

# Cost- Effectiveness of Anticipatory Action



INITIATIVE ON  
Fragility, Conflict,  
and Migration

Lesotho, Madagascar and Mozambique

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*Lesotho 2023-24 El Nino WFP Anticipatory Action activation*

*Credit: WFP/Gabriela Vivacqua*



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# Introduction

An important question when conducting anticipatory action programs relates to its cost-effectiveness. By cost-effectiveness, we refer to the relative costs and benefits of anticipatory action in general relative to a more standard approach to post-shock aid. In this context, we largely want to know what would happen to potential beneficiary households in two different scenarios: 1) if they receive anticipatory action transfers, and 2) if they instead receive unconditional post-shock transfers of the same size. The idea is that we assume there is a fixed budget envelope, and the same amount of assistance could be provided as either anticipatory action or as post-shock transfers. The resulting measurement estimates the difference in benefits and losses to providing anticipatory action relative to post-shock assistance, providing a conclusion on the overall net benefits or losses of this approach. Since we assume a fixed budget envelope, we invert the process of measuring cost effectiveness by measuring the net benefits of anticipatory action relative to post-shock transfers.

This analysis uses the conceptual framework developed by de Brauw and Bloem (2024) to identify classes of potential benefits and costs for anticipatory action relative to unconditional post-shock transfers. The model suggests the main benefit to anticipatory action is that households can better protect their productive asset holdings, whether livestock or other farm implements, which implies their future incomes will be higher than they would be otherwise. There are also potential gains for households during the negative shock, implying those households may be less food insecure, for example, while the shock is occurring.<sup>1</sup> On the other hand, the framework suggests that a specific cost to anticipatory action is the cost of getting it wrong (i.e., giving people benefits when the shock does not materialize for those people).

Households may also have their dignity protected during a long-term shock through anticipatory action; the monetary value of that dignity is much harder to project, and therefore we do not factor it in these calculations. From this perspective, we can think of these monetary benefits as a lower bound; the actual value may be higher.

This report first lays out a methodology for estimating the short- and long-term benefits of anticipatory action relative to post-shock transfers, and then it describes measurement using the methodology. The third section describes measurements for anticipatory action programs in three Southern African countries, and the final section concludes.

This analysis focuses on three of the countries where the United Nations World Food Programme (WFP) activated anticipatory action programs for the Southern Africa El Niño event of 2023-2024: Lesotho, Madagascar, and Mozambique. In response to forecasts of upcoming droughts for the 2023-2024 rain season, WFP and partners provided a combination of cash transfers, agricultural inputs, early warning information and support for the provision of safe water, to help vulnerable populations mitigate the impact of the drought ahead of its impact.

## Section 1: Methodology

In this section, we describe thinking about the net benefits of providing assistance in the form of anticipatory action relative to post-shock action where the assistance is provided after the shock has begun. As noted above, there are two broad classes of net benefits, and one class of net costs.

Benefits:

<sup>1</sup> There may be other additional gains during the shock, such as anticipatory action beneficiaries adopting negative coping strategies on a less frequent and/or severe basis. This analysis focuses on the food security gain, as explained in the country measurements.

- 1) **Food security gains:** First, by receiving assistance earlier, households may not face the same level of food insecurity as they would have otherwise, particularly during a protracted shock. Relative to post-shock action, this benefit occurs in the short-term since households affected by the shock would not receive benefits until post-shock benefits become available. We are assuming that food security levels among the anticipatory action group and the post-shock group recover in the short term to the same level as the anticipatory action group, after the post-shock group has received transfers.<sup>2</sup>
- 2) **Protected assets/income:** Longer term, households receiving anticipatory action can have a larger stream of income because they can save assets they might otherwise lose during the shock, which is the second benefit.<sup>3</sup>

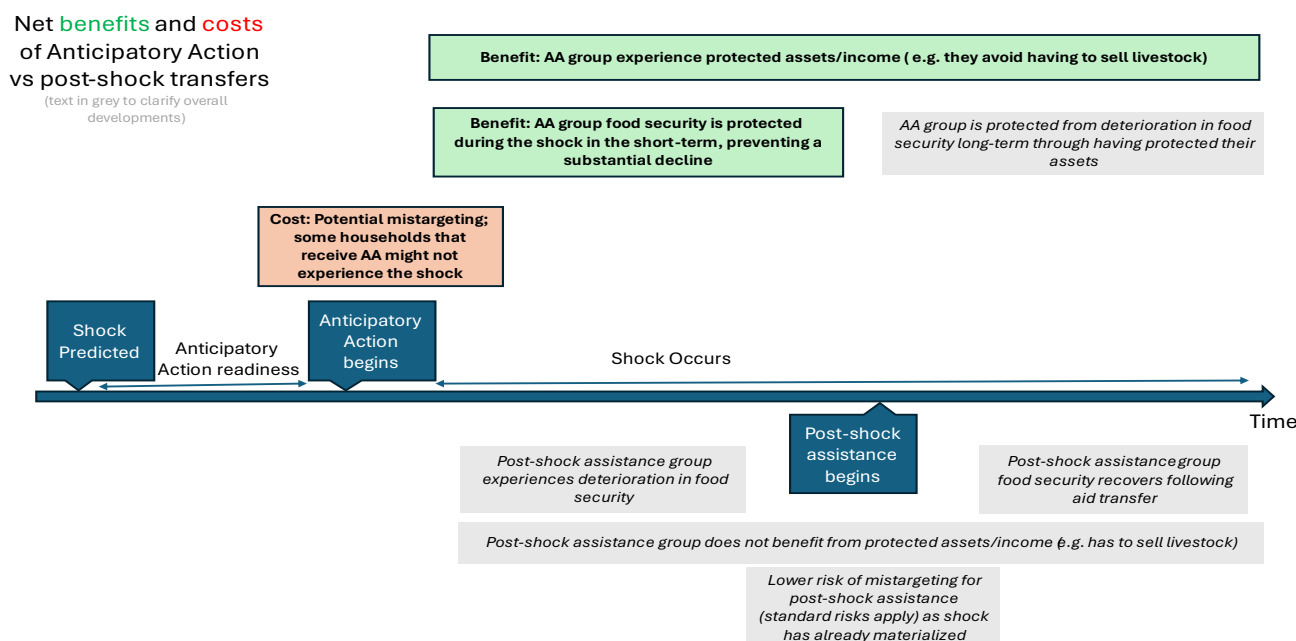
Costs:

