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Somalia Resilience Recurrent Monitoring Survey (RMS) Report

February 2019

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DISCLAIMER

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RECOMMENDED CITATION

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Acronyms

AFDM	African Flood and Drought Monitoring system
AMISOM	African Union Mission to Somalia
CBO	Community-based organization
CFW	Cash for work
C4R	Center for Resilience (USAID)
EREGS	Enhancing Resilience and Economic Growth in Somalia program
FAO	Food and Agriculture Organization
FEWSNet	Famine Early Warning System Network
FFP	(USAID Office of) Food for Peace
FFW	Food for Work
FGS	Federal Government of Somalia
FSN	Formal safety net
FSNAU	Food Security and Nutrition Analysis Unit – Somalia (FAO)
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
HH	Household
HHS	Household Hunger Scale
IDP	Internally displaced person
IPC	Integrated Food Security Phase Classification
ISN	Informal safety net
LR	Likelihood ratio
NGO	Non-governmental organization
OFDA	(USAID) Office of Foreign Disaster Assistance
PROGRESS	Program to Enhance Resilience in Somalia
RE	Random effects
REAL	Resilience and Economic Activity Project in Luuq
RMS	Recurrent monitoring survey
SILC	Savings and internal lending community
STORRE	Somalia Towards Reaching Resilience
TLU	Tropical livestock unit
USAID	United States Agency for International Development
VSLA	Village savings and loan association

Executive Summary

This report presents findings from a two-year study of resilience dynamics in Somalia. The study is a follow-up to the baseline evaluation of the Enhancing Resilience and Economic Growth in Somalia program (EREGS).[1] The baseline study was funded by the USAID Office of Foreign Disaster Assistance, the USAID Office of Food for Peace, and the USAID East Africa Regional Mission. Funding for the current study comes from the USAID Center for Resilience.

The study area includes communities served by three projects under the EREGS program:

- Somalia Towards Reaching Resilience (STORRE), implemented by CARE;
- Program to Enhance Resilience in Somalia (PROGRESS), implemented by Catholic Relief Services; and
- Resilience and Economic Activity project in Luuq (REAL), implemented by World Vision.

Survey and Sample

For this study, three rounds of recurrent monitoring survey (RMS) data were collected from households and communities via telephone. The RMS sample comprises the subset of the baseline households with working telephone numbers and all of the communities included in the baseline. The RMS data were combined with data collected in the 2016 baseline assessment.

The telephone survey method was chosen for the RMS because (1) it is much less intrusive than in-person surveys, thus more appropriate for food security crisis situations; (2) Somalia's telecommunications infrastructure is highly developed; and (3) telephone surveys are significantly less expensive than in-person surveys. Further, researchers hoped that using telephone methodologies would allow households that were migrating due to drought to remain in the study over time. Finally, this methodology was seen as an opportunity to test telephone surveys for future data collection.

Leveraging the mobile data collection methodology resulted in a convenience sample, rather than a simple random sample. Accordingly, findings from this study are not generalizable to the larger baseline survey population or to the general population from which the baseline was drawn. They describe only the respondents to this survey. Despite this, the current research analyzes important trends and yields findings that ought to be further explored in future work.

Research Questions

The research questions guiding this evaluation are:

1. How does the degree of exposure to specific shocks affect households' ability to recover from those shocks?

[1] Langworthy, M., M. Vallet, S. Martin, T. Bower and T. Aziz. 2016. *Baseline Study of the Enhancing Resilience and Economic Growth in Somalia Program*. Prepared by TANGO International for Save the Children Federation, December. http://www.fsnnetwork.org/sites/default/files/usaid_somalia_resilience_baseline_report_2016.pdf

2. How do levels of resilience capacities before the onset of the shock improve households' ability to recover?
3. How does pre-shock household resilience capacity level influence its use of different types of coping strategies during and after a shock?
4. Which coping strategies are associated with households successful in recovering from shocks?
5. What are the downstream effects of shocks on households and how do these evolve over the survey period?
6. How do community resilience capacities support household resilience capacities and outcomes?
7. How do household resilience capacities support community resilience capacities?
8. How does humanitarian assistance support resilience capacity in promoting recovery after shock?
9. Are recovery profiles for households receiving humanitarian assistance different for households with differing levels of pre-shock resilience capacities?
10. How do households respond to shocks, and how do these response strategies change over time?
    a. In particular, what are the relationships between resilience capacity, asset destocking as a shock response strategy, and recovery?
    b. Do the absorptive, adaptive, and transformative resilience capacities support constructive response strategies that support households' ability to maintain or improve their well-being in the face of shocks and stresses?
11. How does resilience capacity, both household and community, change over time?
12. How does household food security change over the shock period? Depending on households' capacities and responses, are some types of households better able to maintain their food security in the face of the shock?
13. What are the specific components of the resilience capacities that help protect households from shocks?
14. Are different capacities more important for different types of shock?
15. How do revised measures of social capital, compared to the original measures, more accurately reflect the relationships between social capital in the Somali context, household resilience capacity, and outcomes? (Results from previous studies indicated that survey questions about social capital were not accurately measuring it.)
16. How do households that receive remittances respond differently to shocks – with respect to impacts, coping strategies, and recovery?
17. Is private investment, common in Somalia for public services such as schools and health services - including community-level investment from the diaspora - an effective substitute, in the context of community resilience and the mitigation of shock exposure on outcomes, for an underdeveloped public sector?

Findings

Shock Exposure

The research documents a complex and shifting array of shocks and household responses. The timing of surveys, from the May 2016 baseline to the third round of the RMS in December 2017, covers the drought from its beginning to near its end. However, as of R3 (Round 3), the period "after the shock" had not yet started. Drought was waning, but some downstream shocks – un/under-employment, crop disease, food and input price shocks, and chronic disease – were at peak levels. In addition, the share of households reporting exposure to flooding had started to rise.

Outcome Measures

This study defines resilient households as those that improve or maintain their well-being even in the face of shocks. Well-being is measured by three indicators. Two are food security measures: moderate to severe hunger (Household Hunger Scale) and the Household Food Insecurity Access Index (HFIAS). For these measures, lower scores indicate better outcomes. The third measure is households' self-reported recovery from drought and/or late or variable rains. For this measure, a higher score indicates improvement.

In R1 and R2, nearly 6 out of 10 households reported moderate to severe hunger. This is an increase from 4 out of 10 at baseline (May 2016). In January 2017, five months before the first round of the RMS, FSNAU and FEWS NET began to issue famine warnings. Food (in)security outcomes were at their worst (highest levels) in R1 and R2, at the peak of the drought. The data show that in R3, households were beginning to bounce back. Household hunger and HFIAS were lower in R3 than in R2, but were still higher than baseline. The data show that households were resilient in terms of recovery. The percentage of households reporting recovery was highest during R3. These findings point to a need to monitor longer – and after the shock period – to better understand recovery, as most households had not recovered by the end of the current study.

Resilience Capacities

This study provides key insights about how absorptive, adaptive, and transformative resilience capacities affected household hunger, HFIAS, and recovery. An expanded survey questionnaire provided data to re-estimate resilience capacity indices at each round. The data show that resilience capacity indices were higher in RMS rounds than at the baseline, and remained higher than the baseline in all three rounds. The analysis shows that the increases were due to programming similar to EREGS activities, including increasing information exposure, improving informal safety nets (savings groups, women's, civic and youth groups, in particular), strengthening disaster risk reduction, and bolstering natural resources management.

Results from Multivariate Estimation Equations

The surveys tracked individual households over time, creating a panel dataset, which can identify causal relationships. The analysis showed that:

Higher baseline levels of absorptive capacity were associated with lower probability of moderate to severe hunger in R2, lower (improved) HFIAS scores in R1, and higher probability of recovery in R1 and R2. Higher baseline levels of adaptive capacity were associated with lower probability of moderate to severe hunger in R1 and R2, and lower HFIAS in R1 and R3. Higher baseline levels of transformative capacity were associated with improved HFIAS in R3.

The analysis found that higher levels of absorptive and adaptive capacities during the RMS rounds led to the improvements in well-being indicators seen in R3. However, there is no evidence to support a causal relationship between baseline levels of the three capacities and recovery.

The research also includes analyses of positive-deviant-households. These are households that fared notably better during the drought. This study identifies three types of positive-deviant-households: those that were able to achieve and maintain no hunger, achieve food secure status (according to the HFIAS), or recover from drought. The findings show that factors that made these households different from comparable households in the sample included expanded humanitarian assistance during the drought, most notably food aid, as well as household access to drinking water and irrigation.

Programmatic Implications

The complex and shifting array of shocks indicates that programming should focus on more than drought mitigation, including protecting livestock and human health, as a way to lessen shock impacts. Programs need to factor in the complex risks, especially the downstream effects of drought that continue long after the drought is over.

As the drought was waning, reports of conflict and trade disruptions increased. At the same time, social capital measures were at their lowest. These findings indicate that a programming should try to strengthen and leverage social bonds, and avoid creating competition.

The study found that informal safety nets improved well-being outcomes. More detailed analysis of informal safety nets showed that village savings and loan associations (VSLAs) were the most important element of informal safety nets for improving outcomes. Given that few households reported cash savings, and savings was quickly depleted during the drought, programming should consider expanding access to cash before and at the start of a drought, through VSLAs or other mechanisms. Increasing households' access to cash could help them to avoid engaging in negative coping strategies.

Access to information was shown to increase resilience and improve well-being outcomes. Yet the share of households reporting that they received information is still very low. Programming should expand both the types of information provided and the mechanisms through which information is disseminated.

The research found that food/cash assistance and development programming helped to improve well-being outcomes. This suggests that programming should continue to layer humanitarian assistance and development programming in shock-prone contexts.

1. Introduction

This report presents findings from a two-year study of resilience dynamics in Somalia. The study is a follow-up to the baseline evaluation of the Enhancing Resilience and Economic Growth in Somalia (EREGS) program.[2] The baseline study was funded by the USAID Office of Foreign Disaster Assistance (OFDA), the USAID Office of Food for Peace (FFP), and the USAID East Africa Regional Mission. Funding for the current study comes from the USAID Center for Resilience.

The study documents household shock exposure, coping strategies and resilience, and the role of humanitarian and USAID development programming during a protracted drought. The surveys included in the study cover the period from the beginning to near the end of the drought (from baseline in May 2016 through the third RMS in December 2017); data collection spanned a period when programming was active as well as after programming had ended. Timing the surveys with respect to the status of programming and the onset of shocks allowed a rare view into how USAID development programming assisted households through almost two years of severe drought. It provided real-time information on how some households were able to improve food security and recover from shocks despite the drought and the extreme livestock, crop, economic, employment and health shocks that accompanied it.

This study defines resilient households as those that improve or maintain their well-being even in the face of shocks.[3] Well-being is measured by three indicators. Two are food security measures: moderate to severe hunger (Household Hunger Scale) and the Household Food Insecurity Access Index. For these measures, lower scores indicate better outcomes. The third measure is households' self-reported recovery from drought and/or late or variable rains. For this measure, a higher score indicates improvement.

The study covers the following 17 research questions and sub-questions generated by USAID staff in Washington, DC and the field, as well as by EREGS and TANGO partners:[4]

1. How does the degree of exposure to specific shocks affect households' ability to recover from those shocks?
2. How do levels of resilience capacities before the onset of the shock improve households' ability to recover?
3. How does pre-shock household resilience capacity level influence its use of different types of coping strategies during and after a shock?
4. Which coping strategies are associated with households successful in recovering from shocks?

[2] Langworthy, M., M. Vallet, S. Martin, T. Bower and T. Aziz. 2016. *Baseline Study of the Enhancing Resilience and Economic Growth in Somalia Program*. Prepared by TANGO International for Save the Children Federation, December.
[3] Smith, L., T. Frankenberger and S. Nelson, 2018. Feed the Future Ethiopia Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) Project Impact Evaluation: Report of Recurrent Monitoring Survey 2 (2015/16). Produced by TANGO International and Save the Children as part of the Resilience Evaluation, Analysis and Learning (REAL) Associate Award https://www.fsnnetwork.org/prime-project-impact-evaluation-report-recurrent-monitoring-survey-2-rms-2
[4] USAID. 2017. Enhancing Resilience and Economic Growth in Somalia: Recurrent Monitoring System Protocol. Unpublished report.

5. What are the downstream effects of shocks on households and how do these evolve over the survey period?
6. How do community resilience capacities support household resilience capacities and outcomes?
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17. Is private investment, common in Somalia for public services such as schools and health services – including community-level investment from the diaspora – an effective substitute, in the context of community resilience and the mitigation of shock exposure on outcomes, for an underdeveloped public sector?

The purposes of this report are to present descriptive measures with summary statistics, as well as results of multivariate analyses looking at the interrelationships between shock exposure, humanitarian assistance, household resilience capacities, and well-being outcomes among households in EREGS program areas. Note that this study does not allow for clear attribution of benefits to EREGS projects: this was not a targeted beneficiary survey and many agencies were providing similar programming at the same time.

1.1. Study Area

The study area includes communities served by three projects under the EREGS program:

- Somalia Towards Reaching Resilience (STORRE), implemented by CARE;
- Program to Enhance Resilience in Somalia (PROGRESS), implemented by Catholic Relief Services; and
- Resilience and Economic Activity project in Luuq (REAL), implemented by World Vision.

Specifically, the study area covers urban, peri-urban, and rural communities in the Gedo, Bay, and Lower Shebelle regions of southern Somalia and the Sanaag region in Somaliland.

1.2. Project Area Profiles

The three USAID/EREGS projects were funded from 2014-2017 (the third RMS round occurred after programming ended).

STORRE (CARE): The STORRE project targeted 25,440 beneficiaries in 20 rural villages in Badhan and Erigavo, two districts in the northern Sanaag region of Somaliland. Main project activities included Village Savings and Loan Associations (VSLAs), distribution of agricultural tools, and cash-for-work (CFW) activities. STORRE also developed participatory conflict management and natural resource management programs and early warning systems, and provided health, nutrition and hygiene information. The project worked with communities to dig pit latrines and shallow wells, rehabilitate irrigation canals and farmland, and produce farm products for markets.

PROGRESS (Catholic Relief Services): PROGRESS targeted 96,000 beneficiaries in 33 villages in three districts (Belet Hawa, Baidoa and Afgooye) across three regions of southern Somalia. PROGRESS worked in primarily peri-urban settings supporting Savings and Internal Lending Communities (SILCs), nutrition and hygiene trainings, participatory disaster risk assessments, peace promotion, and early warning programming. PROGRESS also distributed agricultural tools, and rehabilitated communal water sources and rangeland through CFW programming.

REAL (World Vision): This three-year project was integrated within USAID's longer-term Somalia Resilience Program (SomReP). It covered 23,600 beneficiaries in 14 rural villages, one peri-urban town, and an IDP camp in the Luuq district of southern Somalia. The REAL project established SILC groups in all of its project areas; conducted Farmer Field Schools; provided trainings in health, nutrition, hygiene, and sanitation; provided tools and seeds to women's groups for establishing kitchen gardens; and worked with communities on disaster risk reduction and natural resources management.

1.3. Description of the Project Area Context

Somalia has been mired in decades of protracted crisis and frequent and severe climate emergencies, including droughts and flooding. It has been a collapsed state since the beginning of

civil war in 1991 and the overthrow of President Siad Barre and his military regime.[5] The rise of the insurgent group Al-Shabaab limited humanitarian access in the south-central region, the area most affected by the extreme drought and famine of 2010-2012.[6] Violent conflict has continued between Al-Shabaab and African Union peacekeepers (the African Union Mission to Somalia, AMISOM). These and other factors have contributed to severely deteriorated human development and widespread displacement and emigration of hundreds of thousands of Somalis. As of January 2018, 870,000 Somali refugees were registered in nearby countries, and approximately 2.1 million people were internally displaced.[7] Further, Somalia has recently experienced a series of severe droughts, such as in 2010-2012 and the 2015-2016 El Niño phenomenon, which exacerbated already-widespread drought in Puntland and Somaliland and resulted in increased food insecurity, cash shortages, and livestock deaths.[8]

Political context: Central and southern parts of Somalia have experienced intermittent violent conflict, whereas Somaliland in the north has established a relatively stable government that functions independently of the Federal Government of Somalia (FGS).[9] The FGS, fraught with internal conflict and corruption, has not established a functioning administration or civil service and has been unable to provide public goods, especially security. The FGS, with support from AMISOM, has regained control of most cities and major towns from Al-Shabaab but needs to improve its own security forces to maintain control. A functioning legal system is lacking, and even the larger cities have only civilian courts. The FGS has established military courts, but these are accused of human rights violations.

