

## Background

Malaria, diarrhoea, and pneumonia kill nearly 1.7 million children a year<sup>1</sup>. These deaths are highly preventable<sup>2,3</sup> often by simple behaviour changes.

Twenty years of evidence,<sup>4</sup> culminating in two ground-breaking scientific trials on child survival<sup>5</sup> and family planning<sup>6</sup>, has shown that DMI's mass media campaigns can change behaviours on a scale large enough to save thousands of lives. Results from our randomised controlled trial in Burkina Faso show that treatment-seeking in year one for malaria, diarrhoea, and pneumonia increased by 56%, 39%, and 73% respectively. We have published details of how mathematical modelling using the Lives Saved Tool<sup>7</sup> allows us to calculate how many lives could be saved by national campaigns. In this document, we use the same mathematical model to determine, from first principles, where we should prioritise our efforts and how many lives we expect to save for each \$10,000 invested.

## Overview

We calculated the potential to save children's lives in 13 countries in Sub-Saharan Africa. How we shortlisted these 13 countries, and how the calculation works, is outlined in the Methodology section overleaf. The table below summarises our key findings.

**Table 1: Results of modelling for the most promising countries, ranked by lowest cost per life saved (USD)**

Countries	Under 5 lives saved				Average annual cost to DMI (USD)	Cost per life saved over 3-year campaign (USD)	Lives saved per \$10,000 invested (USD)
	Year 1	Year 2	Year 3	Total			
Tanzania*	7,099	4,146	5,962	17,207	1,220,589	213	47
Sierra Leone	0	3,380	2,779	6,159	800,774	390	26
Madagascar*	1,864	1,081	1,578	4,523	622,174	413	24
Mozambique*	5,037	2,730	3,614	11,381	1,568,863	414	24
Burkina Faso*	2,470	1,374	1,239	5,083	731,730	432	23
Mali	0	2,297	1,314	3,611	606,495	504	20
Zambia*	4,738	3,257	3,161	11,156	2,013,064	541	18
Uganda*	8,235	4,922	5,904	19,060	3,637,810	573	17
Angola**	0	6,380	3,225	9,604	1,892,069	591	17
Guinea	0	3,039	1,638	4,677	1,783,354	1,144	9
Benin	0	896	562	1,458	567,328	1,167	9
Malawi*	1,516	1,025	1,272	3,813	2,088,848	1,643	6
Côte d'Ivoire*, **	1,102	803	1,040	2,944	2,764,998	2,818	4

\* DMI has existing projects in these countries. The costs presented here are actual (marginal) costs to DMI, which are lower in these countries.

\*\* Countries where TV penetration is greater than 50% require major TV campaigns to achieve saturation, adding to costs.

We interpret the results through two lenses:

First, the cost per life saved. Here the countries are ranked in order, with Tanzania being the most cost-effective country for DMI to save lives. Sierra Leone, Madagascar, Mozambique, and Burkina Faso all fall under \$500 per life saved. These figures are at the very cheapest end of child health interventions, which are documented in *Annex 1*.

Second, the absolute costs of campaigning in each country. This is because the minimum threshold for beginning a campaign would be one year's cost in countries where DMI is already active, and two years for new countries. Achieving saturation coverage (the level of broadcast intensity required to achieve large-scale behaviour change) is particularly costly in Zambia, Uganda, Malawi, and Cote d'Ivoire.

COVID-19 also has implications for our analysis. The pandemic makes it time-consuming and difficult to begin projects in countries where DMI does not already operate. So, although Sierra Leone, Mali, and Angola have a relatively low cost per life saved, we deprioritise them for 2021-22 and will monitor the situation over the next twelve months. **For these reasons we prioritise Tanzania, Madagascar, Mozambique, and Burkina Faso for our 2021-22 campaigns.**

## Methodology Part A: How we shortlist countries and topics

Modelling accounts for all epidemiological factors, plus costs and the reach of radio. But it cannot account for everything. In this section we explain the analysis that took us to our shortlist:

### Why focus on child survival?

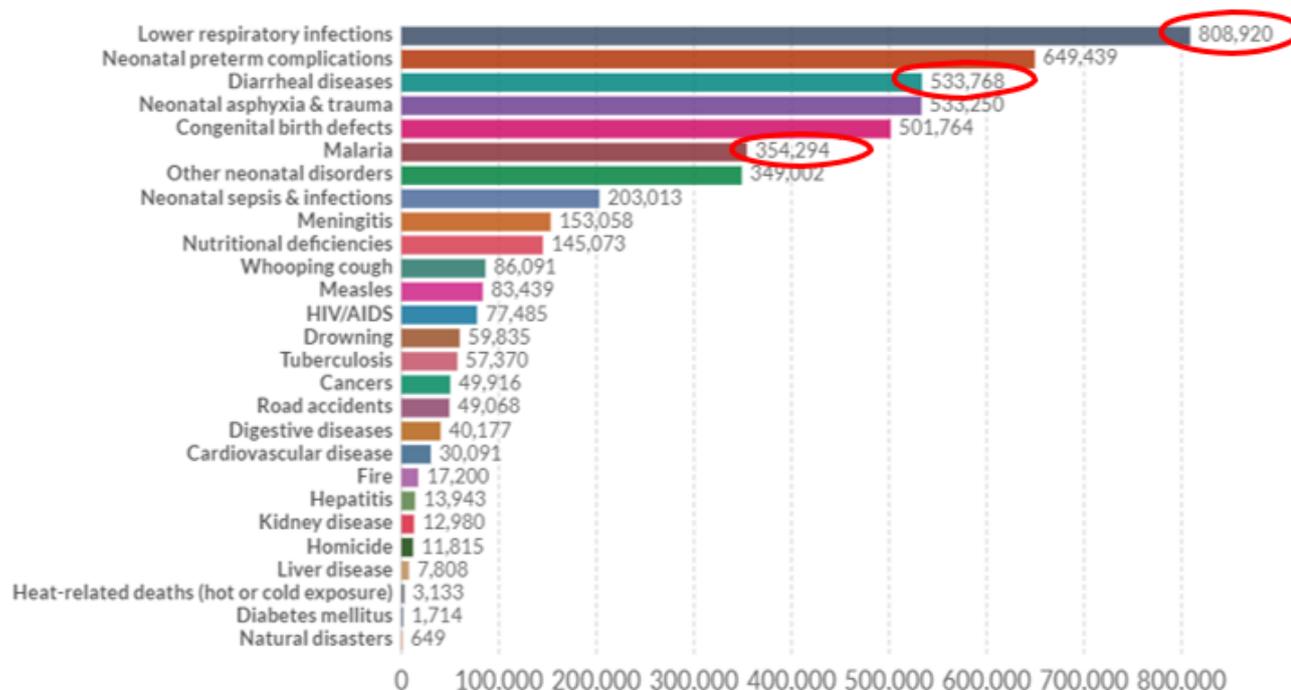
We believe every child has the right to a healthy life. Investments in child survival are also highly cost-effective. If a child survives to its fifth birthday, its life expectancy is at least another 56 years<sup>8,9</sup>, even in the poorest countries. This statistic expresses how consequential it is to save a child's life. It also means we optimise the number of years of human life saved by concentrating on child, rather than adult, deaths. In addition, the unique power of the parental bond makes parents, particularly mothers, highly receptive to information that may save their child's life. Finally, the sophisticated epidemiology of child health and robust modelling tools available<sup>10,11</sup> make it possible to rigorously calculate how many lives we are saving.