- 3) **Mistargeting:** The main difference in costs, then, is in mistargeting; some households that receive anticipatory assistance may not actually experience the shock, which would not occur with post-shock assistance (beyond the standard targeting risks that would apply to both scenarios).

Throughout, given that we assume the value of assistance is the same between anticipatory action and post-shock groups, we can assume the costs of assistance, on a per beneficiary basis, are the same.

Finally, we do not attempt to measure benefits to longer term investments, either those that could help inform anticipatory action and/or post-shock response. For example, investments can be made in better weather prediction infrastructure, which can help reduce the types of mistargeting errors listed above, or better predict the need for specific types of anticipatory action.

These benefits and costs are summarized in Figure 1:



**Figure 1: Net benefits and costs of Anticipatory Action vs post-shock transfers**

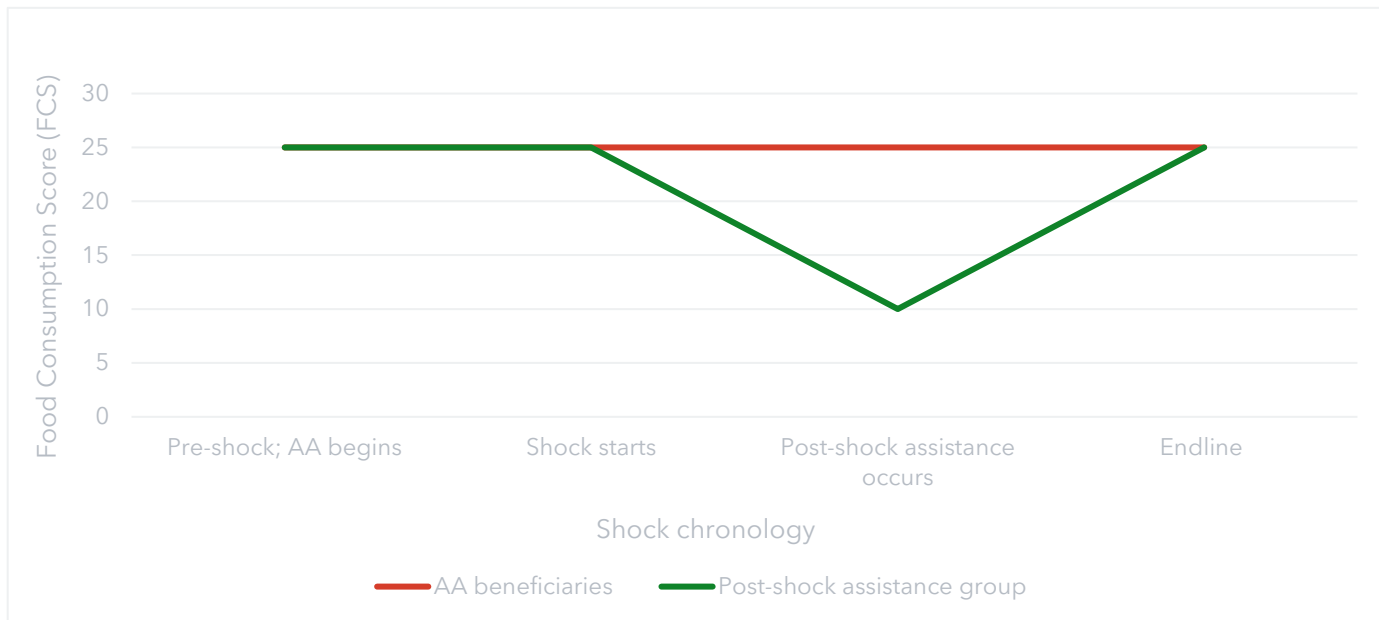
<sup>2</sup> This assumption implies that assistance is provided to the post-shock group in a timely enough manner for its food security levels to attain the same levels as the anticipatory action group. If it is not timely enough, then it may not reach that level. We have therefore taken an optimistic view of the post-shock assistance scenario, so the cost-benefit of anticipatory action can be considered a conservative estimate; the added benefit to food security may be larger.