Human development: Although data were not available for Somalia in the most recent Human Development Report (2016), Somalia has been among the lowest-ranked countries in terms of human development and gender equality in recent years.[10] Gender discrimination is widespread and girls' enrollment in school is low.[11]

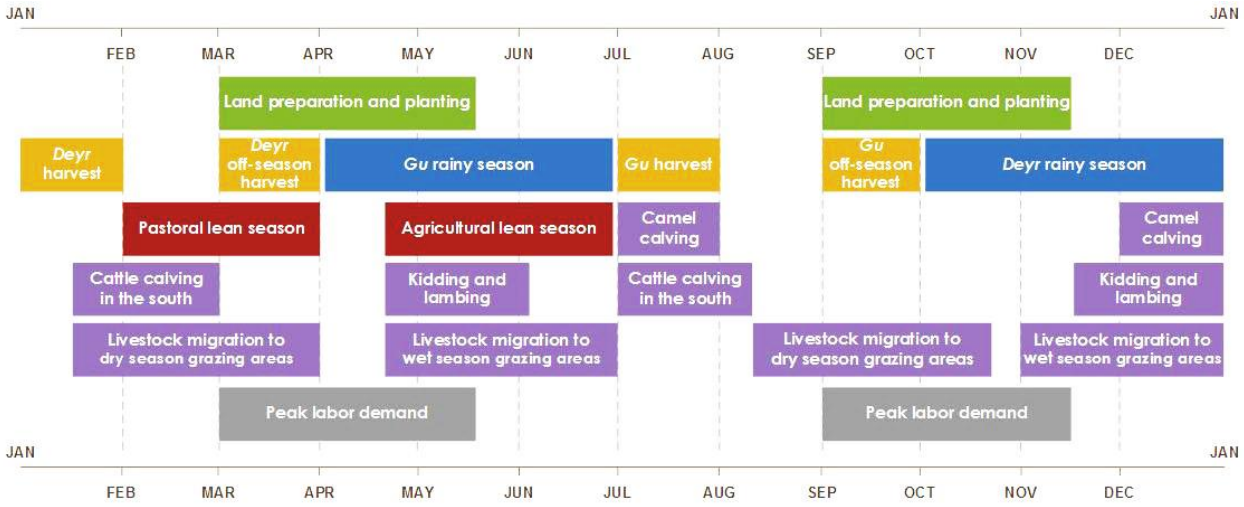
Government response: Somalia has no public welfare or formal safety net system.[12] People rely on informal safety nets through social networks, extended families, and clans. In 2013, the FGS signed a New Deal Compact with the international community to establish a framework for building Somalia's human and social capital and meeting development goals. A recent Overseas Development Institute review of the compact found that it was generally favorably perceived but unsurprisingly – given the challenging context – limited in its progress toward milestones.[13] However, the compact

[5] Collins, G.A., 2009. Connected: Developing Somalia's telecoms industry in the wake of state collapse. University of California, Davis.
[6] Bertelsmann, S. 2018. Bertelsmann Transformation Index (BTI) 2018 Country Report: Somalia.https://www.bti-project.org/en/reports/country-reports/detail/itc/som/
[7] UNHCR. 2018. Somalia. Updated January 2018. http://www.unhcr.org/en-us/somalia.html
[8] OCHA. 2016. Humanitarian Needs Overview 2017: Somalia. October.
[9] Bertelsmann S., 2018. Bertelsmann Transformation Index (BTI) 2018 Country Report: Somalia.
[10] UNDP. 2017. Human Development Report 2016. http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf
[11] Bertelsmann Stiftung. 2018. BTI 2018 Country Report: Somalia.
[12] Ibid.
[13] Manuel, M, McKechnie, A, Wilson, G, and R. das Pradhan-Blach. 2017. An Independent Review of the Somali Compact, 2014-2016. London: Overseas Development Institute, April 2017. https://www.odi.org/sites/odi.org.uk/files/resource-documents/11466.pdf.

has helped to build trust and a transparent framework for mutual accountability between the FGS and development partners.

Climate and seasonal context: Figure 1 shows the timing of rainy seasons, harvests, livestock births, and labor demand for Somalia in a typical year.[14]

Figure 1: Typical seasonal calendar



At the time of the baseline study, May 2016, households in northern rural parts of the study area were reporting that the *Gu* rains were late. This followed less rain than usual in 2015 and marked the beginning of a severe drought that extended for more than 18 months.[15]

During the 12 months between the baseline survey the start of the RMS rounds, drought conditions intensified and food security worsened. Little to no rain across the country during the 2016 *Deyr* season (October-December) meant that drought spread south from the northern regions. According to a FEWS NET report,[16] the combination of two failed rainy seasons generated a series of additional shocks. Rivers dried up and nearly all crops failed. Without a harvest, agricultural employment disappeared and food prices rose at a time when households were forced to switch from producing to purchasing food. Lack of pasture and water for livestock caused low livestock reproduction and livestock disease and death. Households that sold their livestock received lower prices than usual due to the poor quality and health of animals and an oversupply of animals.[17]

[14] FEWS NET. 2017. Somalia food security outlook. February to September 2017. October 2.
[15] FEWS NET. 2017. Somalia food security outlook update. August. http://fews.net/east-africa/somalia/food-security-outlook-update/august-2017.
[16] FEWS NET. 2017. Somalia food security outlook. October 2016 to May 2017. https://fews.net/sites/default/files/documents/reports/Somalia_OL_10_2016_2.pdf
[17] FSNAU. 2017 Nearly 3 million people in Somalia face crisis and emergency acute food insecurity, February 2, 2017. http://www.fsnau.org/in-focus/fsnau-fewsnet-technical-release-february-2017

The period from January through March of 2017 was dry, as is typical for that time of year. January 2017 marked the beginning of a large -scale cholera outbreak[18] due to a lack of clean water that continued beyond the end of the drought, when flooding contaminated water sources and restricted access to health care. A measles outbreak started in early 2017 and continued through most of the drought. Measles levels dropped early in 2018 when UNICEF completed a massive vaccination program.[19]

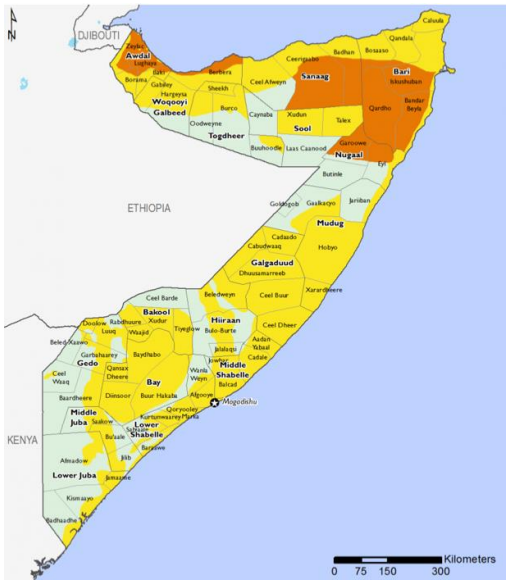
In May 2017, five months after FSNAU and FEWS NET had issued a famine warning, the first round of the RMS began, coinciding with the *Gu* season. Rainfall was late and variable but provided short-term relief to some areas in the south.[20] Serious drought continued into the next year. By May 2017, after another below-average rainy season, much of the country reached *crisis* (IPC Phase 3) and *emergency* (IPC Phase 4) levels, experiencing acute food insecurity and a severe outbreak of acute watery diarrhea and cholera.[21] *Gu* season rainfall was 30 to 60 percent below average across most of the country. The combined reliance on humanitarian assistance, severe food consumption gaps, high acute malnutrition, and disease burden contributed to an elevated risk of entering a *famine* phase (IPC Phase 5). Rains returned in November 2017 and widespread flooding ensued.

The maps in Figure 2 show the progression of food insecurity from the baseline through R3. Figure 2a shows that parts of the Sanaag region (STORRE program area) had already reached *crisis* phase (IPC phase 3) by May 2016. Livestock began to die and few households had animals in good enough condition to sell.

[18] WHO. 2017. Weekly update: Cholera in Somalia. February. http://www.emro.who.int/pandemic-epidemic-diseases/cholera/weekly-update-cholera-in-somalia-15-june-2017.html
[19] WHO. 2018. Huge measles campaign in drought-hit Somali http://www.emro.who.int/pdf/som/somalia-news/huge-measles-campaign-in-drought-hit-somalia-aims-to-protect-children-and-save-lives.pdf?ua=1
[20] FSNAU and FEWS NET. 2018. Post Deyr Technical Release. January 29, 2018, Mogadishu/Washington. http://www.fews.net/east-africa/somalia/key-message-update/january-2018
[21] Ibid.

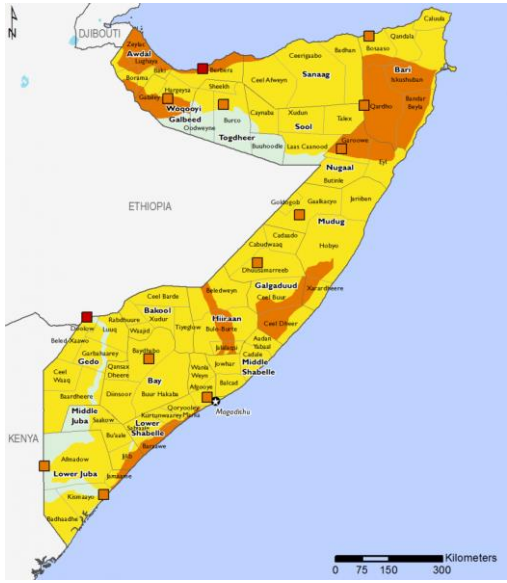
Figure 2: IPC situation in Somalia from baseline through RMS rounds

a. May 2016



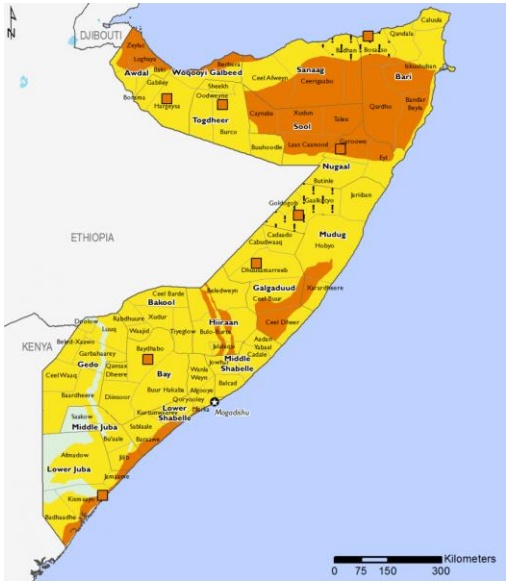
FEWS NET. 2016. Key Message Update: Somalia. May 2016. http://fews.net/east-africa/somalia/key-message-update/may-2016

b. September 2016



FEWS NET. 2016. Key Message Update: Somalia. September 2016. http://fews.net/east-africa/somalia/key-message-update/may-2016

c. December 2016



FSNAU. 2016. Quarterly brief. FSNAU Quarterly Brief - Focus on Post-Deyr 2016 season early warning. http://fews.net/east-africa/somalia/food-security-outlook-update/december-2016

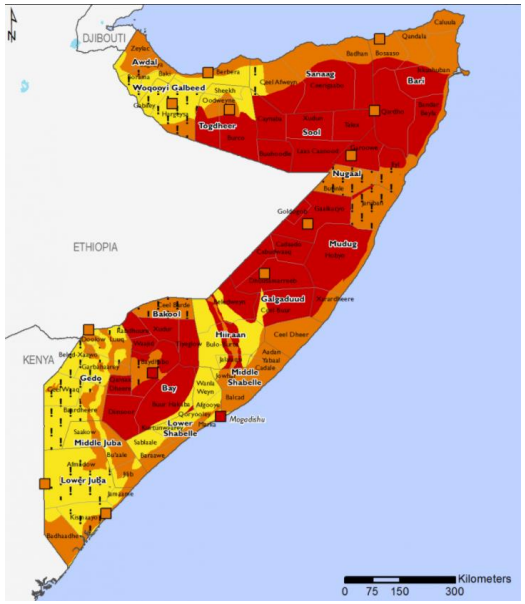
IPC 2.0 Acute Food Insecurity Phase

1: Minimal | 2: Stressed | 3: Crisis | 4: Emergency | 5: Famine

Concentration of displaced people

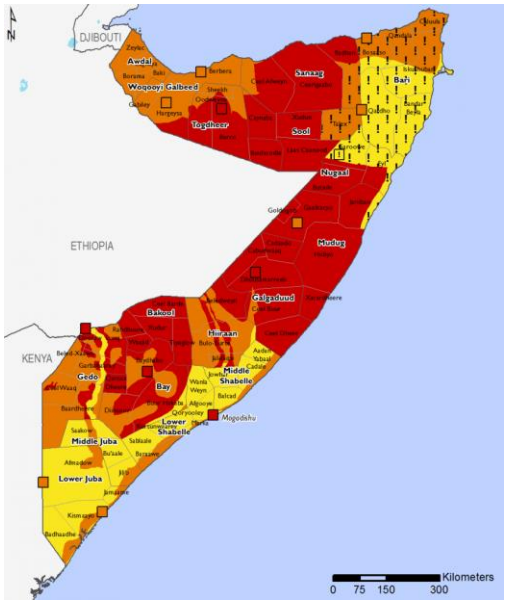
! *Would likely be at least one phase worse without humanitarian assistance*

d. May 2017



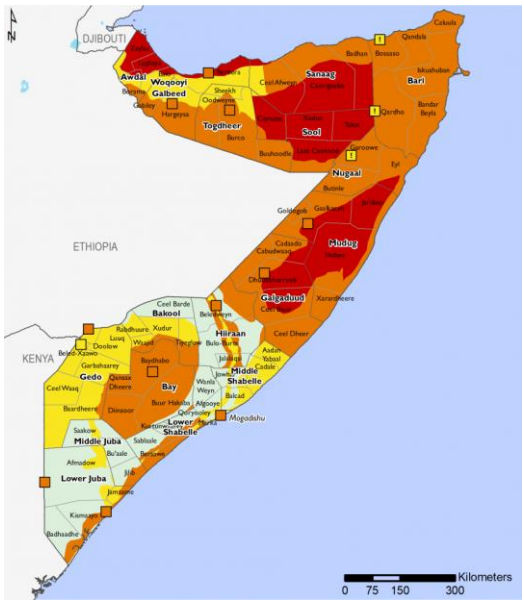
FEWS NET. 2017. Key Message Update: Somalia. May 2017. http://www.fews.net/east-africa/somalia/key-message-update/may-2017

e. September 2017



FEWS NET. 2017. Key Message Update: Somalia. September 2017. http://fews.net/east-africa/somalia/key-message-update/september-2017

f. December 2017



FEWS NET. 2018. Key Message Update: Somalia. March 2018. http://www.fews.net/east-africa/somalia/key-message-update/march-2018

IPC 2.0 Acute Food Insecurity Phase

1: Minimal | 2: Stressed | 3: Crisis | 4: Emergency | 5: Famine

Concentration of displaced people

! *Would likely be at least one phase worse without humanitarian assistance*

2. Methodology

2.1. Survey Design

This research uses household and community data from two different surveys. The first was a baseline, in-person, population-based survey in which households were selected from within program areas through a random walk. The baseline also had a community survey component. The second is a set of three surveys within a recurrent monitoring system (RMS).[22] These were conducted by telephone. The sample comprised a subset of the baseline respondents and all baseline communities. Accordingly, households in the RMS sample were a convenience sample, selected from baseline households that had working cell phone numbers. The telephone survey method was chosen because it is less intrusive than in-person surveys, thus more appropriate for food security crisis situations; telecommunication infrastructure is well developed in Somalia; and telephone surveys are significantly less expensive than in-person surveys. Further, researchers hoped that using telephone methodologies would allow households that were migrating due to drought to remain in the study over time. Finally, this methodology was seen as an opportunity to test telephone surveys as an option for data future collection.

RMS surveys are designed to capture real-time household and community responses to drought and other shocks. RMS instruments are usually shorter than those used in typical household surveys. They collect data on shock exposure, coping strategies, recovery from shocks, food security, access to, and use of development and emergency programming, and social capital. The RMS instrument for this research was longer than most in order to collect data on asset holdings, aspirations, livelihoods, access to and use of financial services, membership in community groups, collective action, remittances, and migration, and to collect sufficient data to compute resilience capacity indices for each survey round. The expanded questionnaire provided one of the first opportunities for USAID and TANGO to test how and if resilience capacities change during a shock. It was also an opportunity to reach households that had migrated.

Table 1 presents information about the sample. The total baseline sample size was 2009. Of the baseline households, 976 had working cell phone numbers and 1033 either did not have working cell phone numbers or did not have phones. The 976 households became the sample for this study. Their baseline data were retained and they participated in R1. Of the 976 respondents, 602 provided data for R2, and 568 were surveyed for R3. Table 1 also shows participation over survey rounds in order to illustrate the panel aspect of the dataset. For example, one set of 390 households participated in the baseline and all three survey rounds; another (distinct) set of 212 households participated in the baseline and two subsequent survey rounds, but not the last round.

[22] https://www.fsnnetwork.org/prime-project-impact-evaluation-report-recurrent-monitoring-survey-2-rms-2

Table 1: Sample size, by survey round

	Baseline	R1	R2	R3
Total HH	2009	976	602	568
Breakdown by survey participation:				
	Baseline	R1	R2	R3
BL only	1033	--	--	--
BL + R1, R2, R3	390	390	390	390
BL + R1, R2	212	212	212	--
BL + R1, R3	178	178	--	178
BL + R1	196	196	--	--

Of the 976 households in R1, individual respondents within households were not the same as the baseline survey in the case of 162 households (16.6 percent) because the telephone number collected from baseline respondents belonged to another household member. Of the 162 households where respondents differed from the baseline, 109 (67.3 percent) were spouses of the baseline respondents. Starting with R2, checks were programmed into survey tools to ensure that respondents were the same across all subsequent RMS rounds.

Data were uploaded nightly and quality-reviewed by TANGO staff. TANGO staff provided feedback within 24-48 hours for every upload and found that the use of telephone surveys did not result in incomplete surveys. The quality reviews checked for survey completion and aimed to minimize "Don't know" and "Refused" responses. The reviews also focused on consistency across responses, time to administer each module, and reducing skipped questions where "yes" responses required additional information.

Forcier Consulting, with technical support from TANGO, conducted the baseline and all RMS surveys. Data collection periods were as follows:

Baseline:	April 2 - May 19, 2016
R1:	May 17 - 28, 2017
R2:	July 23 - August 9, 2017
R3:	November 6 - December 4, 2017

Table 2 shows the distribution of households over the three USAID program areas and by level of urbanization. The distribution across program areas was stable despite attrition in R2 and R3. None of the differences between rounds was statistically significant.