### Why malaria, diarrhoea, and pneumonia?

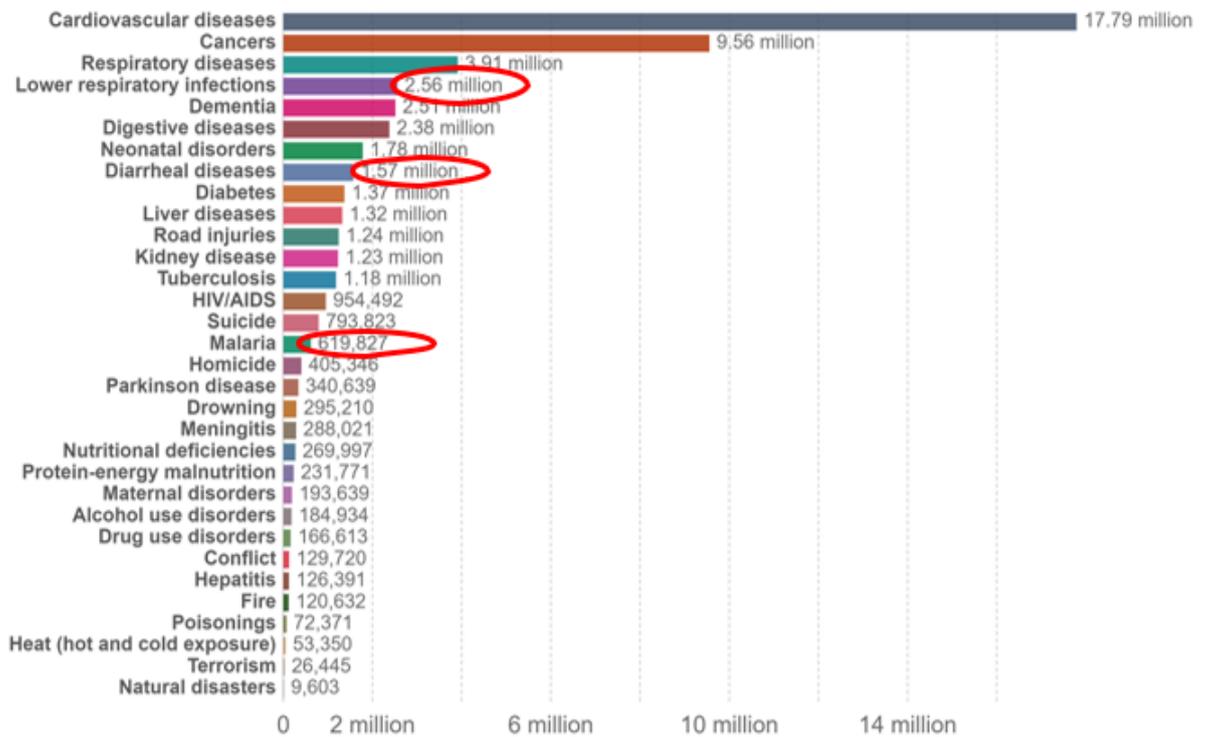
These diseases account for 1.7 million child deaths every year and are the easiest to treat. They are also the diseases for which we have scientific proof that we can persuade parents to seek treatment. The fit for a small organisation like DMI, looking to maximise its impact, is ideal.

Figure 1: Causes of death in children under 5 (World, 2017)<sup>12</sup>



Additionally, while our work is focused on child survival, there is likely to be a secondary impact on adults as they are the primary audience for our campaigns. Malaria, pneumonia, and diarrhoea are also major killers of adults, bringing the total deaths attributable to these causes to 4.75m. Since our calculations focus solely on child deaths averted, our analysis is likely to underestimate the total number of lives saved.

Figure 2: Causes of death in adults and children, (World, 2017)<sup>13</sup>



While malaria, diarrhoea and pneumonia will be the primary focus of our campaigns, we will also give messages on preventative and household-based behaviours such as breastfeeding, handwashing, nutrition and the use of mosquito nets. This is broadly in keeping with UNICEF’s *Facts For Life*<sup>14</sup> approach.

### Why Sub-Saharan Africa?

The twenty countries with the highest child mortality rates in the world are all in sub-Saharan Africa, along with 40 of the top 50 (*Annex 2*). This is why DMI has concentrated its operations on the continent.

### Which countries in Sub-Saharan Africa?

We shortlisted 25 countries with the highest absolute numbers of deaths (as our primary interest is in absolute numbers of lives which could be saved - *Annex 3*). We then took several operational factors into consideration:

**Security concerns:** While radio can be very effective in reaching places that are dangerous to travel to, not being able to travel impedes our ability to conduct research, monitor broadcasts, and visit radio stations. At minimum it is crucial that we can work safely in capital cities. Our judgement is that campaigns in Somalia, Niger and South Sudan are not currently advisable for this reason.

**Barriers to entry:** Two of the most-populated countries in Africa require greater investment, to campaign at scale, than DMI has available. To manage the 31 state governments (and 31 state media structures) of Nigeria would require a financial commitment an order of magnitude greater than that necessary to campaign in most countries. The physical size, poor infrastructure and very limited media infrastructure of DR Congo would also require major investment.



Figure 3: The 25 countries in Sub-Saharan Africa with the highest number of under 5 deaths.

**Media landscape:** Low radio listenership is an obstacle in several countries. It is not currently cost-effective to

campaign at scale in Ethiopia, Chad, and Cameroon, (each with just 23% listenership). While there are no reliable listenership figures for Sudan, available data suggests very low listenership. The high airtime costs in more developed markets make campaigns less cost-effective at scale; Kenya and Ghana have prohibitively high airtime costs. While Angola also has high airtime costs, we will still be modelling our potential for impact there due to an otherwise favourable media landscape.