<sup>3</sup> Since households receiving anticipatory transfers could use those to retain assets, they would in theory have higher incomes in the future than households receiving post-shock transfers, and so they could have higher food security in the future. We measure this benefit in terms of the additional income they would make while post-shock households are recovering their asset bases.

Figure 2 further illustrates how, according to our assumptions on the cost-benefits, the *net* benefits to food security of anticipatory action versus post-shock assistance occur during the shock.

- In an illustrative scenario, the red line portrays how anticipatory action beneficiaries maintain their food consumption scores during the shock.

The green line, meanwhile, shows how the post-shock assistance group experiences a short-term deterioration in their food consumption score during the shock, before recovering when post-shock assistance is delivered.<sup>4</sup>



**Figure 2: Example Food Consumption Score illustrative trajectory for Anticipatory Action and post-shock assistance groups**

In this illustrative scenario, the overall scores converge for both groups, highlighting that the *additional* (net) benefit of anticipatory action to food security, compared with post-shock assistance, occurs in the short-term during the shock. This benefit can also be viewed as counteracting the consequences of inaction that often occur with post-shock assistance, as households that receive anticipatory action are better able to maintain their food consumption during the period of the shock.

## Section 2: Measurement

We measure the two types of benefits as follows:

### 1) Food security gains:

For short-term benefits, we use the fact that Hjelm et al. (2016) demonstrate a positive correlation between the Food Consumption Score (FCS) and per capita expenditures.<sup>5</sup> To measure short term benefits, we measure differences

<sup>4</sup> As per footnote 2, it is also possible that food security among the post-shock assistance group may not sufficiently recover to the pre-shock level. This would mean that anticipatory action would have longer-term benefits to food security, with the anticipatory action beneficiaries potentially starting the next season with higher food security than the post-shock assistance recipients. Therefore, one could argue we are taking a conservative approach to estimating the benefits of anticipatory action to food security, focusing on its additional benefit as occurring during the shock itself.

<sup>5</sup> Many household level surveys measure consumption expenditures rather than income, as income is a more variable measure of household well-being, and therefore does not reflect poverty status as well. Moreover, consumption expenditures are reflective of income potential (Deaton, 2016). We use income in the model, but measure it using total consumption expenditures, since that measure of expenditures is more readily available.

between the average FCS among those who received anticipatory action versus those who did not, and assign a monetary value to that difference.

By monetizing the gain in FCS, the calculation accounts for any components of anticipatory action assistance that could have improved consumption or income during the year following the shock. For example, households could have maintained consumption by using cash to purchase food, or by using drought resistant seeds to grow crops that better maintain yields. We assign a value of \$2 per FCS point on average.<sup>6</sup>

We therefore do not attempt to place a value on several other potential positive effects of anticipatory action that might occur during the shock for the anticipatory action beneficiaries that the post-shock assistance group would not experience during this period, such as an increase in resilience capacities, a reduction in the use of coping strategies, and in potential positive outcomes related to dignity.

## 2) **Protected assets/income:**

For longer term benefits, through asset retention, we measure livestock losses among beneficiaries relative to a control group.<sup>7</sup> We focus on livestock as a primary productive asset that is affected by drought and tend to represent a large portion of the value of productive asset holdings among households in Low- and Middle-income countries (LMICs).<sup>8</sup>

To compute the average losses prevented by anticipatory action on a per capita basis, we need to understand:

- What percentage of those who owned livestock were protected from selling livestock on account of the Anticipatory Action support? In other words, we need to establish the difference in losses between the anticipatory action group and the control group ( $p$ ).
- How much do average livestock losses damage household incomes? To understand this quantity, we need an estimate of the value of livestock sold under duress, which can then be transformed into a percentage loss of future income ( $\Delta$ ). We also need to know the average per capita income ( $M$ ).

The per capita income loss prevented by anticipatory action,  $H$ , among livestock owners is the product of those three quantities ( $p$ ,  $\Delta$ , and  $M$ ):

$$H = p * \Delta * M$$

We then take the per capita income loss prevented by anticipatory action and multiply it by the number of beneficiaries and the proportion of beneficiaries that owned livestock. This calculation provides a total income gain from anticipatory action in the first year.

Since it takes time to recover those assets, we assume that income recovers linearly over the course of 5 years to recover to average.<sup>9</sup> We therefore multiply the total income from anticipatory action in the first year by  $(0.5 \times 5)$  to provide the five-year gain from the protected income.<sup>10</sup>

Now, to measure the costs:

<sup>6</sup> Hjelm et al. (2016) simply report a positive correlation between the FCS score and consumption per capita in Living Standards Measurement Surveys-Integrated Surveys for Agriculture (LSMS-ISA) surveys, collected in five countries in Africa. We used the same surveys to estimate the \$2 value using regression analysis, controlling for rural-urban location and differences in enumeration areas. The value we use here represents a lower bound estimate, to ensure we are being conservative. See Annex Table A2.