Table 2: Distribution of households by program area and urbanization, by survey round

	Baseline	R1	R2	R3
Program area				
STORRE	31.8	31.8	29.7	30.3
PROGRESS	26.3	26.3	24.9	23.8
REAL	41.9	41.9	45.3	46.0
Urbanization				
Urban	44.2	44.2	46.2	48.9
Peri-urban	16.3	16.3	17.4	17.1
Rural	39.5	39.5	36.4	34.0
n	*976*	*976*	*602*	*568*

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Sources: USAID. 2016, 2017. Somalia household surveys.

The analysis uses panel data in which each household has between two and four records – the first record from the baseline survey, and one or more additional record(s) from successive RMS rounds. Variables are of the form X_{it} where i = household (HH) identification number and t = survey rounds (time periods).

Panel data allow for measurement of change over time at the household level: researchers can test hypotheses about the effects of conditions and interventions in one time period on outcomes later on. Panel datasets are in contrast to cross-sectional datasets, where data are collected at one point in time. As panel data are collected over a series of time periods, the sample size increases from the total of all households in the initial round to the total of all households over all rounds. In this dataset, the sample size is 3122. Larger samples improve the ability to detect small changes in outcomes; they also minimize problems like multi-collinearity.[23]

Table 3 provides an example of data from four households. Household 1 and Household 4 each have four data records: both households were surveyed at baseline and in all three RMS rounds. Household 2 has two records (baseline and R1), and Household 3 has three records (baseline, R1 and R3).

[23] Multi-collinearity refers to explanatory variables that are closely related to each other, making it difficult to detect differences between them. Examples in this study are bonding and bridging social capital.

Table 3: Example from Somalia panel dataset

HH ID	Round	Food security category
1	Baseline	Food secure or mildly insecure
1	R1	Food secure or mildly insecure
1	R2	Food secure or mildly insecure
1	R3	Moderate to severe food insecure
2	Baseline	Food secure or mildly insecure
2	R1	Moderate to severe food insecure
3	Baseline	Food secure or mildly insecure
3	R1	Food secure or mildly insecure
3	R3	Food secure or mildly insecure
4	Baseline	Food secure or mildly insecure
4	R1	Moderate to severe food insecure
4	R2	Moderate to severe food insecure
4	R3	Moderate to severe food insecure

2.2. Computing Resilience Capacity Indices

Computation of the three resilience capacity indices – absorptive, adaptive, and transformative – follows USAID/TANGO methods. Each index is made up of a combination of indicators computed from household and community survey data. USAID/TANGO resilience analysis methods typically use exploratory factor analysis to combine data. Exploratory factor analysis is a multivariate statistical method that uses the relationship among observed variables to identify one or more underlying factors.[24]

USAID/TANGO methods have been expanded based on Fry, et al. (2014).[25] The change allows comparison of baseline resilience capacity index scores to subsequent rounds. Indices computed using this method can be tracked over time, which is important because they are USAID indicators. The method assumes that factor loadings are stable over time.[26] Computing indices across panel rounds is a two-step process: the first step uses factor analysis to compute a baseline index, retaining factor scores for use with later rounds. The factor scores are weights; variables with higher scores make up higher proportions of the index. The second step uses baseline means and standard deviations to standardize variables across RMS rounds. Then each standardized variable is multiplied by its baseline factor score and summed to create the index. All indices are then normalized (scaled 0-100) using minimum and maximum values from the baseline.

2.3. Multivariate Regression Analyses

This study applied longitudinal multivariate regression analyses using Stata XT commands. XT commands are appropriate for unbalanced panel datasets such as this one, which is missing observations in some time periods. XT equations account for correlation among error terms in computing standard errors. All equations were random effects equations of the form:

$$Y_{it} = \alpha + \beta X_{it} + \gamma V_{it-n} + u_{it} + \epsilon_{it}$$

[24] Kim, J. and C. W. Mueller. 1978. Factor Analysis. Sage Publications.
[25] Fry K., R. Firestone, and N.M. Chakraborty. 2014. Measuring equity with nationally representative wealth quintiles. Washington, DC: PSI.
[26] We test this assumption and respond to research question 11 in Appendix D: Resilience Capacity Indices and Factor Analysis.

…where *Y* is the outcome of interest, *X* is explanatory variables measured in the same survey round as *Y,* and *V* is explanatory variables measured in a previous survey round, or "lagged" variables. Household control variables are household size, education of head of household, assets, livelihood risk category, and a dummy variable for female-headed household. Geographic control variables are program area and urbanization status of the community (urban, peri-urban, or rural). Survey round is included as a time variable. Longitudinal data analysis allows for the use of lagged values of variables, in this case t values from 1 – 3 (i.e., one to three prior survey rounds). The dependent variable determines whether an ordinary least squares, logit or Tobit (censored regression) equation is appropriate. Structural equation modeling using Stata GSEM (generalized structural equation model) estimated more complicated relationships among outcomes, resilience capacities and mediating variables, such as in Research Question 10b: *Do the absorptive, adaptive, and transformative resilience capacities support constructive response strategies (i.e., coping strategies) that support households' ability to maintain or improve their well-being in the face of shocks and stresses?* Where do coping strategies mediate between resilience capacities and outcomes? GSEM estimates two equations.

$$C_{it} = \alpha + \beta X_{it} + +\gamma V_{it-1} + \epsilon_{it}$$
$$Y_{it} = \alpha + C_{it} + \beta X_{it} + +\gamma V_{it-1} + \epsilon_{it}$$

…where C is a coping strategy, *Y* is the outcome of interest, *X* is explanatory variables measured in the same survey round as *Y,* and *V* is lagged explanatory variables. For all descriptive results and multivariate analyses, we report statistically significant differences at the 0.05 level or better. To simplify the presentation, we did not distinguish between higher significance levels in the body of the report; however, Annex A presents regression results with statistical significance reported to <0.001.

This study extends methods used in the analysis of PRIME data[27,28] by using data collected from households in all four survey rounds. Results from estimation equations can provide estimates of change from baseline to each of the three RMS rounds, as well as between rounds.

[27] Frankenberger, T and L. Smith. 2015. Ethiopia Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) Project Impact Evaluation: Report of the Interim Monitoring Survey 2014-2015. Report for USAID Feed the Future FEEDBACK project. January. September.

[28] The PRIME analysis of food security outcomes compared R1 to R6. Results presented in this paper describe a trend over four survey rounds to compare each RMS round to the baseline or RMS rounds to each other.

Limitations

There were several limitations to this study:

Attribution: This study does not allow for clear attribution of benefits to EREGS projects. Attribution not possible because this was not a targeted beneficiary survey and many agencies were providing similar programming at the same time.

Attrition: As this was a panel study, we had hoped to survey all households in all survey rounds. However, many households moved due to drought and conflict – some into Internally Displaced Persons (IDP) camps – and turned off phones, no longer owned phones, or were beyond the range of cell phone coverage; they were thus unreachable for subsequent surveys. Of the 976 households in R1, 196 (20.1 percent) did not participate in R2 or R3. Table 4 presents data on the reasons for non-responses and shows that refusals made up 9.3 percent. According to Forcier staff, respondents refused because there were no incentives; some said they had responded to surveys before and did not see any signs of change in their community; others said the survey was too long. Forcier staff also noted that some of the switched-off phones and instances of "no answer" reflect respondents' avoidance of enumerators: some respondents from whom a callback was requested switched off their phones, did not answer, or were otherwise not available at the arranged time. Another limitation stemmed from respondents using cell phones with solar-powered batteries; often the battery died before the end of the survey. When batteries died, enumerators called back at a later time and completed the interview.

Table 4: Reasons for non-responses to R2 and R3

Reason	% HH
No answer/no adult available	27.8
Refused	9.3
Phone number not valid	2.1
Phone switched off	60.8
n	*196*

Generalizability: Findings from this study are not generalizable to the larger baseline survey population or to the general population from which the baseline was drawn. They describe only the respondents to this survey. Despite this, the current research analyzes important trends and yields findings that ought to be further explored in future work.

Sample bias: Using a telephone survey for the RMS rounds introduced selection bias, as this limited the sample to households with working cell phone numbers, with the implication that the sample would be biased toward better-off households (in that better-off households were more likely to be able to afford cell phones and have time for interviews). In light of this consideration, the research team performed equivalence tests to identify any statistically significant differences between survey rounds that would affirm our assumption and provide information for interpreting results. Specifically, these tests compared households providing data in baseline and R1 ("BL+R1 households") to households with only baseline data ("BL households"); results are given in Table 5. The bottom section of the table reports recovery from shocks and includes only households that were exposed to the shock. The data show, not surprisingly, that BL+R1 households were better-

off than those participating only in the baseline, as illustrated by these statistically significant differences:

- The urban share of BL+R1 households was higher (41.8 percent compared to 28.8 for BL-only). The rural share was lower (41.0 percent compared to 52.2 percent for BL-only).
- BL+R1 households had higher levels of education and training, with a training and education index score of 0.9 compared to 0.7 for BL-only households.[29]
- BL+R1 households reported higher levels of bridging social capital (averaging 1.3 versus 1.2 for BL-only), and higher scores on the aspiration index (1.4 versus 1.2 for BL-only).
- Household assets were higher for BL+R1 households, averaging 2.8 compared to 2.3 for BL-only.
- The household dietary diversity score was also higher for BL+R1, at 7.1 compared to 6.8 for BL-only households.
- Exposure to unemployment and/or underemployment was lower for BL+R1 households than for households participating only in the baseline (24.2 percent and 27.4 percent of households, respectively).

The percentage of STORRE households was similar in both samples. PROGRESS households made up a smaller share of BL+R1 households (26.3 percent versus 39.4 percent for BL-only) and REAL households made up a larger share (41.9 percent versus 25.6 percent for BL-only).

[29] The education and training index ranges from 0-3. Households score one point each for one or more literate adults, one or more adults with a primary education, and one or more adults with a secondary education.

Table 5: Baseline equivalence results

Baseline measures	BL only		BL+R1		
Program area					
STORRE (% HH)	35.0		31.7		
PROGRESS (% HH)	39.4		26.3	***	
REAL (% HH)	25.6		41.9	***	
Urbanization					
Urban	28.8		41.8	***	
Peri-urban	19.1		17.2	***	
Rural	52.2		41.0	***	
Demographic characteristics					
HH size (mean)	6.2		6.7	***	
Female headed HH (% HH)	10.4		11.2		
Education & training index	0.7		0.9	***	
Social capital					
Bonding social capital index (mean, 0-6)	1.2		1.2		
Bridging social capital index (mean, 0-6)	1.2		1.3	**	
Linking social capital index (mean, 0-2)	0.0		0.0		
Livelihood diversification (mean, 0-12)	0.9		0.86	*	
Aspirations index (mean, -12 to 12)	1.2		1.4	**	
Assets					
Livestock assets (TLU)	2.7		2.8		
HH assets (0-17)	2.3		2.8	***	
Productive asset index (0-15)	7.4		6.5		
Cash savings (% HH)	2.7		3.2		
Food security					
Moderate to severe hunger (% HH)	42.4		43.6		
HFIAS (mean, range 0-27)	9.6		9.6		
HDDS (mean, range 0-12)	6.8		7.1	***	
Shock exposure					
Shocks over past 12 months (mean, range 0-23)	1.8		1.7		
Late/variable rains (%HH)	27.5		28.4		
Drought (%HH)	23.7		24.7		
Livestock disease (%HH)	18.9		18.4		
Food price fluctuations (%HH)	17.4		15.8		
Under/unemployment (%HH)	27.4		24.2	**	
N	*1033*		*976*		
Recovery from shocks (to same or better) (includes only HH reporting shock exposure)					
Late/variable rains (%HH)	12.7	*284*	15.4		*277*
Drought (%HH)	14.0	*245*	14.0		*241*
Livestock disease (%HH)	11.0	*195*	9.3		*180*
Food price fluctuations (%HH)	15.1	*180*	13.5		*154*
Under/unemployment (%HH)	12.6	*283*	11.9		*236*

Asterisks denote levels of statistical significance: *<0.10, **<0.05, ***<0.01

Source: USAID. 2016, 2017. Somalia household surveys.

These differences are important to keep in mind when interpreting results. Reported outcomes likely would have been worse if we had been able to contact all households in all subsequent rounds (n=2009) because this would have included a wider range of households in terms of various indicators of wealth and well-being.

Similar tests for bias across RMS survey rounds, comparing households that responded to R1 only to households responding to R1 plus R2, R3 or both, showed few statistically significant differences,[30] meaning that the data do not indicate attrition bias within the RMS survey rounds and findings are representative of the entire sample (n=976).

Urban and peri-urban households: The USAID/TANGO resilience framework was developed to understand resilience in rural settings (primarily agricultural, agro-pastoral and pastoral). Many households in the study area were in peri-urban and urban communities; and some were in an IDP camp[31] – environments where some of these coping strategies and resilience capacity components are less applicable. For example, the transformative resilience capacity index has component indicators regarding access to pasture, irrigation, livestock and crop services; these may not accurately measure transformative resilience capacity in urban and IDP settings. Similarly, the indicators for livestock holdings and ownership of agricultural equipment may not define absorptive and adaptive capacities for peri-urban and urban households. Multivariate analyses of coping strategies control for differences among urban, peri-urban, and rural households by including dummy variables for urbanization status. To address differences in access to services, this study computed the transformative resilience capacity index separately for urban, peri-urban, and rural households. The 16 IDP households were coded into the urban category.

False positive findings: The large number of research questions and sub-questions necessitated hundreds of regression equations. Taking the total number of equations into account dramatically increases the probability of at least one spurious finding (to higher than 0.99). Results that are least likely to be spurious are those that show up in several equations and/or have relatively small p-values.[32]

3. Descriptive Statistics

This section provides bivariate descriptive statistics covering exposure to various shocks, recovery from shocks, household hunger and food security outcomes, household and community variables, coping strategies, and humanitarian assistance. Means or proportions, as appropriate, are compared across survey rounds. The main purpose of this section is to show relationships among variables and

[30] Comparing across 29 variables (see Table 5) showed households that responded in R1 but dropped out in either R2, R3 or both were more likely to be female headed, smaller in size, and more rural, and have lower education levels and lower exposure to un/under-employment shocks. There were no significant differences in the other variables compared.

[31] Sixteen households were in IDP camps at baseline and R1, eleven in R2, and none in R3.

[32] Adjustments to account for multiple comparisons involve reducing the maximum p-value for reporting results. As an example, the most intuitive (and most restrictive) of these is the Bonferroni adjustment, in which p-values are divided by the number of comparisons. Running nine equations, such as by testing the effects of three resilience capacity indices on three outcomes, would mean that reportable outcomes have a p-value of less than 0.05/9, or 0.006 instead of 0.05. Running 90 equations, such as estimating the effects of 30 coping strategies on three outcomes, would reduce reportable p-values to 0.0006.

changes in variables over time. The graphs and tables illustrate means or percentages for baseline, RMS rounds 1-3, and results of pairwise tests comparing values between years. As noted in the methodology section, only results that are statistically significant at 0.05 or lower are reported. Superscript letters are used in tables to show the results of pairwise comparisons. Values with the same superscript are significantly different from each other ($p<0.05$). Values with no superscript are not different from the others. Comparisons are between columns (i.e., between survey rounds).

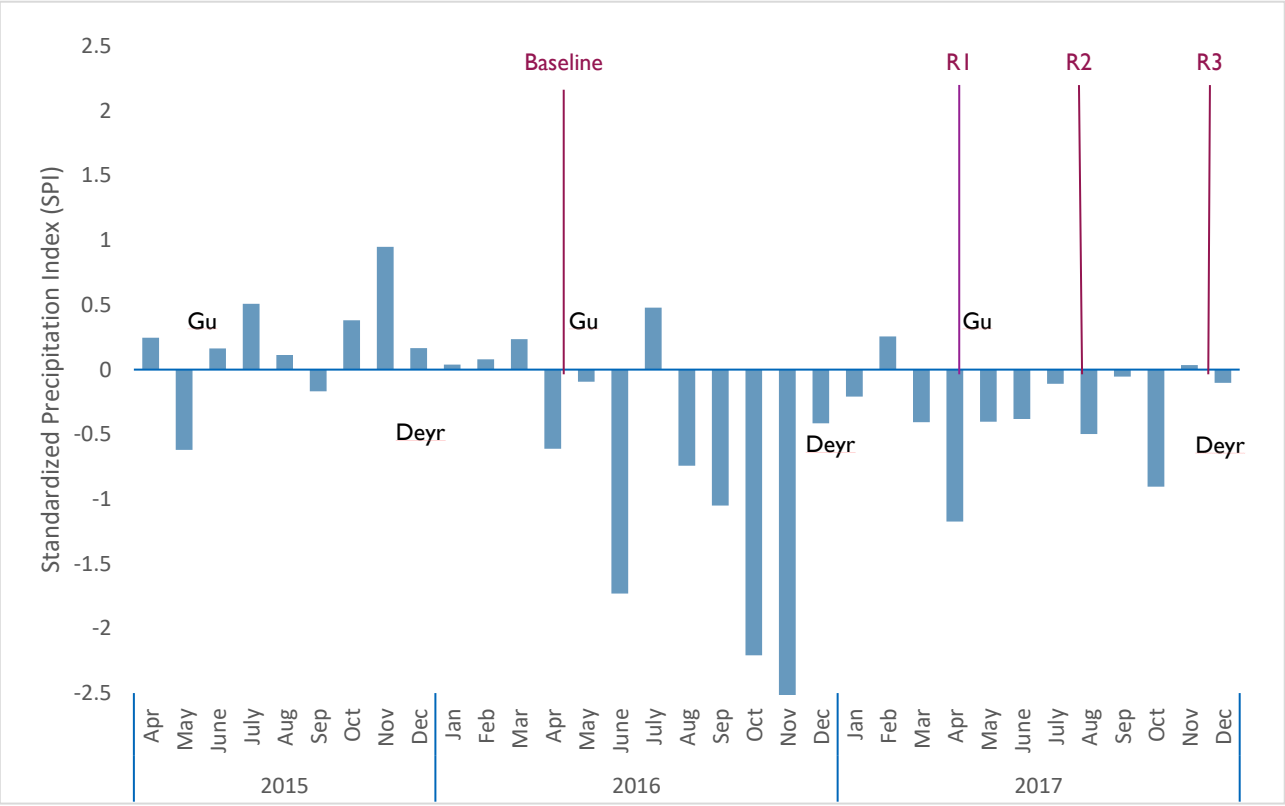
3.1. Shock Exposure

The data on shock exposure come from two sources: the African Flood and Drought Monitoring system (AFDM)[33] and baseline household surveys. Matching latitude and longitude from baseline household surveys to AFDM data provided monthly precipitation for the study area. The data presented in Figure 3 show precipitation in terms of deviation from the mean. The zero line in the middle of the graph represents average precipitation. Columns extending above the zero line represent months that were wetter than normal; those extending below the line represent months that were drier than normal. Included in the figure are the two rainy seasons, *Gu* and *Deyr.* The purple vertical lines mark survey dates. The figure covers the 33-month period from April 2015 through December 2017, coinciding with survey respondent recall periods that begin 12 months prior to the baseline.