**Local capacity:** Our judgement is that South Africa has sufficient capacity for local organisations to carry out the sort of work that DMI does. Some countries, e.g. Benin, lie more outside standard (USAID, FCDO) funding patterns and could particularly benefit from assistance.

**Supply-side:** Our demand promotion work is only as effective as the supply side of the country we operate in. Much of this is already factored into our lives saved modelling using LiST: we made an adjustment to the size of DMI's impact to account for the proportion of children taken to health centres and those who actually receive appropriate treatments (based on DHS/MIS data). Further down the line, when we decide to work in a country, we also verify the supply side situation through consultation with Ministries of Health and other NGOs working closely with the health system. We will also make efforts to align our work with the supply-side priorities of both governments and other major partners (e.g. USAID's President's Malaria Initiative), to help ensure increased demand can be met.

A summary of this shortlisting process can be found in *Annex 4*.

## Methodology Part B: Predicting how many lives saved

The Lives Saved Tool (LiST) is the gold standard modelling tool used to estimate the impact of child health interventions on mortality in low and middle-income countries. It integrates the latest country data and the most robust scientific evidence for the efficacy of each intervention. Our use of LiST was peer-reviewed in 2018<sup>15</sup> and is updated here. For each country, the most important variables include:

- The number of under 5 deaths per year (*The higher child mortality, the more potential to save lives and the greater economies of scale*)
- The % of preventable deaths due to malaria, diarrhoea, and pneumonia (*DMI's impact is higher on these causes than other causes*)
- The % of parents currently not complying with treatment-seeking guidance for children (*Higher means more potential for improvement*)
- The % of parents listening to radio regularly (*Higher means more impact*)
- How much it costs to work in a country, including airtime costs (*Higher means less impact per \$*)
- The model also needs to account for complex factors such as population growth, the efficacy and failure rate of various treatments, etc.

The results of modelling our 13 shortlisted countries using the methodology above can be found in *Table 1*.