<sup>7</sup> We assume that the control group could receive post-shock transfers in the future. From the perspective of the endline survey, they are equivalent.

<sup>8</sup> We choose to measure livestock sales under duress for several reasons. First, in many countries land rights are incomplete, and land sales are unlikely as a result. Second, the value of livestock holdings is high relative to other productive assets (among households that own livestock). Third, the data suggest that the sale of other productive assets is rare. So we use a question in the coping strategies section of the data to understand what share of households have to sell more livestock than usual. As a result, this estimate only accounts for gains among livestock owning households and can therefore be considered conservative.

<sup>9</sup> The recovery time from shocks to consumption is studied in low- and middle-income countries by Giles and Yoo (2007), Carter et al. (2007), and Mogues (2011). While extremely poor households may fall in asset-based poverty traps (Carter and Barrett, 2006), most households save to regain asset levels, and it takes households around five years to fully recover.

<sup>10</sup> The linearity assumption means that five years after the shock, the income recovers fully by the fifth year. To recover linearly, the loss is 75 percent as large in year 2, 50 percent as large in year 3, and 25 percent as large in year 4. The number can also be computed as  $\frac{1}{2}$  times 5 years.

### 3) **Cost of mistargeting:**

Targeting of programs always involves both errors of inclusion and exclusion. Anticipatory action can incur a particular type of inclusion error given the degree of calculated uncertainty involved in acting before a shock materializes. While the likelihood and magnitude of this error occurring can be partly reduced by investments in early warning systems and response triggers, it is nevertheless an additional potential cost to be factored in versus post-shock assistance.

Recall, we are estimating costs relative to hypothetically providing post-shock assistance to the same size group of people, and shocks occur over space. If the area in which anticipatory action takes place includes some geographic areas that end up not affected by the shock, then anticipatory action incurs a cost that would not occur after the shock is realized, since it would then be more straight forward to ensure that only areas that are affected by the shock receive transfers. Similarly, the pre-shock targeting requires a level of prediction of how the shock will affect different households, whereas post-shock targeting can assess how the shock has already affected different households and so the needs to be prioritized are more apparent.

We hypothesize that as the ratio of those reached by anticipatory action to the number of people affected by a specific shock grows, the probability that people who are not affected are reached by anticipatory action grows at an increasing rate. The cost, then, is that some proportion of the people reached by anticipatory action do not need the assistance, whereas if all the assistance was distributed in a post-shock setting, only individuals who suitably meet targeting requirements would receive transfers.

We also consider a proxy measure for mistargeting in this case, which is the proportion of households receiving anticipatory action that had both an adequate FCS and did not have to use any coping strategies, as reported in endline data surveys.<sup>11</sup> While households within targeted communities are not necessarily targeted using the FCS, the idea of using this measure is to understand whether most beneficiary households appeared to need transfers to improve their food security.

## Section 3: Country Estimates

### Lesotho

We first use the data from Lesotho to inform the two types of benefits and the costs in Lesotho.

#### 1) **Benefit: Food Security Gains**

Table 1, column 1 in the annex illustrates differences in outcomes between the beneficiary and control groups in the Lesotho endline survey. Within the group receiving anticipatory action, we find the average Food Consumption Score (FCS) score is 3.2 points higher, or an increase of 11 percent over the control group. The data also indicates a 2.4-point difference in the Reduced Coping Strategies index, as well as other benefits.<sup>12</sup>

To monetize the benefits, we use data from the Hjelm et al. (2016) article to estimate a value of about \$2 per one point increase in the FCS in annualized food consumption per capita. Since anticipatory action is associated with an average FCS that is 3.2 points higher on average in Lesotho, we multiply that by the number of beneficiaries (41,200) to obtain an estimated benefit of about \$264,000 in terms of household consumption. Note that this number does not include any benefits from improvements in the Reduced Coping Strategies index.

<sup>11</sup> A challenge with this proxy measure is that Food Consumption Scores have a seven-day recall period, which is a relatively limited outlook in the context of a multi-month drought and seasonal variation. Additionally, it cannot be established whether the reason that these households had adequate FCS and did not have to use coping strategies was on account of the success of the anticipatory action program or due to not having needed anticipatory action support.

<sup>12</sup> All differences between treatment and control groups in FCS and the Reduced Coping Strategies indices described in the text are statistically significant at the 5 percent level.

## 2) Benefit: Protected assets / income

Recall, the per capita average income loss prevented by anticipatory action,  $H$ , is the product of the difference in the rate of asset sales between the anticipatory action and control groups ( $p$ ), the percent loss in income the following year from lower livestock holdings ( $D$ ), and average per-capita income ( $M$ ).

First, among those households, there is a difference of 17.5 percentage points between the anticipatory action group and the control group who sell livestock due to drought. In other words, the control group was 17.5 percentage points more likely to have sold livestock due to the drought than the anticipatory action group.

Second, as the primary data set we use did not include information on the value of asset sales, we use another data set collected in Lesotho to estimate that when households sell livestock in a bad year, they sell about 24 percent of their livestock.<sup>13</sup> We then compute the corresponding reduction in household farm income using a formula that transforms assets and other inputs (labor, land) into household farm income.<sup>14</sup> We find that the 24 percent reduction in the livestock value translates to a 12.8 percent loss in income in the first year.