The data show relatively erratic rainfall during the 12 months prior to the baseline and below-average rains during the *Gu* in 2016, which coincided with baseline data collection. The figure shows, with few exceptions, drier-than-normal months from just prior to the baseline survey until R3. Households had been experiencing severe drought for almost a year prior to the start of the RMS rounds.

[33] http://stream.princeton.edu:9090/dods/AFRICAN_WATER_CYCLE_MONITOR

Figure 3: Standardized Precipitation Index from April 2015 through December 2017



Source: AFDM. 2017.

The household survey also provided information about exposure to 23 kinds of shocks.[34] The results are summarized in Table 6.

The data show that at the time of the baseline, about one-third of households (37.5 percent) were reporting late or variable rainfall and/or drought. This increased sharply by R1, continued through R2, and decreased in R3 but continued to affect more than 8 out of 10 households. In R3, exposure to all shocks except deforestation was more than double baseline levels. Overall, the data show that even though the percentage of households reporting drought and/or late or variable rainfall fell from R2 to R3, exposure to downstream economic, crop and livestock, and health shocks was not yet declining. In R3, households (11.3 percent) were starting to report flooding. Flooding was soon to become widespread across Somalia and replace drought as a major climate shock.

Because the drought had been underway for 12 months before R1, we do not know the precise onset of all of the downstream shocks. However, by R3, as the percentage of households experiencing drought was decreasing, some downstream shocks were continuing to rise. From R2 to R3, the percentage of households reporting unemployment or under-employment increased from about half

[34] While the survey asked separate questions about exposure to drought and late or variable rainfall, in the tables and analyses that follow, the data from these two questions are combined.

to two-thirds (66.4 percent). Price shocks were at their highest levels in R3. The percentage of households reporting increases in food prices rose sharply from baseline to R1 (15.8 to 54.0 percent of households), dropped to 31.6 percent in R2, and increased to 55.4 percent in R3 – similar to R1 and more than three times higher than the baseline.

The prevalence of chronic diseases such as malaria and tuberculosis rose sharply from baseline to R1 and R2, and jumped again in the last survey round to 29.1 percent of households – more than seven times the baseline and three times higher than the other RMS rounds. Cholera and diarrheal outbreaks increased sharply at drought onset and fell in subsequent RMS rounds, reaching 20.1 percent of households in R3, which was still five times higher than the baseline.

Among crop and livestock shocks, reduced soil productivity and crop disease and pests increased sharply after the baseline and had not abated by R3. Reduced soil productivity rose from 3.8 percent at baseline to around 20 percent in the RMS rounds. Crop disease and pest issues rose from 11.6 percent of households at baseline to around 20 percent in the RMS rounds. Livestock disease was reported by 18.3 percent of households at baseline, jumping to 51.5 percent in R1. It dropped to 31.2 percent in R2, and then rose again in R3 to 35.9 percent.

The onset of some other downstream shocks, notably conflict-related shocks, occurred as the drought was waning. Exposure to conflict and trade disruptions is probably underestimated because, according to field staff, many households exposed to conflict dropped out of the survey after the baseline.[35]

[35] Forcier staff provided this information.

Table 6: Shock exposure, by survey round

	Baseline		R1		R2		R3	
Climate shocks								
Drought and/or ate/variable rainfall	37.5	ab	95.9	a	94.0	b	84.5	ab
Floods/heavy rains	8.0	a	6.0	b	4.5	ab	11.3	ab
Crop and livestock shocks								
Reduced soil productivity	3.8	abc	22.6	a	18.4	b	21.0	c
Livestock disease	18.3	a	51.5	a	31.2	a	35.9	a
Crop disease and pests	11.6	abc	20.9	a	19.8	b	25.2	c
Deforestation and fire								
Deforestation	5.9	ab	14.0	ab	10.0	b	9.5	a
Fire	1.0	a	3.7	a	2.2		2.1	
Conflict shocks								
Military conflict	2.0	a	0.9	ab	2.0	b	5.5	ab
Inter-village conflict/resource disputes	0.4	abc	1.9	a	1.8	b	3.7	c
Inter-village conflict/other disputes	0.4	a	1.1		0.8		1.8	a
Intra-village or clan conflict/ theft	0.5	ab	1.7	a	0.7	b	3.3	ab
Economic shocks								
Increased food prices	15.8	ab	53.0	a	39.2	ab	55.1	b
Trade disruptions	3.1	ab	6.6	a	5.1	b	9.5	ab
Sharp increase in input prices	2.2	a	17.3	a	12.8	a	21.8	a
Sharp drop in livestock or crop prices	1.6	a	23.5	a	11.5	a	15.1	a
Health shocks								
Measles outbreak	6.0	abc	25.1	a	22.1	b	23.6	c
Cholera or diarrheal outbreaks	4.2	ab	29.8	ab	24.4	a	19.9	b
Chronic illness (e.g., malaria, TB)	4.2	ab	9.3	a	9.6	b	28.9	ab
Employment shocks								
Migration of main income earner	0.9	ab	6.9	ab	2.8	a	4.0	b
Displacement of household	1.5	ab	17.6	ab	9.8	a	13.2	b
Unemployment/ underemployment	24.2	ab	54.4	a	53.8	b	66.0	ab
Death or injury of main income earner	2.8	abc	9.1	a	7.0	b	9.0	c
Count of shocks (0-23)	1.7	ab	5.5	a	4.5	ab	5.2	b
N	*976*		*976*		*602*		*568*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.
Sources: USAID. 2016, 2017. Somalia household surveys

The analysis also computed the mean number of shocks per household: 1.7 at baseline, 5.5 in R1, 4.5 in R2, and 5.2 in R3 – more than triple the count at baseline. The higher shock count in R3, when the percentage of households reporting climate shocks is dropping, is another indication that downstream shocks continue to increase even as climate shocks begin to wane.

Households reporting shock exposure were asked to indicate how each shock affected their food consumption, using a three-point scale where 1= remained the same, 2 = decreased slightly and 3 = decreased severely. Table 7 reports mean scores by shock. For almost all shocks in all survey rounds, mean scores were between 2 and 3, indicating a slight to severe decrease in food consumption. For all shocks except measles, the impact of shocks on food consumption was as high or higher at baseline as

during RMS rounds. Humanitarian assistance, which was not widely available during the baseline, may have lowered the impact of shocks on food consumption during later RMS rounds.

Further analysis, presented in Section 5, shows additional shocks reported by households exposed to drought and explores how exposure to climate shocks in one period affects exposure to different shocks in the next.

Table 7: Impact of shocks on food consumption, by survey round

	Baseline			R1			R2			R3		
Climate shocks			*n*			*n*			*n*			*n*
Late variable rainfall and/or drought	2.5	ab	*798*	2.2	a	*925*	2.2	b	*565*	2.4	ab	*496*
Floods/heavy rains	2.3	a	*243*	1.8	ab	*59*	2.1		*27*	2.3	b	*64*
Livestock and crop disease												
Reduced soil productivity	2.5	a	*84*	2.3	b	*216*	2.2	ab	*111*	2.3		*119*
Livestock disease	2.6	ab	*307*	2.3	a	*502*	2.2	ab	*188*	2.4	b	*204*
Crop disease and pests	2.3		*235*	2.2		*202*	2.3	a	*119*	2.0	a	*143*
Deforestation and fire												
Deforestation	2.5	abc	*110*	2.5	a	*137*	2.1	b	*60*	2.2	c	*54*
Fire	2.4		*23*	2.2		*36*	2.2		*13*	2.3		*12*
Conflict shocks												
Military conflict	2.6	ab	*49*	1.7	a	*7*	1.9	b	*12*	2.4		*31*
Inter-village conflict/resource disputes	2.2		*11*	1.9		*17*	2.1		*11*	2.3		*21*
Inter-village conflict/non-resource	2.4		*7*	2.1		*11*	1.8		*5*	2.5		*10*
Intra-village or clan conflict/theft	1.8		*5*	2.1		*14*	1.8		*4*	2.4		*19*
Economic shocks												
Increased food prices	2.6	abc	*303*	2.2	a	*513*	2.3	b	*236*	2.2	c	*313*
Trade disruptions	2.6	ab	*51*	2.2	a	*63*	1.8	ab	*31*	1.9	b	*54*
Sharp increase in input prices	2.5	abc	55	2.0	a	*168*	2.0	b	77	2.0	c	124
Sharp drop in livestock/crop prices	2.5	ab	*46*	2.2	a	*227*	2.1	b	69	2.3	ab	*86*
Health shocks												
Measles outbreak	1.8	abc	*174*	2.2	a	*240*	2.2	b	*133*	2.2	c	*134*
Cholera or diarrheal outbreaks	2.1		*77*	2.1	a	*286*	2.2		*147*	2.3	a	*113*
Chronic illness (e.g., malaria, TB)	1.8	a	*100*	2.1	ab	*86*	1.8		*58*	1.8	b	*164*
Employment shocks												
Migration of main income earner	2.4	a	*35*	2.1		*66*	2.4	b	*17*	2.0	ab	*23*
Displacement of household	2.7	ab	*125*	2.2	a	*172*	2.4	b	*59*	2.5	a	*75*
Unemployment/ underemployment	2.6	ab	*602*	2.1	ab	*527*	2.3	a	*324*	2.2	b	*375*
Death or injury of main earner	2.5	abc	*81*	2.0	a	*89*	2.0	b	*42*	2.1	c	*51*
Total shocks impact	11.0	ab	*912*	12.0	a	*966*	10.0	ab	*596*	12.0	b	*562*

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Sources: USAID. 2016, 2017. Somalia household surveys

3.2. Recovery from Shocks

Recovery from drought and/or late or variable rains is one of the well-being outcome measures for this study. For each of the 23 shocks, respondents were asked if they were exposed to the shock and to what extent their household had recovered. Response options are:

1) *Not recovered at all*
2) *Recovered but worse off than before the shock*
3) *Recovered to the same level as before the shock* and
4) *Recovered and better-off than before the shock.*

Households were considered "recovered" if they reported (3) or (4). The two recovery categories were combined because the percentage of households reporting that they had recovered and were better off was too small to analyze.[36]To combine recovery information for drought and late/variable rains, households that were exposed to either or both were coded as "recovered" if they were exposed to both and had recovered from both, or were exposed to one and recovered from that shock. Again, because the RMS rounds ended before the drought, and the drought was followed by flooding, recovery rates reported in R3 do not actually reflect recovery from all shocks occurring during this time. Exposure to multiple downstream shocks had not yet lessened and households were just beginning to feel the effects of flooding. These findings point to a need for a longer monitoring period in order to understand how households recover after shocks have ended.

Table 8 shows that households were resilient in terms of recovery: recovery from drought and/or late or variable rains was higher in all RMS rounds than at baseline. The table shows the percentage of households reporting recovery from different types of shocks. For many shocks, the percentage of households reporting recovery was lowest in R2, when shock exposure was highest, and in R3, recovery returned to the same level or higher than baseline. Recovery from drought and/or late or variable rains increased from the baseline to R1, rising from 6.8 percent to 12.9 percent; it was unchanged in R2. By R3, the percentage more than doubled to 26.2 percent. Recovery from livestock disease increased after R1, rising from 13.9 to 22.3 percent of households then continuing to increase to 41.7 percent of households in R3. For crop disease and reduced soil productivity, the percentage of households reporting recovery dropped after R1 (from 18.0 to 5.9 for crop disease and from 11.6 to 5.4 for reduced soil productivity), then rose to the highest levels in R3 (21.6 and 25.9, respectively). Recovery from economic shocks followed a similar pattern: the percentage of households reporting recovery in R1 was higher than baseline, then dropped or was steady in R2 and rose to its highest levels in R3. Recovery from measles, however, did not change significantly over the survey rounds.[37] Recovery from cholera and diarrhea outbreaks was highest in R3, when nearly two-thirds households exposed in the past year reported that they had recovered. The percentage of households reporting recovery from unemployment or underemployment was similar in all rounds (between 9 and 11 percent) except R2, when it dropped to 3.5 percent.

[36] For households reporting exposure to drought and/or late or variable rains, 1.4 percent at baseline reported that they had recovered and were better off, 3.5 percent at R1, 0.7 percent at R2 and 8.1 percent at R3.
[37]The measles outbreak was brought under control in early 2018 (after R3 was completed, when UNICEF completed its vaccination program.

Table 8: Recovery from shocks, by survey round

Shocks	Baseline			R1			R2			R3		
Climate shocks			*n*			*n*			*n*			*n*
Drought/late rainfall	6.8	a	*366*	12.9	a	*926*	10.3	b	*565*	26.2	ab	*496*
Floods/heavy rains	16.7	ab	*48*	39.5	a	*43*	24.0		*25*	38.7	b	*62*
Crop and livestock												
Livestock disease	10.2	a	*157*	13.9	b	*424*	22.3	ab	*184*	41.7	ab	*199*
Crop disease and pests	11.5	a	*96*	18.0	b	*172*	5.9	ab	*118*	21.6	a	*139*
Low soil productivity	6.7	a	*30*	11.6	b	*172*	5.4	c	*111*	25.9	abc	*116*
Deforestation and fire												
Deforestation	2.1	ab	*48*	15.7	a	*108*	15.8	b	*57*	34.1	ab	*44*
Fire	33.3		*9*	54.8		*31*	38.5		*13*	33.3		*12*
Conflict shocks												
Military conflict	12.5		*16*	40.0	a	*5*	0.0	ab	*11*	32.3	b	*31*
Inter-village - natural resource	0.0	ab	*3*	46.7	a	*15*	20.0		*10*	23.8	b	*21*
Inter-village - other	33.3		*3*	40.0	a	*10*	0.0	a	*5*	10.0		*10*
Intra-village clan/theft	0.0	a	*2*	58.3	ab	*12*	0.0	b	*4*	22.2	ab	*18*
Economic shocks												
Increased food prices	9.1		*143*	12.7	a	*426*	4.7	ab	*233*	15.1	b	*292*
Trade disruptions	6.7	a	*30*	18.2	b	*55*	12.9	c	*31*	38.6	abc	*44*
Increased input prices	0.0	ab	*17*	30.5	a	*128*	10.4	ab	*77*	22.9	b	*109*
Low livestock or crop prices	0.0	ab	*14*	7.0	a	*187*	13.2	b	*68*	26.2	ab	*84*
Health shocks												
Measles	52.0		*25*	47.7		*195*	44.3		*131*	42.3		*130*
Cholera or diarrhea	24.0	ab	*25*	46.5	a	*245*	44.1	b	*145*	63.4	ab	*112*
Chronic illness	44.4		*18*	35.9	a	*78*	56.4	a	*55*	19.9	a	*156*
Employment shocks												
Migration main earner	14.3		*7*	26.4		*53*	25.0		*16*	36.4		*22*
HH displaced	0.0	abc	*11*	21.6	a	*148*	22.0	b	*59*	25.3	c	*75*
Un-/underemployment	9.7	a	*217*	10.6	b	*454*	3.5	abc	*312*	11.6	c	*354*
Death main earner	14.3		*21*	23.3		*73*	15.4	a	*39*	34.0	a	*50*

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Sources: USAID. 2016, 2017. Somalia household surveys

3.3. Well-Being Outcomes

In addition to recovery from drought, this study uses food-security-based measures of well-being: the Household Food Insecurity Access Scale (HFIAS) and the Household Hunger Scale (HHS). Appendix A describes the computation of both measures, following indicator guidelines.[38] Compared to HHS, HFIAS provides a more complete description of food security, measuring the range from worrying about not having enough food, through changes in consumption, to actual lack of food. HHS is concentrated at the extreme end of that scale; its developers note that it measures

[38] Coates, J., A. Swindale and P. Bilinsky. 2007. Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3). Washington, D.C. https://www.fantaproject.org/sites/default/files/resources/HFIAS_ENG_v3_Aug07.pdf

"the more severe range of household food insecurity, which is characterized by food deprivation and actual hunger… The HHS is most appropriate to use in areas of substantial food insecurity."

TANGO usually analyzes HFIAS as the food security outcome, but in the case of Somalia, analyzing moderate to severe hunger in addition to HFIAS is useful in light of famine warnings in R1 and R2. This study combined moderate and severe hunger categories of the HHS so that they are comparable to other studies, and identified factors associated with lowering hunger. Endline data from the USAID/PRIME project in the Somali region of Ethiopia collected at the same time as R3 provide context for the severity of moderate to severe hunger in Somalia: PRIME data show that 18.8 percent of households reported moderate to severe hunger.