## References

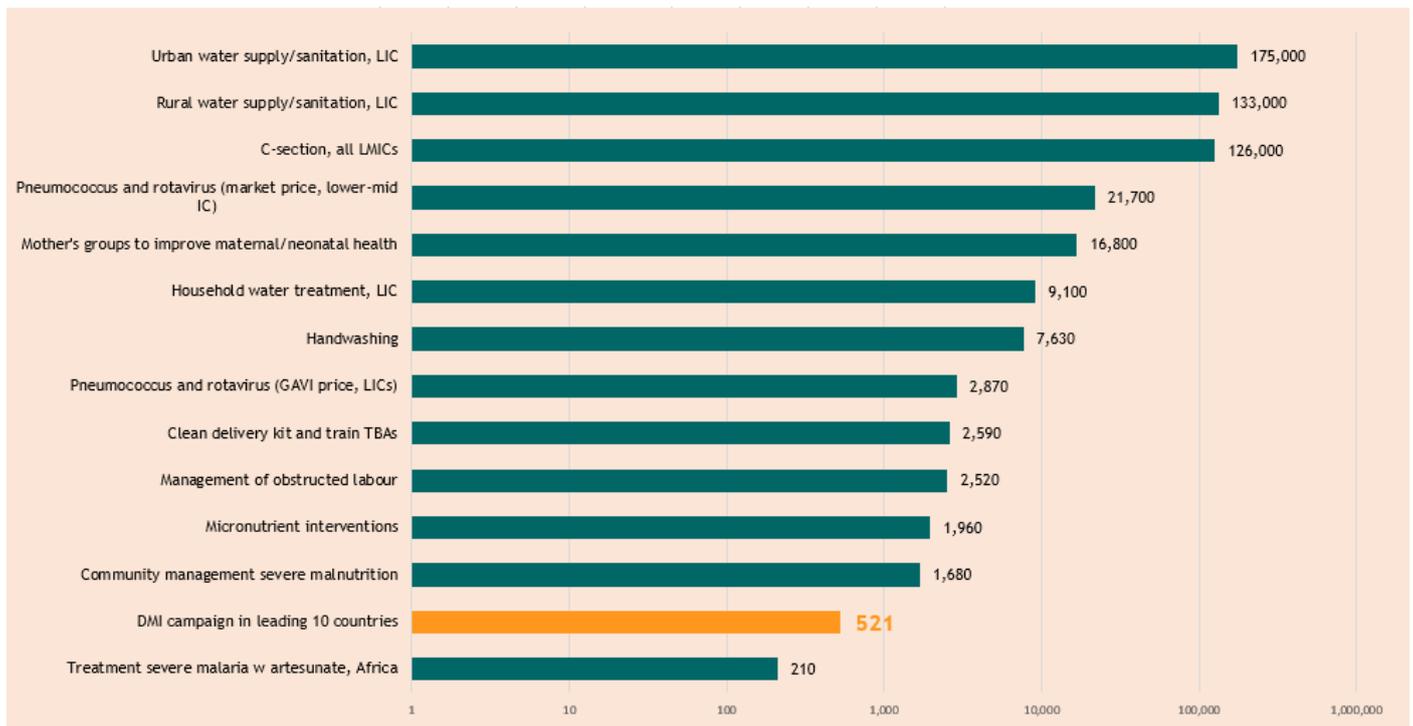
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- <sup>1</sup> Roser M, Ritchie H and Dadonaite B (2013) Child and Infant Mortality. *Our World in Data*. Available at: [ourworldindata.org/child-mortality](https://ourworldindata.org/child-mortality)
- <sup>2</sup> *Child Survival* (2003) Child Survival Series, June. The Lancet. Available at: [linkinghub.elsevier.com/retrieve/pii/S0140673603137877](https://linkinghub.elsevier.com/retrieve/pii/S0140673603137877)
- <sup>3</sup> Bryce J and Victora CG (2005) Child survival: countdown to 2015. *The Lancet* 365(9478). Available at: [www.thelancet.com/journals/lancet/article/PIIS0140-6736\(05\)66752-9/abstract](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(05)66752-9/abstract)
- <sup>4</sup> Head R, et al. (2015) Can mass media interventions reduce child mortality? *The Lancet*. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0140673614616494>
- <sup>5</sup> Murray J, et al. (2018) Modelling the effect of a mass radio campaign on child mortality using facility utilisation data and the Lives Saved Tool (LiST): findings from a cluster randomised trial in Burkina Faso. *BMJ Global Health* 3(4). Available at: [gh.bmj.com/content/3/4/e000808](https://gh.bmj.com/content/3/4/e000808).
- <sup>6</sup> Glennerster R, Murray J and Pouliquen V (2021) The media or the message? Experimental evidence on mass media and modern contraception uptake in Burkina Faso. Available at: [ora.ox.ac.uk/objects/uuid:a41bd05f-ed71-4001-8333-0f97b14d68a8](https://ora.ox.ac.uk/objects/uuid:a41bd05f-ed71-4001-8333-0f97b14d68a8)
- <sup>7</sup> Murray J, et al. (2018) *ibid*.
- <sup>8</sup> Life expectancy at birth, total (years) | Data. World Bank. Available at: [data.worldbank.org/indicator/SP.DYN.LE00.IN](https://data.worldbank.org/indicator/SP.DYN.LE00.IN)
- <sup>9</sup> UNICEF DATA, Child Mortality. Available at: <https://data.unicef.org/topic/child-survival/under-five-mortality/>
- <sup>10</sup> *The Lives Saved Tool. Ibid*
- <sup>11</sup> Countdown 2030 - Maternal, Newborn & Child Health Data - Countdown to 2030. Available at: [www.countdown2030.org/](https://www.countdown2030.org/)
- <sup>12</sup> Roser M, Ritchie H and Dadonaite B (2013) *ibid*.
- <sup>13</sup> Ritchie H and Roser M (2018) Causes of Death. *Our World in Data*. Available at: <https://ourworldindata.org/causes-of-death>
- <sup>14</sup> Facts for Life - UNICEF, WHO, UNESCO, UNFPA, UNDP, UNAIDS, WFP, World Bank - The Mother and Child Health and Education Trust. Available at: [factsforlife.org](https://factsforlife.org)
- <sup>15</sup> Murray J, et al. (2018) *ibid*

## ANNEX 1: Cost per life saved for Reproductive Maternal Newborn and Child Health interventions (USD)

The following comparisons are representative examples from the most authoritative source of cost-effectiveness comparisons, [the Disease Control Priorities project \(3<sup>rd</sup> edition, 2016\)](#). The DMI figure is constructed from the average cost per life saved of the 10 most promising countries modelled in Table 1. The table uses a logarithmic scale to allow comparisons across a wide range of figures.