Finally, to estimate average per capita income, we use the World Development Indicators, which provide an estimate of average per capita consumption expenditures in Lesotho of about \$880/year.<sup>15</sup> This gives a total per capita income loss of \$19.70 when the three values in the formula are multiplied together.

We take that number and multiply it by the number of beneficiaries (41,200) and the proportion of anticipatory action recipients in the data set that owned livestock (31.3 percent). This gives us a total income gain to anticipatory action in the first year of about \$254,000 ( $41,200 \times 0.295 \times \$19.70$ ). If we then assume that income linearly recovers over five years, the total gain to anticipatory action from protecting assets is \$635,000.<sup>16</sup>

## 3) Cost of Mistargeting

In Lesotho, overall needs after the El Niño shock suggest that 700,000 people are in need (UN Lesotho, 2024), which implies about 5.9 percent of those in need were reached by anticipatory action.<sup>17</sup> Mistargeting costs, at this level, are likely negligible. In other words, when there is a low proportion of potential need reached by anticipatory action, the intervention is likely to almost exclusively reach people in need.

We also examine the share of households that received transfers that had an adequate FCS and did not use any livelihood coping strategies as a proxy to understand households included in assistance who may not have been in need. 15 percent of anticipatory action households fit that definition, but 9 percent of control group households do as well. Therefore, there is only a 6 percentage point difference between the two. Given that a certain percentage of households would fit that definition anyway, and the small share of those affected who were reached by anticipatory action, we can consider the costs as negligible.

## Lesotho result

We estimate the relative benefits of providing anticipatory action as the benefits of monetizing gains in consumption in the short term, plus gains from retaining assets, minus the cost of mistargeting that could have taken place. In Lesotho, we estimate the short-term food security gains at \$264,000, and the gains to retained assets at \$635,000. Meanwhile, we value the costs of mistargeting at zero.

<sup>13</sup> We use a data set collected for Millenium Challenge Corporation in 2021 among potential beneficiaries conducted in helping set up the Lesotho Market Driven Irrigated Horticulture Project among 1140 farm households. The 24 percent sales are derived from households who owned livestock and reported having low farm income that year.

<sup>14</sup> Specifically, we use a Cobb-Douglas production function, with two inputs (labor and assets) with equal weight in the production function, which gives the 12.8 percent income loss for a 24 percent reduction in assets. The return to assets is assumed to include both animal sales and sales of animal by-products.

<sup>15</sup> The consumption expenditures per capita are specifically the total household consumption expenditures in 2022, divided by population, so they are expressed in 2022 dollars.

<sup>16</sup> As explained above, the linearity assumption means that five years after the shock, the income recovers fully by the fifth year. To recover linearly, the loss is 75 percent as large in year 2 (\$190,500), 50 percent as large in year 3 (\$127,000), and 25 percent as large in year 4 (\$63,500). The number can also be computed as  $\frac{1}{2}$  times 5 years times \$182,500.

<sup>17</sup> This comparison is based on the rationale that targeting for anticipatory action for WFP programs in Southern Africa typically includes the use of crisis response criteria to predict who would be likely to be food insecure and in need of post-shock support.

**In Lesotho, we therefore estimate that the relative net benefits of doing anticipatory versus post-shock assistance are, at minimum, about \$899,000**, relative to providing post-shock assistance to the same size group of beneficiaries. In other words, if the same investment is spent on anticipatory action instead of post-shock assistance, there is an additional estimated \$899,000 in program benefits, or **the additional benefit from anticipatory action is 28% of the overall program cost** (\$3.19 million). This result can also be understood as **every \$1 in anticipatory action being equivalent to \$1.28 in post-shock response** to yield the same quantity of benefits.<sup>18</sup>

## Madagascar

We use the data from Madagascar to inform the two types of benefits and the costs. Baseline and endline data were both available in Madagascar, so estimates are based on comparing changes in the anticipatory action group against changes in the control group.

### 1) Benefit: Food Security Gains

Columns 2 and 3 in Table A1 in the Annex illustrate difference-in-difference changes in outcomes between the Madagascar baseline and endline surveys.<sup>19</sup> For the control group, the average FCS decreased by 4.4 points and for the beneficiary group, the average FCS decreased by 1.14 points. We can therefore conclude that receiving AA assistance increased the average FCS score by 3.26 (i.e. 4.4-1.14 points). Among other benefits, the data analysis also indicates a 6.8-point reduction in the Reduced Coping Strategies index.

As in Lesotho, we use the estimate that there is about a \$2 increase in annualized food consumption per capita per one point increase in the FCS. Since anticipatory action is associated with an average increase in the FCS of 3.26 points in Madagascar, we multiply that by the number of beneficiaries (151,701) to obtain a benefit of about \$990,000. Note that this estimate does not include any benefits from changes in the Reduced Coping Strategies index or other improvements.

### 2) Benefit: Protected assets / income

According to the model, the next group of benefits relate to assets, which are a longer-term benefit.

