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Coping with Drought: Assessing the Impacts of Livestock Insurance in Kenya

by Michael R. Carter and Sarah A. Janzen

Uninsured risk challenges the more than 3 million pastoralist households who live in northern Kenya's arid and semi arid lands. Whenever drought hits this region, as it did in 2011, households dependent on livestock must cope with large livestock losses (families lost about a third of their animals in the recent drought). When households anticipate droughts such as this, they may tend to shy away from higher return activities in order to pursue safer strategies, keeping themselves poorer on average than they need to be. During and after a drought, cash-strapped households sell off remaining livestock, driving down prices, making it that much harder to cope with the disaster, and again reinforcing the poverty impacts of uninsured risk.

In January 2010 the index-based livestock insurance (IBLI) pilot project was launched in Marsabit District of northern Kenya as an effort to help pastoralists manage drought risk, and its pernicious *ex ante* and *ex post* effects. The IBLI index insurance contract uses satellite-based measures of vegetative cover to predict average livestock mortality experienced by local communities (see Chantarat *et al.*, 2012 for details). Households receive a payout if the predicted average livestock mortality rate reaches 15%. In October-November 2011 the first IBLI payouts were made to households who had purchased insurance earlier in the year. Households in our study received an average payout of about 10,000 Kenyan Shillings (or roughly \$150).

As microinsurance products similar to IBLI become increasingly popular in developing economies, an empirical evaluation of the ability of such products to help individuals cope with risk is in high demand. The IBLI pilot was implemented in connection with a rigorous impact evaluation. This long-term research design will allow researchers to explore whether the beneficial effects of insurance (on both ex ante and ex post coping strategies) are large enough to warrant increased development of similar products. While we await those long-term findings, this Brief reports results based on the impact of insurance on households' anticipated changes in their coping behavior after receipt of their October 2011 insurance payouts. By comparing these anticipated coping changes with those of their uninsured peers, we are able to arrive at a preliminary appraisal of the impact of drought insurance on household well-being.

The IBLI Impact

At the time of the October-November IBLI payout, a random sample of 924 households from

Table 1: Impact of IBLI on coping

	Insured		Unins	sured	Impact
	Qtr 3	Qtr 4	Qtr 3	Qtr 4	DD ^e
Reduce the number of meals eaten each day	60	35	75	71	-22***
Rely more on food aid	88	50	91	92	-38***
Rely on assistance from others	39	22	40	41	-18***
Pull children otherwise in school, out of school	9.7	8.0	10	8.9	-0.4
Sell livestock	39	18	28	32	-25***
Increase non-livestock activities like petty trade	26	25	23	28	-6.2
Send family members to look for work elsewhere	3.5	4.9	5.7	8.3	-1.2
Did not do anything different	24	8.8	20	16	-13***

Notes: Columns 2-5 indicate the percentage of each population, insured (column 2-3) or uninsured (column 4-5), answering "yes" to use of a particular coping strategy. Columns 2 and 4 reflect true behavior, whereas Columns 3 and 5 reflect expected behavior in the near future. Column 6 is calculated following Equation (1). While standard errors for the ex ante difference in difference estimates (Column 6) are not reported here, *** indicates the estimates are significant at the 1% significance level.

across Marsabit participated in the 3rd round of a panel survey. Every household was asked how they managed to cope with drought in the prior 3 months, and how they anticipated coping in the upcoming three months. Insured households were asked this question after being told exactly how much they would receive as an insurance payment.

Table 1 shows the questions posed to both insured and uninsured households. As can be seen, substantial majorities of both insured and uninsured households coped in the third quarter by both reducing the number of meals eaten and relying on food aid. Roughly a third in each group sold livestock from their already damaged herds.

These responses allow us to answer several questions. First, have uninsured households been coping differently from insured households prior to receipt of payout? Second, does an insurance payout enable households to cope differently, perhaps in less costly ways?

A bit of notation will help sharply frame our answers to these questions. Let p_3 denote the proportion of households saying that they used the particular strategy in the third quarter of 2011, and p_4 be the proportion anticipating using that strategy in the fourth quarter. A superscript *I* indicates insured households, while a *U* superscript indicates data from non-insured households. Thus, p_3^I represents the proportion of the insured population who engaged in a particular coping strategy during the 3rd quarter of 2011, whereas p_4^I represents the proportion of insured households anticipating using a strategy soon, knowing that they were about to receive an IBLI payout. Similarly, p_3^U represents actual behavior in the 3rd quarter by uninsured households, while p_4^U represents uninsured households' anticipated coping behavior in the 4th quarter.

To see if insured households are different from uninsured households, we can compare the percentage of the treated (insured) population who answered "yes" to using a given coping strategy in the 3rd quarter of 2011 to the control (uninsured) population ($p_3^I - p_3^U$). A difference between the two can mean two things: either households are coping differently in anticipation of a payout, or insured households are intrinsically different from uninsured households. We find that there are some statistically significant differences. In particular, insured households are less likely to have reduced the number of meals eaten each day and more likely to have sold livestock in the 3rd quarter of 2011. These differences hint that insured households may be wealthier.