Table 9 shows the distribution of households in the four food insecurity categories.[39] The data show a downward trend in food security from baseline to R2, with HFIAS increasing (worsening) between baseline and R1 and R2, and improving slightly in R3. Even though HFIAS improved from R2 to R3, the percentage of food-secure households dropped from 14.5 percent to 6.0 percent, with a corresponding increase in severe food insecurity, from 67.9 percent of households in R2 to more than three-quarters of the R3 sample.

Table 9: Percentage of households in different HFIAS categories, by survey round

	Baseline		R1		R2		R3	
HFIAS	9.6	ab	11.7	a	12.7	ab	11.2	b
HFIAS categories								
Food secure	21.3	ab	12.4	a	14.5	b	6.0	ab
Mildly food insecure	3.0		3.5		4.7		2.6	
Moderately food insecure	13.8		11.1	a	13.0		15.7	a
Severely food insecure	61.9	ab	73.1	a	67.9	ab	75.7	b
n	*971*		*976*		*602*		*568*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.
Sources: USAID. 2016, 2017. Somalia household surveys.

One of the strengths of the panel estimation methods used in this study is the ability to examine not only change between two points in time, but trends over four survey rounds. This is especially important for the analysis of household hunger. As shown in Table 10, 43.6 percent of households reported moderate to severe hunger at baseline. This increased to around 58 percent in R1 and R2, then decreased in R3 to 47.9 percent but was worse than baseline. However, it is important to notice the steep rise from baseline to R1 and R2, then after nearly two years of drought, a decrease in hunger from R2 to R3. This marks a shift of households away from dire food insecurity.

[39] HFIAS is a non-monotonic variable. Scores from 1-16 fall into more than one category. Categorization depends on the level of food insecurity: secure 0-1, mildly food insecure 1-8, moderately food insecure 1-16, and severely food insecure 1-27.

Table 10: Household hunger categories

	Baseline		R1		R2		R3	
Moderate or severe household hunger (%HH)	43.6	ab	58.7	a	56.0	b	47.9	ab
Household hunger categories								
Little or no hunger	56.4	ab	41.3	ac	44.0	cd	52.1	bd
Moderate hunger	35.5	ab	42.1	ac	33.4	cd	42.1	bd
Severe hunger	8.2	a	16.6	ab	22.6	ab	5.8	b
n	*976*		*976*		*602*		*568*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.
Sources: USAID. 2016, 2017. Somalia household surveys.

3.4. Coping Strategies

Coping strategies are household actions to reduce the impact of shocks. Households' choice of coping strategies depends in large part on their resilience capacities. Not all coping strategies discussed in this section are relevant for urban and peri-urban households. Appendix A shows coping strategies by urban, peri-urban and rural households, and the multivariate analysis presented in the next section includes rural/ peri-urban/ urban as a control variable. It is worth noting that some studies of rural households[40] indicate that to cope with a drought, households progressively draw down resources, beginning with savings, then household and productive assets, then small livestock, then large livestock. Households without savings or assets to sell, cope by reducing food consumption, removing children from school, or sending children to work. These are considered to be negative coping strategies because they have both short- and long-term negative impacts on well-being, especially for children.

Table 11 presents coping strategies used by households exposed to late/variable rainfall or drought in each survey round, and compares across rounds. The discussion includes coping strategies reported by at least 10 percent of households in any survey round.

Wage labor: The percentage of households taking up new wage labor to cope with drought was higher in R3 than at baseline. The increase in R3 may have been due to increased agricultural and livestock production (Figure 6) as the drought was easing, and continued, albeit somewhat lower, support from cash for work (CFW) /food for work (FFW) programs.

No coping strategies: A large percentage of households reported using no coping strategies. The percentage reporting no coping strategies was highest in R2, when drought exposure was the highest. Additional analysis shows that households reporting no coping strategies have fewer assets, 36 percent reported no food or cash assistance, and 18 percent reported having no livelihoods. Future research, ideally qualitative, should explore the ways these households manage drought.

Reducing food consumption: The percentage of households reporting that they reduced their food consumption was higher in the baseline than any survey round, and markedly low in R2 and R3. In fact, after R1, fewer than 5 percent of households reduced food consumption to cope with drought and/or late or variable rains. This is consistent with results presented in Table 7: the impact

[40] TANGO International, 2016, Zimbabwe Resilience Research Initiative (ZRRI) Final report. Oct 31. https://www.fsnnetwork.org/sites/default/files/zrri_endline_report_2017.pdf

of drought and/or late or variable rains on food consumption was greater at baseline than in RMS survey rounds. One explanation is that food aid lowered the need to reduce food consumption as a coping strategy.

Lack of resources may explain the low prevalence of negative coping strategies (see Table 11) in R2 and R3: food availability and/or access is so severely constrained that in terms of meeting food intake requirements, people are already functioning at a survival or near-survival level. Increasingly smaller percentages of households reported reducing food consumption as a way to cope at the same time as larger percentages reported severe hunger (Table 10). By the last RMS round, almost none were using this coping strategy. This information, in combination with low and decreasing food security, points to severe food depletion.

Selling livestock: The percentage of households that reported selling livestock to cope with drought and/or late or variable rains was highest in R3. This may be due to improved animal conditions and slightly higher prices for some livestock.[41]

Loans from friends/relatives: Taking loans from friends or relatives in response to drought was highest in R3. The relatively low numbers may suggest that households were similarly taxed by the shocks they experienced and thus did not have adequate resources available to provide loans.

Sending livestock to pasture: Households reported sending livestock in search of pasture to cope with drought. However, use of this coping strategy did not increase after the baseline even though the drought persisted. In fact, the percentage of households sending livestock to pasture decreased and remained lower than baseline throughout all RMS rounds, reaching its lowest point in R2. This may be due to lack of pasture, sick and dying livestock, or both.

Table 11: Coping strategies

	Baseline		R1		R2		R3	
New wage labor	18.9	ab	24.0	a	21.4	b	33.9	ab
No coping strategy	25.4	ab	39.7	a	53.8	ab	31.0	b
Sell livestock	7.7	a	9.7	b	6.2	b	17.9	ab
Loan friends/relatives	4.1	ac	9.7	ab	5.7	bd	11.9	cd
Livestock pasture	24.0	ab	13.1	a	7.8	ab	11.3	b
Slaughter livestock	2.5	a	1.4	b	3.4	b	7.5	ab
NGO food aid	0.5	abc	5.2	a	7.1	b	6.9	c
Loan money lender	3.6	a	9.1	abc	2.1	b	5.2	b
Money/food family local	0.0	abc	2.5	a	2.7	b	4.4	c
Government food aid	0.0	abc	2.3	a	4.8	b	3.8	c
Reduce food consumption	24.9	ab	16.5	ab	4.8	a	3.0	b
Firewood sales	1.1	a	4.3	abc	1.8	b	3.0	ac
Savings	0.3	a	0.4	b	1.1	c	2.6	abc
Temporary migration (all households)	6.6	ab	3.9		3.0	a	2.2	b
Remittance	0.0	abc	1.2	a	1.9	b	1.8	c

[41] FEWS NET. 2018. Somalia livestock price bulletin. http://fews.net/east-africa/somalia/price-bulletin/january-2018-0

Table 11: Coping strategies

	Baseline		R1		R2		R3	
Charcoal production	0.0	abc	2.4	a	1.6	b	1.4	c
Children out of school	2.7	a	6.0	ab	0.5	a	1.2	b
Temporary migration (some household members)	5.7	a	6.0	b	3.9	c	1.0	abc
Permanent migration (some household members)	1.1		1.7	ab	0.5	a	0.6	b
Girls sent to live with other households	0.3		0.2		0.0		0.6	
Children work	0.0	a	0.6	b	0.0		0.6	
Loan bank	0.0	a	0.4	a	0.4		0.4	
Boys sent to live with other households	0.0	ab	0.5	a	0.9	b	0.2	
Sell household items	0.0	a	0.3		0.9	a	0.2	
Loan NGO	0.5		1.6	ab	0.4	a	0.2	b
Help from local organizations	0.0	a	0.5	a	0.2		0.2	
Lease out land	0.0	a	0.6	ab	0.4		0.0	b
Less expensive housing	0.3		0.9	a	0.4		0.0	a
Sell productive assets	0.0		0.8	a	0.5		0.0	a
n	*366*		*926*		*565*		*496*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Sources: USAID. 2016, 2017. Somalia household surveys.

3.5. Humanitarian Assistance

During the RMS rounds, two-thirds to three-quarters of households received some kind of assistance, with a mean of about 1.5 types per household. The R3 survey asked the start and end month for each type of food or cash assistance (food aid, cash aid, FFW/CFW) received over the past 12 months; households reporting that they received more than one type of assistance did not receive more than one type at a time. Households may have received more than one type of assistance because other households shared with them. Hedlund et al.[42] note that when humanitarian assistance is distributed, families anticipate that relatives will come request a share. As shown in Table 12, the percentage of households reporting receipt of food and/or cash aid remained fairly constant across all RMS rounds, with about 45 percent receiving food aid and 40 percent receiving cash in any given round. The percentage reporting that they participated in CFW or FFW decreased from R1 and R2 to R3, dropping from 18.9 percent to 11.3 percent.

[42] Hedlund, K. et al., 2013. *Final Evaluation of the Unconditional Cash and Voucher Response to the 2011–12 Crisis in Southern and Central Somalia*, https://www.unicef.org/somalia/SOM_resources_cashevalfinep.pdf.

Table 12: Humanitarian assistance, by survey round

	Baseline	R1	R2	R3
Food or cash assistance (% HH)	13.8 [abc]	65.9 [a]	78.9 [b]	80.5 [c]
Food aid (% HH)	8.1 [abc]	48.7 [a]	45.7 [b]	44.5 [c]
Cash (% HH)	1.2	38.8 [a]	41.5 [b]	41.4 [c]
FFW/CFW (% HH)	4.4 [a]	18.9 [a]	16.0 [a]	11.3 [a]
Total types of food or cash assistance (mean, 0-3)[2]	1.0	1.6	1.6	1.5
Other assistance[1]				
Drinking water	na	33.0 [a]	23.5 [a]	17.1 [a]
Irrigation	na	16.6 [ab]	8.8 [a]	6.6 [b]
n	*972*	*976*	*601*	*568*

[1] Data on "other assistance" were not collected in the baseline survey.
[2] Includes only households reporting that they received assistance
Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.
Sources: USAID. 2016, 2017. Somalia household surveys.

3.6. Remittances

Only a small percentage of households – no higher than 9 percent in any survey round – reported receiving remittances.[43] This is lower than reported in other studies; for instance, a recent World Bank study in northwest Somalia,[44] whose study area corresponds roughly to the STORRE programming area, provides information for comparison. It estimates that 13-24 percent of households receive remittances, which is moderately higher than the results of the current study. Households in the current study may have underreported remittances either because they depleted the resource, thought their responses could affect benefits, feared theft after disclosing that they were receiving money, feared being linked to diaspora groups out of favor with the government, or feared punishment from Al Shabaab for having ties to the West.[45]

[43] There was no significant change across rounds in the percentage of households reporting remittances. Very few (15 out of 165) reported receiving remittances in more than one round. Only two households reported remittances in three rounds.
[44] Pape, U. J. 2017. Somali poverty profile; findings from wave 1 of the Somali high frequency survey (English). Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/325991506114032755/Somali-poverty-profile-findings-from-wave-1-of-the-Somali-high-frequency-survey
[45] Vargas-Silva, C. 2016. Literature review: Remittances sent to and from refugees and internally displaced persons. World Bank-Global Knowledge Partnership on Migration and Development (KNOMAD)
Hammond, L. et al., 2011. Cash and compassion: the role of the Somali diaspora in relief, development, and peace-building, http://www.so.undp.org/content/somalia/en/home/library/poverty/publication_1.html

TAKEAWAYS

The data show the onset of a severe drought just before the baseline survey in some areas, continuing through RMS rounds 1 and 2 and beginning to abate during R3. Household survey data indicate that the effects of downstream shocks generally extend beyond the initial climate shock. Some downstream shocks (crop and livestock disease, reduced soil productivity, cholera and measles) start soon after the onset of drought and level off in intensity but continue past the point when the drought begins to decline. Other downstream shocks start with the onset of the climate shock then increase in intensity as the climate shock winds down: un/under-employment, increases in food prices, increased input prices, and chronic illness. Other downstream shocks – conflict and trade disruptions – have a much later onset, first appearing as drought begins to decline. Even though the drought was ending by R3, the high prevalence of other shocks indicates that households were still managing widespread shocks and stresses.

4. Resilience Capacity Index Components

This section describes household and community indicators that are components of resilience capacity indices, and the three resilience capacities over the baseline and RMS rounds.

4.1. Assets

Table 13 reports on three types of asset indices.

- The **livestock asset index** is computed following FAO guidelines.[46] Livestock holdings are converted to a common unit called a Tropical Livestock Unit (TLU) and summed for each household. The data in Table 13 show that livestock holdings dropped from 2.8 TLU at baseline to 2.0 in R1, and again in R2 to 1.5, staying at the lower level in R3 (1.8).
- The **household asset index** is the count of types of household assets owned (out of a list of 17 assets). This index dropped slightly after the baseline then trended downward until R3, when it rose slightly.
- The **productive asset index** is a weighted sum of types of productive assets owned (out of a list of 15). The weights reflect relative prices of the assets, except for agricultural land, which is weighted by the size of the plot. Table 13 shows that productive asset levels nearly doubled from baseline to R1, dropped between R1 and R2, and returned to R1 level (10.1) in R3. The increase after the baseline was due to increased ownership of pruning/cutting shears, wheelbarrows, beehives, mechanical water pumps, manual grain mills, and granaries; this coincided with the distribution of tools by a USAID program. The index values may have been lower at baseline because at that time programs were assessing need and identifying recipients and had not begun distribution.

[46] Food and Agriculture Organization (FAO). 2011. Guidelines for the preparation of livestock sector reviews.

Table 13: Asset indices, by survey round

	Baseline		R1		R2		R3	
Livestock (TLU)	2.8	ab	2.0	b	1.5	b	1.8	a
Household asset index (0-17)	2.8	a	2.6	a	2.2	a	2.4	a
Productive asset index (0-15)	6.5	ab	11.0	a	8.9	ab	10.1	b
n	*973*		*976*		*602*		*568*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.
Sources: USAID. 2016, 2017. Somalia household surveys.

Table 14 presents more detailed information on livestock ownership. Livestock counts include only households that own one or more of that type of livestock. The data show that small ruminants – sheep and goats – are more commonly owned than large livestock (cattle and camels) in all survey rounds. Large livestock ownership levels were relatively steady from baseline throughout the RMS rounds. More marked differences between baseline and subsequent survey rounds are evident for small ruminants. At baseline, sample households had about 27 sheep on average; this decreased sharply to 13 sheep in the next two survey rounds, and further, to only 11 sheep by R3. Goat ownership followed a similar pattern, starting at baseline with about 19 goats on average, then dropping to 11-12 goats in subsequent survey rounds. These trends may indicate that households tried to hold on to higher-value animals, opting to first sell lower-value livestock to cope with shocks in R1.

Table 14: Livestock ownership, by survey round

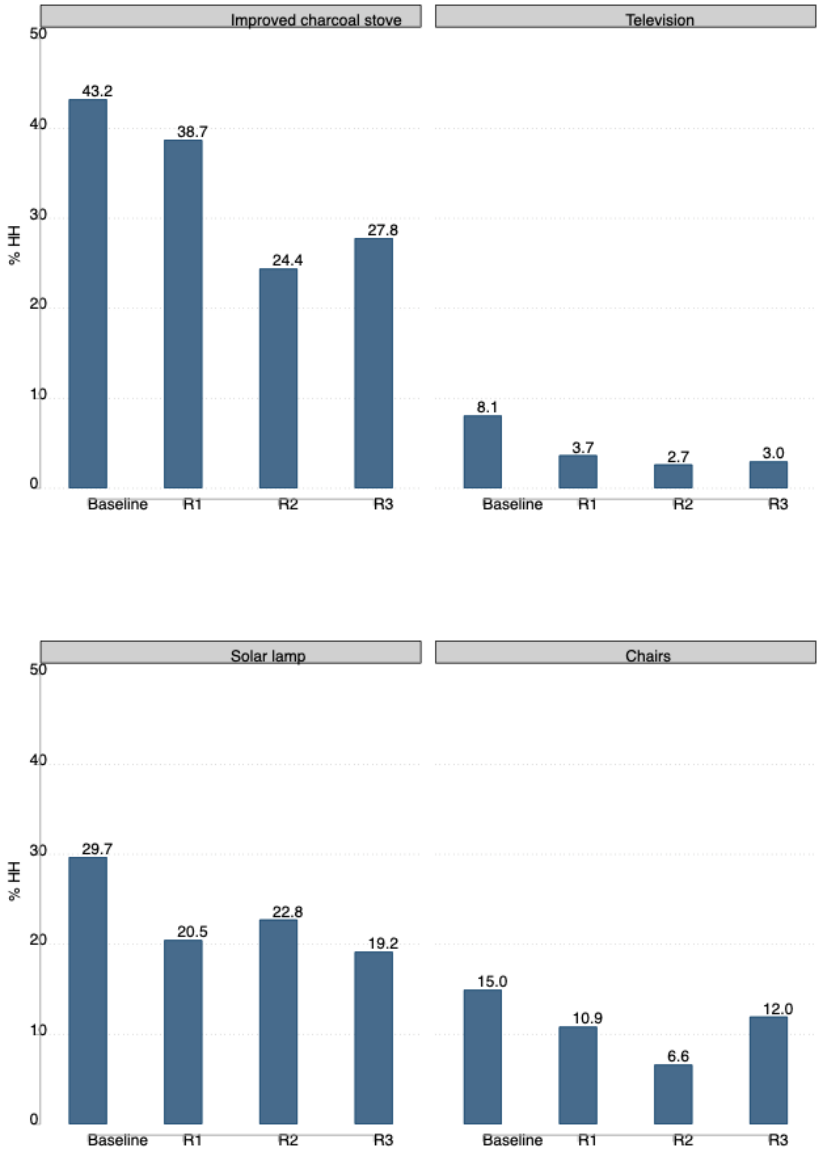
	Baseline			R1			R2			R3	
% HH owning											
Camels	10.5	a		10.5	b		7.8			6.9	ab
Cattle	15.7			18.3			14.8			16.2	
Sheep	34.5			35.0			30.7			34.0	
Goats	49.0			51.0	a		44.4	ab		52.3	b
Donkeys	25.7			22.0	a		23.1			28.0	a
n	976			976			602			568	
Number of animals owned (mean) includes HH owning each type of livestock											
			n			*n*			*n*		
Camels	7.2	a	*102*	5.3	a	*102*	5.3		*47*	6.5	
Cattle	4.2		*153*	4.3		*179*	3.3		*89*	4.5	
Sheep	27.1	abc	*337*	12.9	a	*342*	12.9	b	*185*	11.2	c
Goats	18.6	abc	*478*	11.6	a	*498*	11.0	b	*267*	10.9	c
Donkeys	1.5	ab	*251*	1.5		*215*	1.2	a	*139*	1.3	b

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns
Sources: USAID. 2016, 2017. Somalia household surveys.

