a positive sign for its future.
    "In the past, ministers in charge of CIDA haven't had the same enshrinement in law as other federal cabinet ministers.
    "The new department will be known as the Department of Foreign Affairs, Trade and Development." **CBC News 2013**

- HKI plays a range of technical assistance roles to national vitamin A supplementation programs in Africa. These have been almost exclusively supported from grants from the Canadian Government, the most recent being a grant entitled, “Scaling Up Nutrition through Integrated Life-saving Interventions Project-2013-2016.” **HKI VAS documents guide for GiveWell 2017**, Pg 1.
- "Annex 1 - History of grants devoted to VAS implemented by HKI with support from GAC [Global Affairs Canada]" lists five grants from GAC to HKI, beginning in January 2006, totaling around $80 million CAD in total funding. **HKI VAS concept note**, Pg 22.

128.

- "Since 2002, Helen Keller International (HKI) has partnered with UNICEF and the Department of Foreign Affairs, Trade and Development of Canada (DFATD), formerly the Canadian International Development Agency (CIDA), to work towards increasing and sustaining vitamin A supplementation (VAS) coverage in countries with a high burden of child mortality and nutrition-related disease. The partnership started in five sub-Saharan countries, and expanded during the 2005–2008 period to nine countries, where it focused primarily on shifting to twice-yearly distribution, sustainability and building national capacity. The subsequent project (Scaling up Child Health and Nutrition in Sub-Saharan Africa) ran from 2009–2013 and operated in 13 countries.
  "The current grant amounts to CDN$29,000,000 over a three-year period (2013–2016) and is entitled 'Scaling Up Nutrition through Integrated Life-Saving Interventions.' The two primary anticipated outcomes of the project are:

  1. enhanced healthy nutritional practices for children 6–59 months through maintained high coverage of child health and nutrition services; and
  2. increased national ownership of child survival activities (in transitioning countries)."

  HKI External Evaluation and HKI Response - Canada DFATD VAS Project 2015, Pg 1.

- "Annex 1 - History of grants devoted to VAS implemented by HKI with support from GAC [Global Affairs Canada]" lists a grant of $29 million CAD from Global Affairs Canada to HKI for 13 countries in sub-Saharan Africa implemented between February 2013 and May 2016. **HKI VAS concept note**, Pg 22.

129.

- "HKI requests support from Global Affairs Canada (GAC) for a five-year program (June 2016 – May 2021) focusing on the following core objectives:

    1. Provide VAS to all children 6 to 59 months in high VAD and high mortality countries in SSA through sustainable, locally managed delivery mechanisms;
    2. Continue institutionalization of VAS services within national health systems;
    3. Integrate VAS services within a comprehensive nutrition and health package for pregnant and lactating mothers and children less than five using a health systems strengthening approach ensure effective management as well as equity, quality and access to interventions that address the unacceptably high prevalence of VAD."

    HKI VAS concept note, Pg 4.

- "In a three-year period between 2013 and 2016, GAC granted around $30 million (CAD) to HKI as well as provided significant funding to UNICEF and the Canadian-based Nutrition International for VAS programs in SSA. Going forward, GAC will be passing its VAS funding directly to UNICEF to ease the administration burden of managing two separate grants with the expectation that UNICEF will use some of this funding to provide grants to other organizations supporting VAS programs, including HKI." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**, Pgs 6-7.

130.

"In a three-year period between 2013 and 2016, GAC granted around $30 million (CAD) to HKI as well as provided significant funding to UNICEF and the Canadian-based Nutrition International for VAS programs in SSA." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**, Pg 6.

131.

"In a three-year period between 2013 and 2016, GAC granted around $30 million (CAD) to HKI as well as provided significant funding to UNICEF and the Canadian-based Nutrition International for VAS programs in SSA. Going forward, GAC will be passing its VAS funding directly to UNICEF to ease the administration burden of managing two separate grants with the expectation that UNICEF will use some of this funding to provide grants to other organizations supporting VAS programs, including HKI." **GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017**, Pgs 6-7.

132.

See **this spreadsheet** for details.

133.

See **this spreadsheet** for details.

134.

See **this spreadsheet** for details.

135.

- **Global Affairs Canada Project profile: Scaling Up Nutrition - Helen Keller International**
- **Global Affairs Canada Project profile: Scaling Up Nutrition and Immunizations - UNICEF**
- **Global Affairs Canada Project profile: Enhanced Child Health Days**

136.

- "In a three-year period between 2013 and 2016, Global Affairs Canada (GAC) granted around $30 million (CAD) to HKI and provided significant funding to UNICEF and the Canadian-based Nutrition International for VAS programs in sub-Saharan Africa. Going forward, GAC will be passing its VAS funding directly to UNICEF to ease the administration burden of

managing two separate grants with the expectation that UNICEF will use some of this funding to provide grants to other organizations supporting VAS programs, including HKI. Under the new arrangements between GAC and UNICEF, the amount of funding to support VAS appears to be considerably lower than in previous years because it covers four rather than three years of VAS activities, supports immunization activities in addition to VAS, and because the value of the Canadian dollar relative to the US dollar has decreased ~30% since 2013.

"UNICEF, as a multi-national United Nations program, works in many more countries than HKI does, and has had to prioritize certain countries over others to receive GAC funding. Many UNICEF priority countries for VAS are not countries where HKI has a presence, which has meant fewer resources to continue HKI's VAS work in those countries not prioritized by UNICEF. There are several other global trends that cause concern for the future of funding VAS programs:

- HKI is concerned that over recent years, global attention to and funding for VAS has waned, most likely due to competition with other pressing priorities and interventions emerging to address broader maternal-newborn-child-adolescent health and nutrition needs.
- 'Donor fatigue' may be contributing to declining interest in supporting VAS.
- Due to the changing political landscapes in the U.S., Europe, and the U.K., HKI anticipates major reductions in development aid for maternal and child health programs, including for nutrition and VAS. This may further threaten the long-term funding situation for child survival interventions such as VAS in countries where the need remains high, including many of those in which HKI has a presence."

  GiveWell's non-verbatim summary of a conversation with Helen Keller International, June 1, 2017, Pgs 6-7.

- In 2013 to 2016, 33% of GAC's 41 million CAD grant to UNICEF was intended to cover "Basic health care" and 67% of the grant was intended to cover "Basic nutrition." **Global Affairs Canada Project profile: Scaling Up Nutrition and Immunizations - UNICEF**
- In 2013 to 2016, 100% of GAC's grant to HKI was intended to cover "Basic nutrition." **Global Affairs Canada Project profile: Scaling Up Nutrition - Helen Keller International**
- Overall, in 2013 to 2016, 19.3% ((0.33*41)/70) of GAC's grants to UNICEF and HKI were intended to cover "Basic healthcare" and the remainder (80.7%) was intended to cover "Basic nutrition"
- In 2016 to 2020, 33% of GAC's 70 million grant to UNICEF is intended to cover "Basic healthcare" and 67% is intended to cover "Basic nutrition." **Global Affairs Canada Project profile: Enhanced Child Health Days**
- Our understanding is that "Basic healthcare" primarily refers to immunization programs, and that "basic nutrition" primarily refers to VAS programs in this context.

137. "Global Affairs Canada (GAC), a department of the Canadian government, has funded vitamin A supplementation (VAS) work by HKI, UNICEF, and Nutrition International since the early 2000s. It has been the only major funder of VAS programs. **GiveWell's notes from a site visit with HKI to Conakry, Guinea, October 9-11, 2017**, Pg 1.