To answer the second question about the impact of IBLI payments on coping, we can now compare insured and uninsured households after controlling for their pre-existing differences by using a standard 'difference-in-difference' impact estimator:

$$DD = (p_4^I - p_3^I) - (p_4^U - p_3^U)$$
(1)

The estimator *DD* controls for biases in second period comparisons between treatment and control groups that could be the result of permanent differences between those groups, as well as biases from comparisons over time in the treatment group that could be the result of trends.¹

These difference-in-difference estimates are reported in Table 1 for each coping strategy. The results reveal that insured households anticipate radically reducing their dependence on costly coping strategies relative to uninsured households. According to the DD estimates, IBLI results in a 22-percentage point drop in the number of households reducing the number of meals eaten as a coping strategy (an overall reduction of about one third). Similarly, there is almost a 50% reduction in the number of households who anticipated selling further livestock to cope with the wake of the 2011 drought. This latter change is especially important from an economic perspective as it is the massive sell-off of livestock that makes it that much more difficult for insured and uninsured households to cope with a drought's aftermath. Insured households also anticipate relying less on food aid, and relying less on assistance from others.

While these difference-in-difference estimates control for pre-existing and permanent differences between the insured and the uninsured households, they should be treated with caution as they do not control for differences that change over time. The reported results do stand up to at least partially controlling for these differences using other econometric control function techniques. Given the notable size of the impacts presented, we remain confident that the impacts are real reflections of program impacts.

Spending the IBLI Payout

Another way to assess coping abilities is to consider how insured households expected to use the IBLI payout they were about to receive. For each household, we calculated an expected IBLI payout based on livestock units they had insured. Every insured household was then asked how they expect to spend the estimated payout.

Figure 1 shows the results of the answers to these questions. The vertical axis shows the fraction of a household's payout it anticipated spending on different goods (food, livestock purchases, etc.). The horizontal axis shows the total amount of the payment to be received in Kenyan Shillings. As we would expect, the percentage spent on different categories varies with the size of payout. Notably, a larger share is spent on food when the payout is small whereas a larger share is spent on purchasing livestock or other savings when the expected payout is larger. Combined with the coping strategy results, this



Figure 1: IBLI Payout Allocation

¹ The long-term research strategy is built around a spatial rollout strategy that randomizes the availability of IBLI. Anticipated coping strategy data are not available for households in control areas.



Authors

Michael R. Carter

University of California, Davis, USA

Sarah A. Janzen

University of California, Davis, USA

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Comments encouraged: Department of Agricultural and Resource Economics, University of California Davis Davis, CA 95616 USA ifour@ucdavis.edu http://i4.ucdavis.edu finding suggests that IBLI shifts households from being net sellers to net buyers of livestock, an outcome likely to have positive spillover impacts on uninsured households, or those who suffered especially large losses. It's also interesting that, regardless of the size of payout, households on average expect to spend 10% of the IBLI payout on purchasing livestock insurance again.

Conclusions

Our ex ante empirical analysis suggests that the expectation of insured households' own abilities to cope with drought are distinctly different from uninsured households' expectations. Insured households have reason to expect a payout in the near future. These households intend to use the bulk of their anticipated payouts to purchase food and livestock. By using part of the payout to purchase food, most insured households expect to maintain their current consumption of food, rather than reduce meals like their uninsured counterpart. Similarly, fewer insured households intend to rely on food aid or assistance from others. While insured households were more likely to sell livestock in the past few months, upon receipt of a payout far fewer insured households anticipate using livestock sales as a way of coping in the next 3 months, whereas an increasing number

of uninsured households expect to resort to livestock sales in the upcoming months.

If these expectations closely follow true behavior, then the highly anticipated positive welfare impacts of IBLI and other microinsurance products are likely to be observed in the near future. While we wait to see if behavior truly changes, these results seem a strong indicator that insurance can be a helpful strategy for households coping with risk in developing countries.

Further reading:

- Barrett, Christopher B., Michael R. Carter, Sommarat Chantarat, John McPeak and Andrew Mude, 2008, "Altering Poverty Dynamics with Index Insurance: Northern Kenya's HSNP+." BASIS Brief 2008-08. Madison: University of Wisconsin. <www.basis.wisc.edu/live/ama brief08-08.pdf>
- Carter Michael R., Christopher B. Barrett, Steve Boucher, Sommarat Chantarat, Francisco Galarza, John McPeak, Andrew Mude and Carolina Trivelli, 2008, "Insuring the Never before Insured: Explaining Index Insurance through Financial Education Games." BASIS Brief 2008-07. Madison: University of Wisconsin. <www.basis.wisc.edu/live/ama brief08-07.pdf>
- Chantarat, Sommarat, Andrew G. Mude, Christopher B. Barrett, and Michael R. Carter, 2012, "Designing Index Based Livestock Insurance for Managing Asset Risk in Northern Kenya." *The Journal of Risk and Insurance*