The challenge here is that although the endline survey asked about livestock holdings, there is a substantial difference between the treatment and control groups; a much smaller proportion of the control group owned livestock, and those who owned livestock owned a smaller amount of livestock than the beneficiary group. It is therefore challenging to make a valid comparison about the benefits to livestock holdings that can be attributed to Anticipatory Action in this context, as a control group with substantially less livestock to begin with would invariably experience less significant livestock losses.

We alternatively attempt to use indicators that are part of the Livelihoods Coping Strategy index; unfortunately, again those are not useful for measuring benefits to saved livestock, as we observe very few households reporting losses in the control group; if one does not own livestock, they cannot lose them.

As a result, we cannot assign benefits to saved assets or livestock in Madagascar.

### 3) Cost of mistargeting

In Madagascar, overall needs after the El Nino shock suggest that 2.3 million people are in need (OCHA, 2024b), which implies about 6.6 percent of those in need were reached by anticipatory action (151,701 people). Mistargeting costs, at this level, are likely negligible. In other words, when there is a low proportion of potential in need reached by anticipatory action, the intervention is likely to almost exclusively reach people in need.

While we do not attempt to directly measure mistargeting, we can use the data collected to come up with a proxy. Among those in the data receiving transfers, only 2.5 percent had an adequate FCS and did not use any livelihood

<sup>18</sup> The benefits would necessarily be different in nature. For example, as explained in the methodology, the benefits of anticipatory action include long-term benefits to protected assets/income that post-shock assistance does not yield.

<sup>19</sup> Difference-in-difference is a methodology that refers to changes in a group that was affected by something - in this case, anticipatory action - versus changes in an unaffected group over the same time period.

coping strategies. Therefore, we can consider that the level of mistargeting was relatively low and that the costs are likely negligible.

### Madagascar result

As per Lesotho, we estimate the relative benefits of providing anticipatory action as the benefits of monetizing gains in consumption in the short term, plus gains from retaining assets, minus the cost of mistargeting that could have taken place. In Madagascar, the latter two figures are here valued at 0, as per the analysis above.

**In Madagascar, we therefore estimate that the relative net benefits of doing anticipatory versus post-shock assistance are, at minimum, therefore about \$990,000**, relative to providing post-shock transfers to the same size group of beneficiaries. In other words, if the same investment is spent on anticipatory action instead of post-shock transfers, there is an additional estimated \$990,000 in program benefits, or **the additional benefit from anticipatory action is 23% of the total program cost** (\$4.26 million). This result can also be understood as **every \$1 in anticipatory action being equivalent to \$1.23 in post-shock response** to yield the same quantity of benefits.<sup>20</sup>

### Mozambique

We finally use the data from Mozambique to inform the two types of benefits and the costs in Mozambique.

In Mozambique, the Anticipatory Action activation was led and implemented by the government, according to the Anticipatory Action framework. The activation included the delivery of cash-based transfers through the horizontal expansion of the national social protection system, the dissemination of early warning messages, the distribution of drought-tolerant seeds, as well as a set of agricultural and water asset creation activities tailored to the specific contexts of each district.

The outcomes of the latter activity to support agricultural and water management asset creation are not captured in the WFP endline analysis and consequently the data used for this study. This is due to a different prioritization strategy used by the two government institutions responsible for cash-based transfers (National Institute of Social Action) and agricultural activities (National Institute for Disaster Management); WFP is working with both institutions to harmonize the targeting strategy for future activations. The results below are therefore likely on the conservative side as they do not cover the full benefits of the Anticipatory Action program.

#### 1) Benefit: Food Security Gains

Column 4 in Annex Table A1 illustrates differences in outcomes between the treatment and control group in the Mozambique endline survey. We find a higher average Food Consumption Score (FCS) score for the anticipatory action beneficiary group than for the control group by 4.2 points. The data also indicate a 3.9-point reduction in the Reduced Coping Strategies index, as well as other benefits.

We use data implied by the Hjelm et al. (2016) article to estimate a value of about \$2 per one point increase in the FCS in annualized food consumption per capita. Since the FCS is 4.2 points higher for anticipatory action beneficiaries on average in Mozambique, we multiply that by the number of beneficiaries (58,955) to obtain a benefit of about \$495,000. Note that this number does not include any benefits from the reduced coping strategies index.

#### 2) Benefit: Protected assets / income

As in Lesotho, the per capita average income loss prevented by anticipatory action,  $H$ , is the product of the difference in the rate of asset sales between the anticipatory action and control groups ( $p$ ), the percent loss in income the following year from lower livestock holdings ( $D$ ), and average per-capita income ( $M$ ).

<sup>20</sup> As per footnote 14, the benefits would necessarily be different in nature.

First, among those households, there is a difference of 3.3 percentage points between the anticipatory action group and the control group who sell livestock due to drought. In other words, the control group was 3.3 percentage points more likely to have sold livestock due to drought than the anticipatory action group.<sup>21</sup>

Second, as the primary data set we use did not collect information on the value of asset sales, we use another data set collected in Mozambique to estimate that when households sell livestock in a bad year, they sell about 21 percent of their livestock.<sup>22</sup> We then compute the corresponding reduction in household farm income using a formula that transforms assets and other inputs (labor, land) into household farm income.<sup>23</sup> We find that the 21 percent reduction in the livestock value translates to a 11.1 percent loss in income in the first year.