Some household assets and livestock were nearly completely depleted during the RMS rounds. Notably, nearly all types of productive assets (equipment) rose between baseline and R1 and none declined over subsequent rounds. Figure 4 shows the depletion of the top four household assets

over survey rounds. Columns represent the percentage of households that own each item. Ownership of improved kerosene or charcoal stoves dropped in R1 and continued to fall through R2 and R3 to around 25 percent. Ownership of televisions and solar lamps also dropped sharply between baseline and R1 and stayed low through the remaining rounds. The severe depletion of some assets meant households ran out of options for generating income from distress sales as a coping strategy.

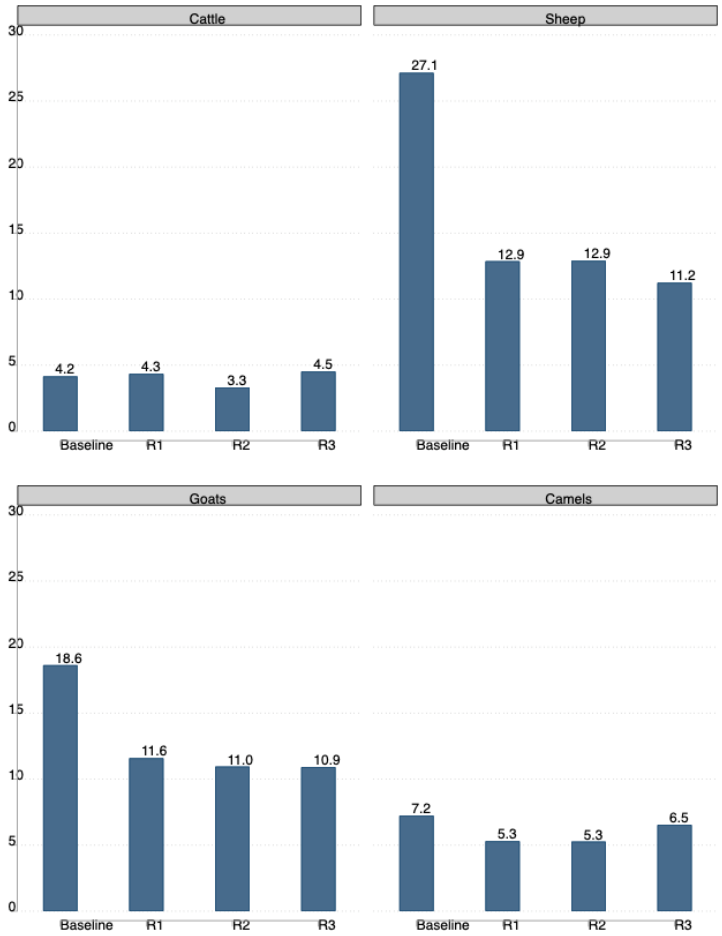
Figure 4: Household asset ownership, by survey round



Source: USAID. 2016, 2017. Somalia household surveys

The columns in Figure 5 represent the percentage of households that had lost their last remaining animal since the previous round. Loss rates were highest in R2, reflecting the highest exposure to late or variable rainfall, drought, and livestock disease that occurred in R1. Losses may have been due to sale, slaughter, disease, starvation, or theft. The sharp drop between baseline and R1 for sheep and goats supports the earlier observation that households tend to unload smaller livestock first.

Figure 5: Loss of last remaining livestock



Source: USAID. 2016, 2017. Somalia household surveys.

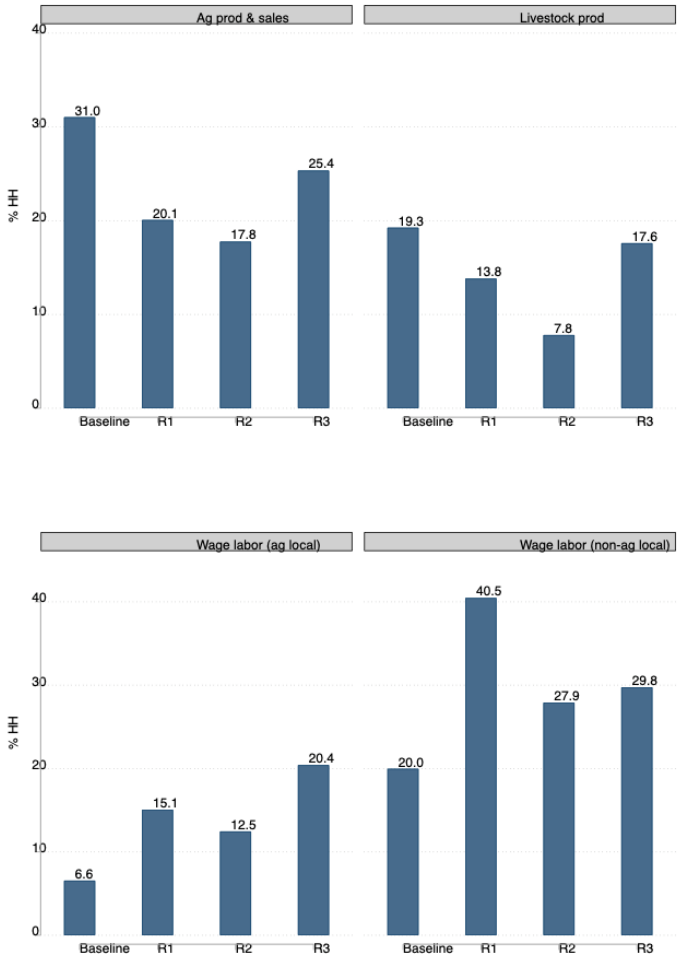
TAKEAWAY

Households suffered sizeable losses to all their herds as the drought progressed, and were unable to restore these herds to baseline levels. Households tended to sell off small livestock before higher-value large livestock.

4.2. Livelihoods

The survey data presented in Figure 6 show a shift in livelihood activities following the onset of shocks. As illustrated by the bar graphs, agricultural and livestock production and sales both decrease in R1 and R2; neither returns to baseline levels by R3. In contrast, wage labor (both agricultural and non-agricultural) increased sharply from baseline to R1 and R2. In R1, 17 percent of wage workers were participating in CFW/FFW, dropping to around 12 percent in R2 and R3. The uptick in wage labor in R3 may be due to agriculture and livestock production beginning to recover, creating jobs in those sectors as well as in supporting sectors.

Figure 6: Percentage of households engaging in four main livelihoods, by survey round



Sources: USAID. 2016, 2017. Somalia household surveys.

4.3. Social Capital

Social capital refers to the bonds between community members and across communities. It involves principles and norms such as trust, reciprocity, and cooperation, and is often drawn on in the

disaster context, when survivors work closely to help each other to cope and recover.[47] Within the resilience framework, household-level social capital has two primary forms: bonding and bridging. Horizontal links between people within more proximate geographies are part of bonding social capital; more-dispersed horizontal links with those in less-proximate geographies represent bridging social capital.

The bonding social capital score is based on responses to two survey questions: one asking whether the household would be able to *receive* help from various categories of people in their community if they need it, and one asking whether the household would be able to *give* help. The possible responses are *relatives, non-relatives within my ethnic/caste group, non-relatives of other ethnic/caste groups* or *no one;* the range of the score is 0 to 6.

The bridging social capital score is based on responses to two questions similar to those above; however, they are asked in reference to members outside the community. The bridging social capital score also ranges from 0 to 6.

Table 15 illustrates that changes in bonding and bridging social capital show similar patterns over the survey rounds. Both were relatively low at baseline (1.8 and 1.3, respectively). In the 12 months between the baseline and R1, bonding and bridging social capital increased to 2.8 and 2.9, respectively. The percentage of households reporting any social capital also rose. This may be due to changes in the questionnaire, discussed in Appendix C.

Table 15 also shows the percentage of households reporting any bonding and bridging social capital (they could give, receive or both). The percentage of households reporting any social capital increased from baseline to R1. The corollary is also true: the percentage of households reporting that they had no one on whom they could depend and no one that they could help decreased between baseline and R1. Again, some of the increase may be due to a change in the survey questions; it may also be due to households supporting each other during the early stage of the drought.

Bonding social capital dropped to around 2.6 in R2 and R3, and bridging social capital decreased to around 2.5 after the initial increase in R1. These decreases could be the result of the geographic extent of the drought: households in multiple communities were affected similarly, which constrained their ability to offer assistance. From R1 to R3, decreases in bonding and bridging social capital are consistent with other studies[48] showing that social capital is depleted during a drought. They are also consistent with other findings in this study showing the depletion of assets, savings, food and water as the drought intensified. In R3, as the drought was waning, the patterns reversed. This suggests that rapid recovery of support among close ties may be important for recovery.

[47] Frankenberger, T., Mueller, M., Spangler, T., and Alexander S. (2013). Community Resilience: Conceptual Framework and Measurement Feed the Future Learning Agenda. Rockville, MD: Westat. https://www.fsnnetwork.org/community-resilience-conceptual-framework-and-measurement-feed-future-learning-agenda

[48] Frankenberger, T and L. Smith. 2015. Ethiopia Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) Project Impact Evaluation: Report of the Interim Monitoring Survey 2014-2015. Report for USAID Feed the Future FEEDBACK project. January. September.

Table 15: Bonding and bridging social capital, by survey round

	Baseline		R 1		R 2		R 3	
Bonding social capital (mean, 0-6)	1.8	ab	2.8	ab	2.6	a	2.5	b
Any bonding social capital (% HH)	74.2	ab	92.9	ab	88.2	a	88.7	b
Bonding - able to receive (% HH)	56.7	ab	80.1	ab	73.6	a	75.7	b
Bonding - able to give (%HH)	70.0	abc	87.8	a	83.7	b	83.8	c
n	*967*		*967*		*602*		*568*	
Bridging social capital (mean, 0-6)	1.3	ab	2.9	ab	2.5	a	2.4	b
Any bridging social capital (% HH)	69.9	ab	91.7	ab	84.9	a	88.2	b
Bridging – able to receive	45.6	ab	23.9	a	28.6	a	25.7	b
Bridging – able to give	34.4	ab	12.6	ab	19.1	a	18.7	b
n	*964*		*963*		*602*		*568*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.
Sources: USAID. 2016, 2017. Somalia household surveys.

TAKEAWAYS

Given the quality of the data collected after the baseline, the revised questions in the RMS rounds improved the measurement of social capital. Revisions included introductory questions to prompt reflection on social capital. This was a likely cause of respondents in RMS rounds noting more sources and recipients of social capital than baseline respondents. In addition, fewer RMS households reported they had "no one" to rely on.

From R1 to R3, decreases in bonding and bridging social capital are consistent with the depletion of assets, savings, food and water described in this study, and with other studies showing that social capital is depleted during a drought. Decreases are also consistent with the underestimation of bonding and bridging social capital at baseline: if social capital is depleted during a drought, values should have been highest at baseline. Baseline bonding social capital did not have a positive factor loading in the computation of baseline adaptive capacity, but measured using the revised survey, it had a positive loading in R1, signaling its importance to households' ability to recover and adapt to circumstances.

Neither bonding nor bridging social capital was statistically significant in the results of equations estimating the three well-being outcomes. Additional tests using data from the social capital module in the community dataset (summarized in Table 18) show that community social capital was also not statistically significant in similar equations.

The task of measuring social capital may not be complete. Improving its measurement should be part of a broader discussion, including pre-testing the survey questions and translations in an interview setting and collecting feedback about what respondents understand to be the meaning of the questions. Given that borrowing improves well-being outcomes, and people who borrow have high levels of bonding and bridging social capital, additional analysis should include looking at borrowing in the context of social capital. It may be that data from other survey modules about lending and borrowing need to be incorporated into computing social capital indices.

4.4. Exposure to Information

The last household-level indicator, exposure to information, is a count (range 0-13) of whether a household received information about any of the following topics:

1) Long-term changes in climate patterns (patterns of drought/flooding/temperature change)
2) Rainfall prospects for the coming season
3) Early warning for natural hazards (floods, droughts, etc.)
4) Weather-related agricultural recommendations (crop, seed variety, timing)
5) Animal health/husbandry practices
6) Current market prices – farm-gate, wholesale or retail (food, crops, livestock)
7) Business and investment opportunities
8) Opportunities for borrowing money
9) Child nutrition and health information
10) Gender equality/gender-based violence
11) Conflict or other security restrictions on access to grazing
12) Information about government services/responsibilities/processes
13) Safe migration opportunities

Table 16 shows that exposure to information was very low at baseline, with a mean score of 0.2. While it increased over survey rounds, this indicator never rose above 1.7, indicating that access to information remained minimal.

Table 16: Exposure to information

	Baseline		R1		R2		R3	
Exposure to information (mean, 0-12)	0.2	a	0.7	a	1.8	a	1.3	a
Types of information (% HH)								
Long-term climate	2.8	ab	14.7	a	12.3	b	8.7	ab
Rainfall prospects	3.3	ab	15.6	ab	11.0	a	8.1	b
Early warning floods, droughts, etc.	2.0	ab	12.6	b	8.5	b	9.9	a
Weather-related agriculture (planting, seeds)	0.3	ab	8.4	a	6.3	b	12.1	ab
Animal health/husbandry practices	1.0	ab	23.6	ab	18.1	a	18.7	b
Current market prices	2.0	ab	19.3	a	14.1	a	8.9	a
Business opportunities	0.5	ab	7.7	a	3.8	ab	6.5	b
Borrowing money	1.5	ab	12.8	ab	9.3	a	7.9	b
Child nutrition & health	1.9	ab	33.1	a	23.1	ab	28.5	b
Gender equality/gender-based violence	0.8	ab	3.6	cd	1.3	bc	5.6	ac
Conflict/security restrictions	0.6	ab	9.8	ab	4.7	a	6.4	b
Govt services and processes	0.4	ab	2.4	ac	1.0	cd	3.2	bd
n	*976*		*976*		*602*		*568*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Sources: USAID. 2016, 2017. Somalia household surveys.

4.5. Other Household Indicators

Table 17 presents data on other household-level resilience capacities. Linking social capital is a count (range 0-2) of whether the household could receive help from a government official or an NGO if they needed it. The education and training index (range 0-3) reflects the level of education achieved by at least one member of the household. It is computed by assigning a value of 1 to each of the following categories: any literate adult, any adult member completed primary education, and any adult member completed secondary education. The index is a sum of these values, hence ranges from 0 (no/minimal education/literacy) to 3 (highest level of education/literacy). The data show that the education and training index was fairly stable across survey rounds, ranging from a low of 0.9 at baseline to a high of 1.3 in R2.

The aspirations index is computed based on whether respondents agree or disagree with the following statements:

1. I feel like what happens in my life is mostly determined by powerful people.
2. It is not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune.
3. I can mostly determine what will happen in my life.
4. When I get what I want, it is usually because I worked hard for it.

Responses are coded on a Likert scale ranging from 0 (strongly disagree) to 6 (strongly agree). The index is the sum of responses to questions 1 and 2, subtracted from the sum of responses to questions 3 and 4. The index score ranges from -6 to 6. The data show that mean values of the aspirations index scores are near the middle of the range. There is very little variation in these scores across survey rounds.

The next indicator shows that the percentage of households reporting cash savings, while extremely low (<3 percent of households in the sample), nearly tripled from baseline to R1, from 3.2 percent to 9 percent. However, this dropped to 1 percent in R2 and increased slightly to 2.6 percent in R3.

Table 17: Other household indicators

	Baseline		R1		R2		R3	
Linking social capital (mean, 0-2)	0.01	a	0.4	a	0.2	a	0.3	a
Education and training index (mean, 0-3)	0.9	abc	1.3	a	1.2	b	1.2	c
Aspirations index (mean, -6 to 6)	1.4	ab	1.2	ac	1.2	bd	1.4	cd
Cash savings (%HH)	3.2	a	9.0	ab	1.0	ab	2.6	b
n	*964*		*976*		*602*		*568*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Sources: USAID. 2016, 2017. Somalia household surveys.