It is clear that DMI's cost effectiveness is at the very cheapest end of comparable reproductive, maternal and newborn child health interventions.



\*All costs extracted from DCP 3 are in 2012 USD, per life saved. DMI costs are 2021 USD.

\*\*The figures from DCP 3 are converted from cost per DALY.

ANNEX 2: Under 5 deaths per 1000 live births (UNICEF, 2019)

Global Rank	Countries	U5 deaths per 1000 live births
1	Nigeria	117.2
2	Somalia	117.0
3	Chad	113.8
4	Central African Republic	110.1
5	Sierra Leone	109.2
6	Guinea	98.8
7	South Sudan	96.2
8	Mali	94.0
9	Benin	90.3
10	Burkina Faso	87.5
11	Lesotho	86.4
12	DRC	84.8
13	Liberia	84.6
14	Equatorial Guinea	81.8
15	Niger	80.4
16	Côte d'Ivoire	79.3
17	Guinea-Bissau	78.5
18	Cameroon	74.8
19	Angola	74.7
20	Mozambique	74.2
21	Mauritania	72.9
22	Pakistan	67.2
23	Togo	66.9
24	Comoros	62.9
25	Haiti	62.8
26	Zambia	61.7
27	Afghanistan	60.3
28	Sudan	58.4
29	Yemen	58.4
30	Djibouti	57.5
31	Burundi	56.5
32	Zimbabwe	54.6
33	Gambia	51.7
34	Kiribati	50.9
35	Ethiopia	50.7
36	Madagascar	50.6
37	Tanzania	50.3
38	Eswatini	49.4
39	Congo	47.8
40	Ghana	46.2
41	Uganda	45.8
42	Lao People's Democratic Republic	45.5
43	Senegal	45.3
44	Papua New Guinea	44.8
45	Myanmar	44.7
46	Timor-Leste	44.2
47	Kenya	43.2
48	Gabon	42.5
49	Namibia	42.4
50	Turkmenistan	42.0

ANNEX 3: Number of under 5 deaths (UNICEF, 2019)

SSA Rank	Countries	U5 deaths
1	Nigeria	857,899
2	DRC	290,859
3	Ethiopia	177,849
4	Tanzania	103,222
5	Angola	92,690
6	Niger	81,635
7	Mozambique	81,507
8	Sudan	78,028
9	Uganda	74,053
10	Mali	73,632
11	Chad	73,024
12	Somalia	72,126
13	Côte d'Ivoire	70,330
14	Cameroon	66,071
15	Burkina Faso	64,744
16	Kenya	63,623
17	Guinea	44,114
18	Madagascar	43,110
19	South Africa	40,631
20	Ghana	40,168
21	Zambia	38,460
22	Benin	37,100
23	South Sudan	36,916
24	Sierra Leone	27,580
25	Malawi	25,712

## ANNEX 4: Process of elimination and final shortlist

SSA Country	Under 5 deaths	% radio	Security Concerns	Barriers to entry	Airtime costs	Media Landscape	Covid 19	Local capacity
Tanzania	103,222	52%					↓	
Mozambique	81,507	54%					↓	
Uganda	74,053	64%					↓	
Côte d'Ivoire	70,330	40%					↓	
Burkina Faso	64,744	56%					↓	
Guinea	44,114	35%						
Madagascar	43,110	57%					↓	
Zambia	38,460	45%					↓	
Benin	37,100	43%						
Sierra Leone	27,580	31%						
Malawi	25,712	40%					↓	
Angola	92,690	65%			↑			
Mali	73,632	50%	↑					
Nigeria	857,899	34%		↑	↑			
DRC	290,859	31%		↑		↑		
Ethiopia	177,849	23%			↑	↑		
Niger	81,635	39%	↑					
Sudan	78,028	-	↑			↑		
Chad	73,024	23%				↑		
Somalia	72,126	-	↑					
Cameroon	66,071	23%	↑			↑		
Kenya	63,623	78%			↑			
South Africa	40,631	57%						↑
Ghana	40,168	65%			↑			
South Sudan	36,916	-	↑					

↑ increasing risk ↓ decreasing risk (due to established DMI operations)