Finally, to estimate average per capita income, we use the World Development Indicators, which provide an estimate of average per capita consumption expenditures in Mozambique of \$420/year. This gives a per capita income loss of \$1.54 when the three values in the formula are multiplied together.

We take that number and multiply it by the number of beneficiaries (58,955) and the proportion of anticipatory action beneficiaries that owned livestock (41.2 percent). We find a total income gain to anticipatory action in the first year of \$37,400 ( $58,955 \times 0.412 \times \$1.54$ ).

If we assume the households recover linearly in 5 years, the total gain to anticipatory action is about \$93,500.<sup>24</sup>

### 3) Cost of Mistargeting

In Mozambique, overall needs after the El Niño shock suggest that 2.7 million people are in need (UN OCHA, 2024a), which implies about 2.2 percent of those in need were reached by anticipatory action. Mistargeting costs, at this level, are likely negligible. In other words, when there is a low proportion of potential need reached by anticipatory action, the intervention is likely to almost exclusively reach people in need.

We do examine the share of households that received transfers that had an adequate FCS and did not use any livelihood coping strategies. 27 percent of anticipatory action households fit that definition, though 14 percent do in the control group as well, suggesting a 13 percentage point difference. Despite this difference, almost all households in the data suggested they had been affected by drought when asked, and given the small share of those affected who were reached by anticipatory action, we can consider the costs as negligible.

### Mozambique result

As per Lesotho and Madagascar, we estimate the relative benefits of providing anticipatory action as the benefits of monetizing gains in consumption in the short term, plus gains from retaining assets, less the cost of mistargeting that could have taken place. In Mozambique, we estimate the short-term food security gains at \$495,000, and the gains to retained assets at \$93,500. Meanwhile, we value the costs of mistargeting at zero.

**In Mozambique we therefore estimate that the relative net benefits of doing anticipatory versus post-shock assistance are, at minimum, about \$588,500**, relative to providing post-shock assistance to the same size group of beneficiaries. This number is a total increase in benefits from the same investment over investing in post-shock transfers. In other words, if the same investment is spent on anticipatory action instead of post-shock assistance, there is an additional estimated \$588,500 in program benefits, or **the additional benefit from anticipatory action**

<sup>21</sup> 20 percent of the control group sold livestock, whereas 16.7 percent of the anticipatory action group sold livestock, leading to the 3.3 percentage point difference.

<sup>22</sup> We use a data set collected for an impact evaluation conducted by the Development Impact Group of the World Bank, that studied sustainable land management practices. The survey was conducted among 1503 households, and the 21 percent sales are derived from households who owned livestock and reported having a crop loss to drought at endline in 2019.

<sup>23</sup> As in Lesotho, we use a Cobb-Douglas production function, with two inputs (labor and assets) with equal weight in the production function, which gives the 11.1 percent income loss for a 21 percent reduction in assets.

<sup>24</sup> The linearity assumption means that five years after the shock, the income recovers fully by the fifth year. To recover linearly, the loss is 75 percent as large in year 2 (\$28,050), 50 percent as large in year 3 (\$18,700), and 25 percent as large in year 4 (\$9,350). The number can also be computed as  $\frac{1}{2}$  times 5 years times \$37,400.

is **23% of the overall program cost** (\$2.55 million).<sup>25</sup> This result can also be understood as every **\$1 in anticipatory action being equivalent to \$1.23 in post-shock** to yield the same quantity of benefits.<sup>26</sup>

## Section 4: Conclusion

Across the three countries, we estimate the relative benefits of providing anticipatory action as the benefits of monetizing gains in consumption in the short term, plus gains from retaining assets, minus the cost of mistargeting that could have taken place. Given the small proportions of affected populations that we estimate mistargeting costs at zero for all three countries. We summarize our estimated gains in Table 1.

**Table 1. Short- and Long-Term Relative Benefits to Anticipatory Action over Post-Shock assistance**

Country	Short-Term Benefits	Long-Term Benefits	Total Benefits	Total as a Share of Program Budget
Lesotho	\$264,000	\$635,000	\$899,000	28%
Madagascar	\$990,000	\$0 (not measured)	\$990,000	23%
Mozambique	\$495,000	\$93,500	\$588,500	23%

Source: Authors' Calculations and budget figures provided by WFP.

**We estimate that the additional benefit from anticipatory action is between 23 and 28 percent of overall program costs, depending upon the country.** In other words, if the same investment is spent on anticipatory action instead of post-shock assistance, there is an additional 23 to 28 percent return to assistance. This result can also be understood as every \$1 in anticipatory action being equivalent to \$1.23-1.28 in post-shock response to yield the same quantity of benefits.<sup>27</sup>

Moreover, we have been somewhat conservative in estimating these benefits; for example, in the short term we have not assigned any monetary benefit to changes beyond the FCS, and in the long term we have not assigned any benefit to any households that did not own livestock.