A small percentage of households reported the negative coping strategy of removing their children from school. While on the surface this statistic is encouraging, it may underrepresent the actual prevalence of keeping a child home from school, as the baseline study showed that almost half of 6- to 13-year-old children had never attended school at all.

TAKEAWAYS

Coping strategies require resources. It is important to distinguish between not using them because they are not necessary and not using them because there are no resources.

The combined findings regarding coping strategies, savings, and assets indicate that using savings and selling assets – strategies with fewer long-term negative consequences than removing children from school or reducing food consumption – are not options for most households in this study, especially over a prolonged drought.

The data on food security and coping show that food security deteriorated to a point where households had few options. Selling assets to cope with shocks was not an option for many households, as they had few assets to start. Similarly, the low prevalence of removing children from school can be explained in part by baseline data, which show that almost half of all children ages 6 to 13 had never attended school.

4.6. Community Indicators

Table 18 presents mean values and ranges of community-level indicators. Higher values are desirable for all indicators presented. All of the indicators, except community social capital are components of either the absorptive or transformative resilience capacity index.

Table 18: Community-level indicators

	Baseline		R1		R2		R3	
Informal safety nets (0-8)	1.9	abc	2.9	a	3.2	b	3.5	c
Conflict mitigation committee (0-3)	1.8		1.8		1.7		2.1	
Financial/insurance services (0-2)	0.02	a	0.02	b	0.03	c	0.2	abc
Disaster preparedness and mitigation index (0-4)	0.3	abc	1.1	a	1.3	b	0.9	c
Formal safety nets (0-2)	0.1	abc	0.8	a	0.6	b	0.8	c
Access to markets (0-18)	13.4	a	13.3		12.3		11.0	a
Access to infrastructure (0-4)	0.5		0.5		0.5		0.5	
Access to services (0-6)	2.0	a	3.0	ab	2.6		1.9	b
Access to veterinary services (0-3)	0.1		0.2		0.2		0.0	
Access to ag extension services (0-2)	0.1		0.3		0.1	a	0.4	a
Access to communal resources (0-4)	2.5	a	2.8		2.9	a	2.9	
Governance (0-2)	1.5	abc	1.8	a	1.8	b	1.9	c
Community social capital (0-11)	na		2.5	a	1.0	a	5.1	a
n	*43*		*43*		*43*		*40*	

Subgroups with the same superscript are significantly different at the 0.10 level. Comparisons are across columns.
"na" indicates data were not collected at baseline

Sources: USAID. 2016, 2017. Somalia community surveys.

The informal safety nets (ISN) indicator counts the categories of community organizations/ groups present in a given community. It ranges from 0 to 8 and uses the following group categories:

1. Credit or micro-finance group (VSLA, SILC, etc.)
2. Savings groups (VSLA, SILC, etc.)
3. Mutual help group (including burial societies)
4. Trade or business associations
5. Civic group (improving community)
6. Charitable group (helping others)
7. Religious group
8. Women's group

The higher the ISN value, the wider the range of informal safety nets accessed in the community. ISN increased in every survey round, rising from 1.9 at baseline to 3.5 in R3.

The conflict mitigation committee index indicates whether a community has a conflict mitigation group and whether that group has been active. A score of 0 means that there is no conflict mitigation group, 1 means that there is a group but it is not active, and 2 means that there is an active conflict mitigation group. This index value remained at the top of the range (1.8 versus a maximum value of 2.0) and saw no statistically significant changes across survey rounds.

The financial and insurance services index indicates whether a community has lending institutions and hazard insurance is available. A 0 value indicates neither service is available, 1 indicates one is available, and 2 indicates that both are available. The data indicate that financial and insurance services were only minimally available in communities, as index values ranged from close to 0 at baseline to a high of only 0.2 in R2.

The disaster preparedness and mitigation index is a count of different strategies a community uses to prepare for shocks and mitigate their effects: disaster planning or resilience group, early warning monitoring group, strategy to respond to future shocks, and/or emergency plan for livestock offtake in the event of a drought. The index is a count (0-4) of the types of strategies in use. While this index rose from 0.3 in the baseline to around 1.1 over the RMS rounds, the low values suggest community planning mechanisms to prepare for shocks are minimal.

The **formal safety nets (FSN) index** is a count (range 0-2) of whether a community offers food assistance, non-food assistance, or both. The index rose from 0.1 at baseline to around 0.8 in the RMS rounds. Appendix C provides more information about formal safety nets. **Access to markets** reflects the extent of households' accessibility to three types of markets: livestock, agricultural products, and agricultural inputs. For each market type, communities receive a score of one point for a market within 20 km and one point if that market is open and functioning (range 0-6). The analysis reveals no statistically significant changes in this index between baseline (13.4), R1 and R2; however, it dropped in R3 to 11.0.

The **access to infrastructure** index is a count (range 0-4) of how many types of infrastructure a community has: access to piped water, cell phones, internet, and/or paved road access. The index was unchanged (0.5) over the four survey rounds.

The **access to services** index (range 0-6) measures the access to and quality of primary schools and health centers. Communities scored 1 point for each of the following: a primary school within

5 km, enough teachers, and school conditions rated as good or very good. Health centers are also scored 0-3, with one point for each: health center within 5 km, health center condition rated as good or very good, and health center does not have problems.[49] The access to services index increased from 2.0 to 3.0 from baseline to R1 then dropped in R3 to 1.9.

Access to veterinary services is scored 0-3, similar to health centers (veterinary center within 5 km, condition good or very good, and no problems). This index value was <1 across rounds.

The **access to agricultural services** index ranges from 0-2. Communities are scored one point for having a visiting agricultural extension worker, and another point if the worker comes more than three times per year. This index value was also <1 in all rounds.

The **access to communal resources** index is a count (range 0-4) of how many of the following types of communal resources exist in a community: communal pasture, communal water source, communal source for firewood, and/or communal irrigation. The index increased from baseline to R2 (2.5 to 2.9) and remained at 2.9 in R3.

The **governance** index (range 0-2) measures two aspects of effective governance: residents' ability to voice their concerns at village and/or community meetings, and community linkages to higher levels of government. A 0 value indicates that neither of these aspects is present, 1 indicates that one or the other is present, and 2 indicates that both are present. The governance index rose from 1.5 at baseline to about 1.8 in RMS rounds.

The **community social capital** index (range 0-11) is a count of the following types of meetings and activities that occur more than three times per year: private or family celebrations, community celebrations, mosque, friends and family activities, meetings of clan elders (between clans), women's organizations, community organizations, tea shops, market places, *khat*-chewing clubs and sporting events. This index was initially low but rose to 5.1 in R3.

4.7. Resilience Capacity Indices

Research Question 11 addresses change in the resilience capacity indices: *How does resilience capacity, both household and community, change over time?* USAID/TANGO methods compute resilience capacity indices that are comparable to each other. As shown Table 19, all three resilience capacity indices were higher in the RMS rounds than at baseline. These improvements in resilience are noteworthy, considering that by R1 households were deep into a prolonged drought.

This is one of the first USAID/TANGO resilience research projects that assessed changes in resilience capacities. Other studies found that capacities decrease. This study shows that households drew down savings, social capital and assets, but resilience capacity indices increased during the drought. Index values rose because of increases in variables measuring interventions and the relative weights (factor loadings) of the variables. Appendix D presents a detailed discussion of the resilience capacity indices.

[49] Problems include no beds, no staff or health center destroyed.

Table 19: Resilience capacity indices, by survey round

	Baseline		*n*	R1		*n*	R2		n	R3		n
Absorptive capacity index	22.6	ab	*976*	36.9	ab	*976*	42.1	a	*602*	41.2	b	*554*
Adaptive capacity index	33.9	ab	*966*	52.2	ab	*958*	47.9	a	*602*	48.7	b	*568*
Transformative capacity index	45.3	a	*962*	64.1	a	*962*	66.6	a	*602*	56.3	a	*566*

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.
Sources: USAID. 2016, 2017. Somalia household and community surveys.

Note that USAID/TANGO methods use baseline weights for all survey rounds.[50] [51]

Community-level components of the absorptive capacity index had the highest factor loadings (Table 27). This means they made the largest contributions to the absorptive capacity index. Of the component variables, higher values for ISN, disaster preparation and mitigation, and access to financial and insurance services between baseline and R1 (Table 18), meant that households had higher absorptive capacity. Increases in ISN may be due to EREGS (or similar) programming. Of the groups that make up ISN, participation in VSLA/SILC groups, women's groups, and civic and religious groups increased the most over the survey rounds. EREGS (and similar) programming started or supported many of these (but not religious groups). Increases in household savings between baseline and R1 may also be at least partially attributable to increased access to VSLA/SILC groups. Household depletion of absorptive capacity due to drawing down livestock and household assets was more than compensated for by community-level increases.

Of the underlying components of the adaptive capacity index, bridging social capital (Table 15) information exposure (Table 16), and education and training (Table 17) all increased from baseline to R1. Taking into account their factor loadings (Table 28), these increases were determined to cause this index to rise between the baseline and R1. EREGS (or similar) programming may be responsible for at least part of the increase in information exposure. Table 16 shows that information about climate and weather, animal husbandry and child nutrition and health – which are EREGS focus areas – increased sharply from baseline to R1. Household assets, aspirations, livestock assets, and livelihood diversification did not increase between baseline and R1 and so did not contribute to the change in the adaptive capacity index. Because of the low factor loading for productive assets (see Appendix B), the increase in productive assets (see values in Table 13), while moderate, nevertheless did not have a big effect on adaptive capacity indices between baseline and R1.

Increases in the transformative capacity index between baseline and R1 are due to increased access to services including health services, access to communal natural resources, FSN in peri-urban areas, and to a lesser extent, governance, according to the relatively high factor loadings of these variables (Table 30). Access to markets and infrastructure did not change so they did not contribute to the increase in transformative capacity.

[50] Separate factor analysis for each survey round showed factor loadings differed in both magnitude and direction (positive or negative) across rounds. Refer to Appendix D for a detailed discussion.
[51] Refer to Appendix D for a detailed description of factor analysis related to resilience capacity indices.

TAKEAWAYS

All three resilience capacity indices increased from baseline to R1. The absorptive and transformative capacity indices continued to increase through R2. Some of the resilience capacity components that make the biggest contribution to overall resilience capacity indices reflect facets of resilience programming that USAID focused on in its Annual Program Statement. These include informal safety nets, disaster preparedness and management, and conflict mitigation, which contributed to increases in the absorptive capacity index; exposure to information and increases in productive asset ownership, which contributed to increases in the adaptive capacity index; and increased agricultural extension and livestock services and improved access to communal resources, which contributed to the increase in the transformative capacity index.

5. Multivariate Analyses

Multivariate analysis, as the name suggests, allows researchers to examine the relationships between more than one independent variable and an outcome. This section presents the results of multivariate analyses of the interrelationship of variables related to shocks, coping strategies, resilience capacities, remittances, and humanitarian assistance, and their effect on outcome variables. The analyses also examine positive deviant households and which resilience capacities and programming are related to their success. The primary goal is to understand the effects of absorptive, adaptive, and transformative resilience capacities on household food security outcomes and recovery.

Analyses of hunger and HFIAS include all households. The analysis of recovery only includes households exposed to drought and/or late or variable rains (n=2353). Household-level control variables used in all equations are household size, age of household head, education of household head, an asset index, and livelihood risk categories. Geographic control variables in all equations are program areas and urbanization status of the community. Survey round is included as a time variable. Program area as a control variable is meant to be a geographic control and is at best, only a rough proxy for USAID programming. Using dummy variables to represent communities as geographic controls was problematic. Bivariate outcomes (hunger and recovery), did not vary within some of the communities (everyone was hungry or no one recovered). Estimation equations would have dropped all households in those communities from the analysis.

Graphs in this section use the results from the estimation equations presented in Annex A, which presents the complete results. In most cases the results show the relationship between baseline and the survey round of interest. The same equations can be used to produce estimates by geographic area, program area, or household characteristic. The figures and discussion cover results that are statistically significant at 0.05 or better.

5.1. Shock Exposure

This section presents findings relating to:

- Research Question 1: *How do the severity and duration of exposure to the shock affect households' ability to recover?*
- Research Question 5: *What are the downstream effects of shocks on households and how do these evolve over the survey period?*

The three graphs in Figure 7 show the relationships between shock exposure and three outcomes (moderate to severe hunger, HFIAS, and recovery) over the RMS rounds. In all three graphs, the number of shocks is plotted along the x-axis. The probability of each expected outcome is plotted along the y-axis. The three lines represent the three RMS rounds. An upward-sloping line indicates that as the number of shocks increases, the outcome value increases; a downward slope indicates that as shocks increase, the outcome value decreases. An increase or decrease is not inherently a "good" or "desired" effect – this depends on the variable. For example, we would wish to see decreasing values for moderate or severe hunger, and increasing values for recovery. Below we explain the significance of the slopes in each of the different graphs. We also call attention to changes across survey rounds, explaining the significance of the relative positions of the lines representing each RMS (i.e., with each subsequent RMS, how does the line change relative to the previous line, and what this indicates regarding the outcome examined).

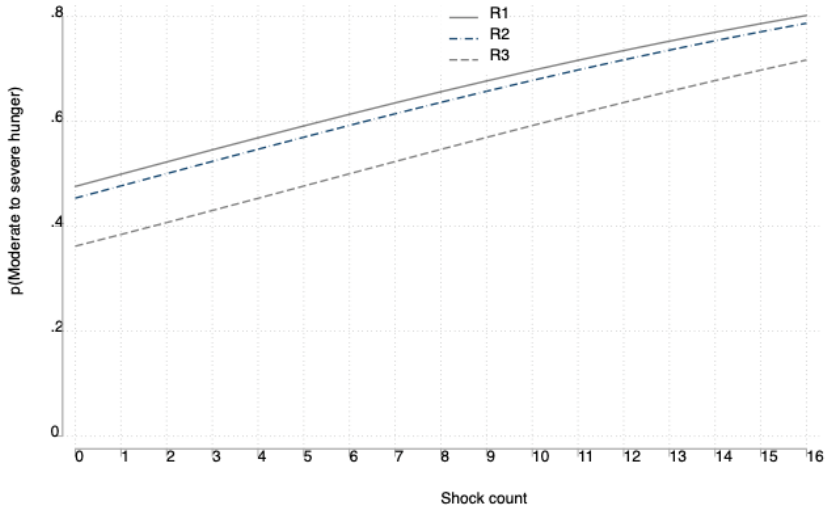
Figure 7a plots shocks against the probability of moderate to severe hunger. The graph shows all three RMS lines sloping upward as they move from left to right along the x-axis, indicating that as shocks increase, hunger increases (worsens). However, we do see some improvement over time, as evidenced by the reductions in hunger level across survey rounds. The R1 line is topmost, indicating that hunger was highest in the first round. The line for each subsequent round is a little lower than the previous one, indicating that hunger is decreasing (though it remains high). The largest improvement (reduction in hunger) is seen between R2 and R3.

Figure 7b plots shocks against HFIAS scores. The upward slope of the RMS lines indicates a direct relationship between shocks and HFIAS: as shocks increase, HFIAS scores increase (worsen). This finding is not surprising and is consistent with the increasing hunger levels shown in graph (a).

Figure 7c plots shocks against the probability of recovery. As with graph (b) on food security, for recovery the desired slope of the RMS would be upward, suggesting increasing rates of recovery. However, similar to the trend seen in food security, we see that recovery levels are lower (all RMS lines slope downward) as the number of shocks increases. Recovery levels varied over time: recovery decreased between R1 and R2 (the line for R2 is lower than the line for R1), then in R3 improved substantially to better than R1 levels (R3 is higher than R1 and as such, the topmost line).

Taking the three graphs in Figure 7 as a group, we see that improvements in outcomes vary over the shock duration. Of note, at R3, some households were just emerging from a drought shock; floods – a common follow-on shock after drought – were just starting, and other downstream impacts of the drought were starting to manifest: while there was no major change in the shock environment at R3, households were still struggling to cope with previous shocks and their aftermath.

Figure 7: Shock exposure and outcomes, by RMS round
a) Shocks and hunger



b) Shocks and HFIAS

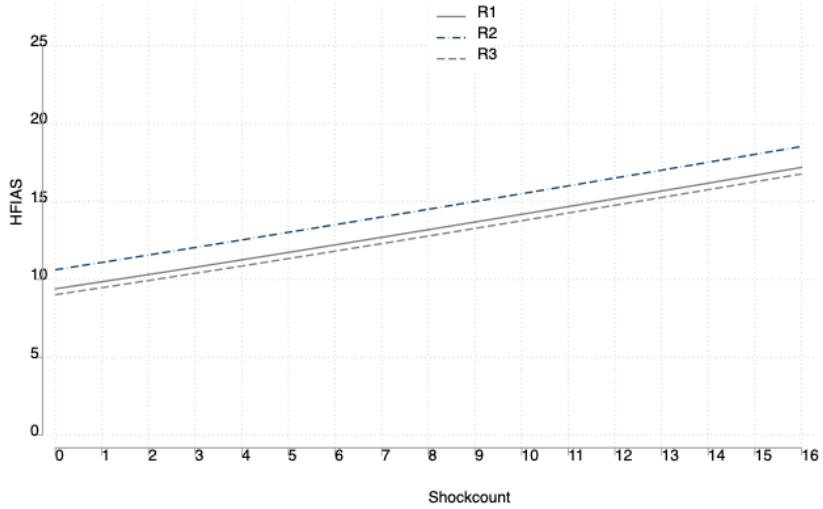
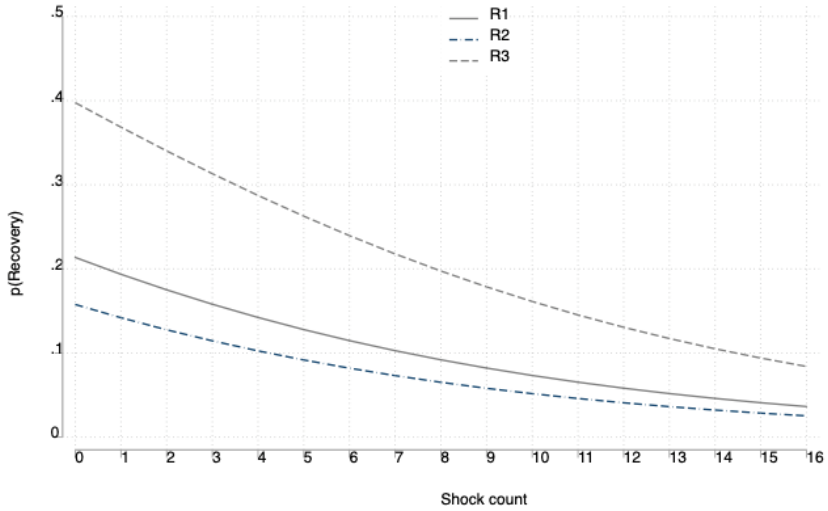


Figure 7: Shock exposure and outcomes, by RMS round
c) Shocks and recovery



Sources: USAID. 2016, 2017. Somalia household surveys.