<sup>25</sup> This cost covers the key AA activities implemented here - cash-based transfers and early warning information - but does not cover WFP funding for AA government-led livelihoods projects, which, as explained in the introduction to the Mozambique section on p.11, are not within the scope of the endline analysis.

<sup>26</sup> As per footnote 14, the benefits would necessarily be different in nature.

<sup>27</sup> As per footnote 14, the benefits would necessarily be different in nature.

# Acronyms

AA	Anticipatory Action
FCS	Food Consumption Score
LMICs	Low- and Middle-Income Countries
LSMS-ISA	Living Standards Measurement Study- Integrated Surveys on Agriculture
PSU	Primary Sampling Unit
WFP	World Food Programme

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# Annex 1: Additional Results Tables

**Table A1. Short- and Long-Term Relative Benefits to Anticipatory Action over Post-Shock assistance**

Outcome	Lesotho		Madagascar		Mozambique			
	AA Group, Endline	Control Group, Endline	AA Group, Baseline	Control Group, Baseline	AA Group, Endline	Control Group, Endline		
	(1)		(2)		(3)		(4)	
<b>Food Consumption Score (FCS)</b>	30.6	27.3	26.0	24.9	29.3	24.9	34.0	29.8
<b>Reduced Coping Strategies Index (rCSI)</b>	10.6	13.0	19.8	20.8	16.9	24.7	4.7	8.6

Notes: The table presents the descriptive (non-weighted) outcome results for Lesotho, Madagascar, and Mozambique. In Madagascar (columns 2 and 3), a Difference-in-Difference analysis was then applied to produce the key outcome results and in Lesotho (column 1), inverse probability weighting was applied to increase comparability between the anticipatory action and control groups, as per the results in the narrative of this report. The difference in Lesotho is slightly lower (3.2) once rounding is taken into account.

Source: WFP surveys.

**Table A2. Regression Results Linking Annual Consumption Expenditures per Adult Equivalent and FCS**

	Ethiopia, 2018-9	Niger, 2014-5
<b>FCS</b>	219.9 (41.5)	3084.5 (299.1)
<b>p-value</b>	<0.001	<0.001
<b>Controls</b>	PSU Fixed Effects	PSU Fixed Effects
<b>Number of Obs.</b>	6770	3616

Notes: Standard errors in parentheses. PSU stands for primary sampling unit. Results in local currency, and are estimated at the household level. Average adult equivalents are 3.46 in Ethiopia and 4.58 in Niger and using Ethiopia exchange rate of 28.9 birr to \$1 yields \$2.19 per FCS point per capita. In Niger, we use the purchasing power parity rate of 240 FCFA to \$1, since FCFA are a regional currency; that yields \$2.80 per FCS point per capita. We round the more conservative estimate to \$2 in the main body.

Source: LSMS-ISA Surveys, Ethiopia and Niger.

# Annex 2: Limitations and Future Research Opportunities

- The analysis focuses the short-term gains during the shock on food security, but there may be other additional gains, such as anticipatory action beneficiaries adopting negative coping strategies on a less frequent and/or severe basis. It would be beneficial for future research studies to investigate outcomes during the shock beyond the effect of anticipatory action on food consumption scores, and to conduct long run analyses.
- The analysis does not factor in data on the El Nino post-shock responses subsequently implemented in these countries, in terms of the outcomes of the responses or the cost of the responses, which would be useful to further compare the trajectories of the two scenarios.
- The analysis focuses the (additional) cost of mistargeting for anticipatory action on inclusion errors. Because the number of people who received anticipatory action in each country is a small fraction of those who experienced drought, we assume that such costs are likely negligible. We similarly did not use differences in the proportion of households that have adequate FCS and do not use any coping strategies to estimate costs to exclusion errors. If resources for anticipatory action double or triple, it would be worthwhile conducting future studies to quantify the risk of exclusion errors in both anticipatory and post-shock assistance.
- The interventions were not randomized, so there could be bias in estimated differences between treatment and control groups, despite efforts to minimize bias. So long as resources are substantially constrained as in the previous bullet, it is worthwhile piloting a randomized rollout of anticipatory action with an impact evaluation to rigorously validate findings (both here and in reports on each country).
- We estimated the correlation between consumption expenditures per adult equivalent and FCS scores using LSMS-ISA data sets from elsewhere in Africa at different times, and assumed a completely linear relationship. We used LSMS-ISA surveys with already available consumption aggregates. To further study this relationship, future studies could relax the linearity assumption, add data from other nationally representative surveys from other countries, and add further control variables (beyond fixed effects) to regressions to further refine these estimates.
- A further refinement that could be made would be to understand whether that relationship (between consumption expenditures and FCS) differed by household demographics.
- We use a Cobb-Douglas production with two inputs (labor and assets) with equal weight in the production function to estimate the percentage income loss due to lower livestock holdings. Further research could improve upon this estimation to refine the percent loss of income to lower asset holdings.
- For asset recovery, we assume that income recovers linearly over the course of 5 years to recover to average. This assumption is based on previous studies conducted in low- and middle-income countries; the trend may be different in the countries of this study for the 2023-24 droughts. This type of study has also fallen out of favor in the literature, and could easily be replicated or improved upon using recently collected data sets.

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