5.2. Downstream Shocks

A downstream shock refers to a shock caused or triggered by other shocks. In the current context, the initial shock is a climate shock: drought or late rains. Drought has a range of potential consequences, "kicking in" at different times along the drought's trajectory. For example, prolonged lack of water and pasture can lead to livestock weight loss, ill health, and death; herders (often children) may travel longer distances seeking water and pasture – and miss school because they are tending livestock.[52] Downstream shocks may be nearly simultaneous with the onset of the drought, or delayed. Livestock prices may fall because markets are over-supplied with sick and emaciated animals, which is likely to occur after the drought has had time to worsen. Drought can also cause crop failure and food shortages that trigger food price hikes. These shocks would emerge during harvest season, after the onset of drought, which is usually during rainy season. Household members, especially those working in agriculture and livestock, may lose their jobs and be unable to afford to buy food. Failed crops, lack of water, and cash shortages may also mean lower dietary diversity, increased malnutrition, and a higher incidence of diarrheal diseases, measles, and malaria.

We included downstream shocks in the analysis in an effort to address Research Question 5: *What are the downstream effects of shocks on households and how do these evolve over the survey period?* This question generated two related hypotheses:

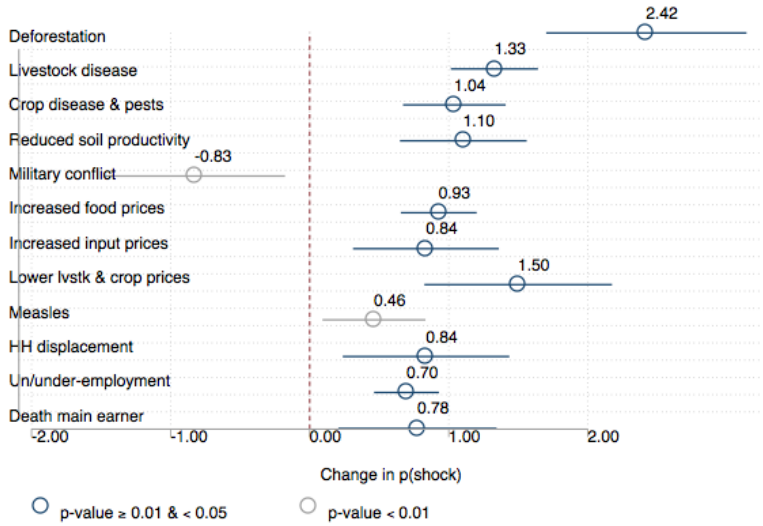
1) Households reporting exposure to drought and/or late or variable rains experienced other kinds of shocks as well; and

[52] TANGO International. 2017. Zimbabwe (ZimVAC) Resilience Research Report. USAID. Center for Resilience (C4R). https://www.fsnnetwork.org/sites/default/files/Zimbabwe%20Resilience%20Research%20Report_FINAL.pdf

2) Exposure to climate shocks also increased the probability of additional shocks later on.

Figure 8 shows the findings relative to the first hypothesis. The equations used for this analysis tested 21 shocks, all considered to be possible downstream shocks after drought and/or late or variable rains. The analysis included the baseline and all three survey rounds. The graph[53] illustrates the change in the probability that households will be exposed to downstream shocks at the same time as they are exposed to drought and/or variable rains. Movement along the x-axis indicates change in the probability of exposure to downstream shocks for households exposed to drought and/or late or variable rains. The position of the small circles indicates the direction of the change in probability (positive/increase vs negative/decrease) and its magnitude (value). Horizontal lines show the confidence interval (95 percent) around the estimate and allow for comparison across shocks. The figure shows that households exposed to drought and/or late or variable rains have an increased probability of exposure to almost all other shocks, with one exception: exposure to drought lowers the probability that a household will experience military conflict. Almost all of the values (except deforestation and military conflict) have overlapping confidence intervals, meaning they are not different from each other.

Figure 8: Climate shocks and downstream shocks



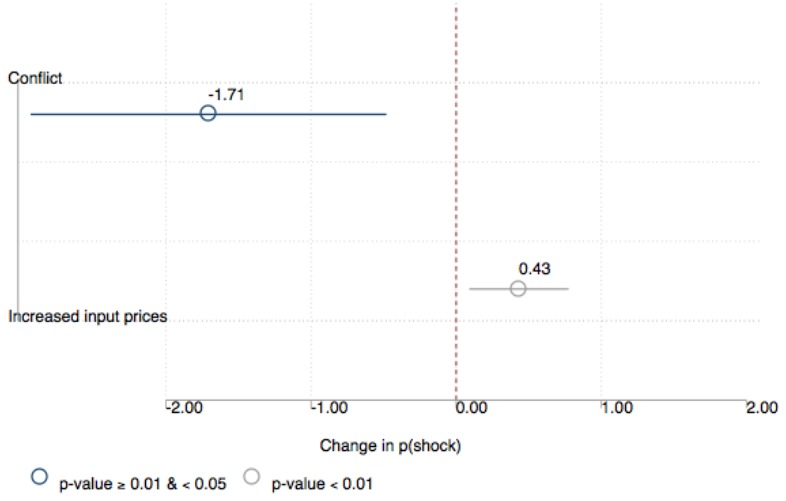
Sources: USAID. 2016, 2017. Somalia household surveys.

The analyses to test the second hypothesis examine whether exposure to drought and/or late or variable rainfall in R1 changes the probability of shock exposure in R2. These analyses use R1 instead of the baseline as a starting point because drought was well established in R1 and 12 months had elapsed since baseline. Almost all households were exposed to drought and/or late or variable rains in R1 and R2 (Table 6), which means that the explanatory variable does not vary, making it difficult to measure differences across households. Figure 9 shows how exposure to drought and/or late or rainfall in R1 or R2 reduces the probability of inter-village conflict in the next round: the

[53] Jann, B. 2014. Plotting regression coefficients and other estimates. The Stata Journal 14(4): 708-737.

probability of conflict is reduced by 1.71. This may suggest that households have worked together to recuperate from the drought – though this would be an important indicator to examine over a longer period, to see whether households respond collaboratively or competitively in a prolonged scenario of scarce resources. Note that households in conflict areas were likely to drop out of the survey, so the data on conflict are incomplete. The analysis also indicates that households exposed to drought and/or late or variable rainfall were also more likely to experience increased input prices in the next survey round.

Figure 9: Drought exposure in R1 and downstream shocks in R2

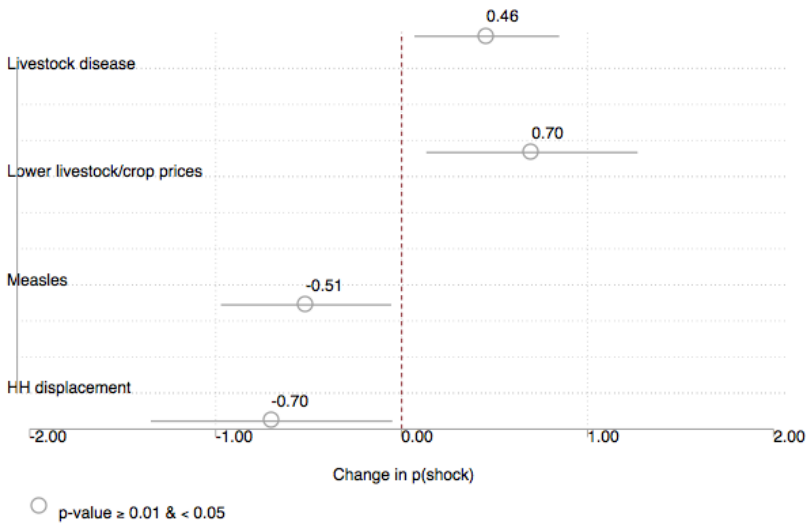


Sources: USAID. 2016, 2017. Somalia household surveys.

Figure 10 shows how exposure to drought and/or late or variable rainfall in R1 affects the probability of exposure to downstream shocks in R3. The probability of livestock disease and lower prices for livestock were higher by 0.46 and 0.70, respectively, for households reporting drought in R1. It is notable that drought exposure in R1 lowered the probability of measles exposure in R3. This may be due to UNICEF targeting drought areas in its widespread vaccination program. The probability of household displacement was also lower in R3 for households reporting drought in R1, which may reflect the targeting of emergency assistance to communities hardest hit by drought.

These large increases in the likelihood of additional future shocks after drought reinforce the notion that an initial climate shock increases exposure to other kinds of risks. This raises the concern that the cumulative effect of exposure to multiple shocks may hinder recovery even when the immediate effects of the initial shock have subsided: the impacts of the climate shock have multiplier effects. Nevertheless, the data indicate that exposure to drought/variable rainfall decreases the probability of exposure to conflict shocks and measles.

Figure 10: Drought exposure in R1 and downstream shocks in R3



Sources: USAID. 2016, 2017. Somalia household surveys.

TAKEAWAYS

Drought-related climate shocks were abating by R3. However, the shock period was not over: households were reporting flooding, which often follows prolonged drought and became widespread across Somalia after the RMS surveys were complete. In addition, drought shocks triggered downstream shocks, and some of these were still increasing in R3.

5.3. Coping Strategies

This section presents results from the analyses of coping strategies, which are the subject of research questions 3, 4 and 10. We analyze each question in sequence.

- Research Question 3: *How does pre-shock household resilience capacity level influence its use of different types of coping strategies during and after a shock?*

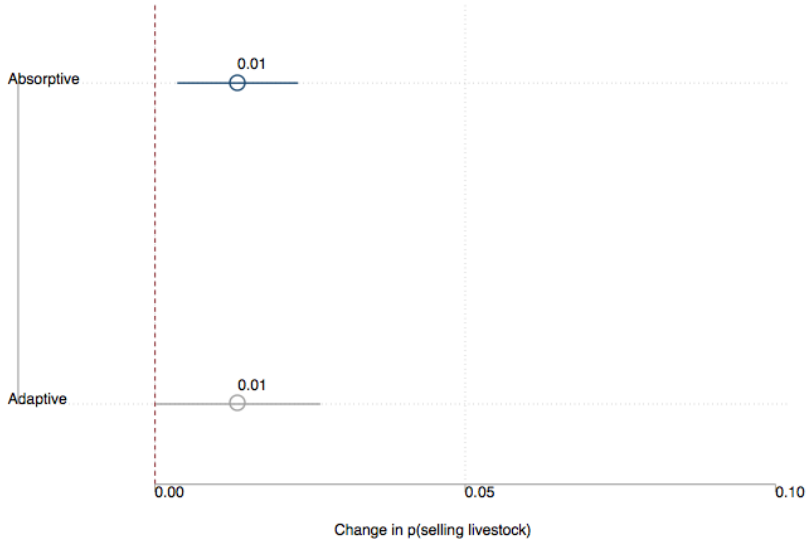
The associated hypothesis is that baseline resilience capacity changes the probability that a household will engage in a coping strategy during or after a shock. For the equations relating to this research question, the dependent variables are coping strategies used by households exposed to drought and/or late or variable rains. The explanatory variables are absorptive, adaptive, transformative capacities at baseline, and total shocks. The equations also include control variables. The analysis involved 90 equations covering 30 coping strategies and three resilience capacity indices. Complete results are presented in Annex A. This section presents the three statistically significant results.

At the time of the R3 survey, the "after the shock" period had not yet started. Droughts and late or variable rainfall were waning, but some downstream shocks were at peak levels and the share of

households reporting exposure to flooding had started to rise. We therefore cannot address this research question in terms of the post-shock period; results from the analysis reflect the "during the shock" period.

The two figures below show the change in the probability that a household will engage in a coping strategy when there is a 10-point increase in baseline levels of each resilience capacity index. Figure 11 analyzes livestock sales. It consolidates results from two equations. As illustrated in the figure, 10-point increases in baseline levels of absorptive and adaptive resilience capacities increased the probability that a household would sell livestock in R1; however, results were not statistically significant in later RMS rounds. The reason why the two capacities influence the use of livestock sales as a coping strategy is that they include livestock assets as a component; absorptive capacity also includes whether a community has a livestock-destocking program. It should follow that households with livestock and a destocking program in their community are more likely to sell livestock than households that have neither.

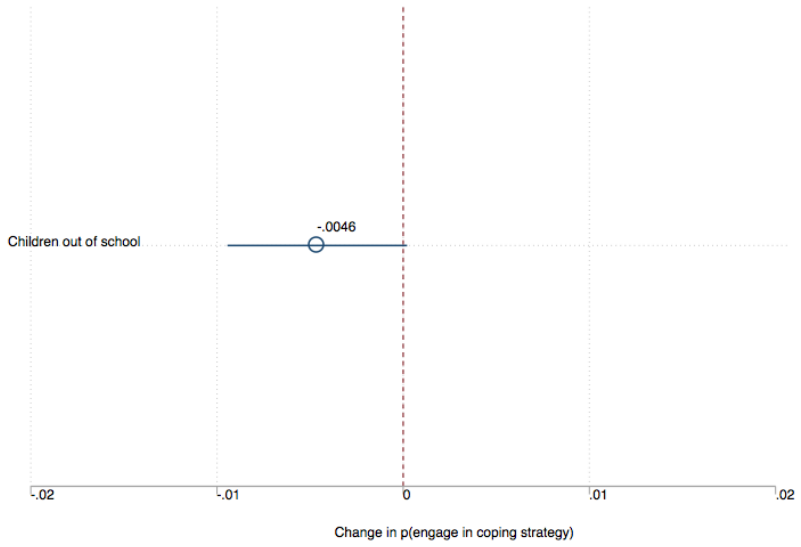
Figure 11: Effects of a 10-point increase in baseline absorptive and adaptive capacity indices on the probability of selling livestock in R1



Sources: USAID. 2016, 2017. Somalia household surveys.

Figure 12 shows that a 10-point increase in the baseline transformative capacity index benefits households by lowering the probability that a household will take children out of school in R1.

Figure 12: Effect of a 10-point increase in transformative capacity index on the probability of removing children from school in R1



Sources: USAID. 2016, 2017. Somalia household surveys.

TAKEAWAYS

Of the many equations estimating the relationship between baseline resilience capacity indices and coping strategies, few yielded statistically significant results. Baseline absorptive, adaptive, and transformative resilience capacities influenced different strategies to cope with drought in R1. Higher absorptive and adaptive resilience capacities increase the probability that a household will sell livestock. Higher transformative capacity reduces the probability that households will remove children from school.

- Research Question 4: *Which coping strategies are associated with households successful in recovering from shocks?*

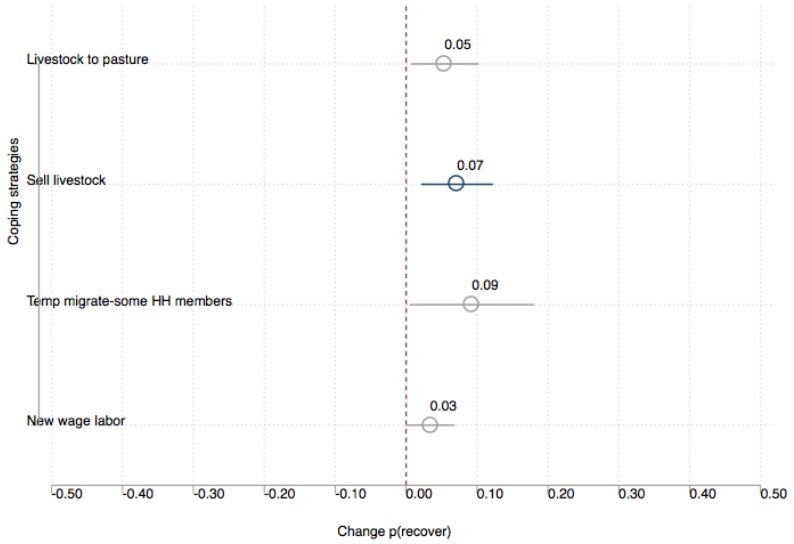
The equations to address Research Question 4 use three outcome measures as dependent variables: moderate to severe hunger, HFIAS, and recovery from drought and/or late or variable rains. Explanatory variables are coping strategies and shock exposure. The equations also include control variables. The results showed few statistically significant relationships. Some of the coping strategies may be linked to USAID programming, such as household savings, CFW/FFW and food aid.

From the equations estimating the probability of household hunger as a function of coping strategies, one statistically significant result emerged. Taking children out of school is associated with higher probabilities of moderate to severe hunger. The equations estimating HFIAS found that removing children from school is associated with an increase in HFIAS of about 1.5 points.

Permanent migration of family members reduced HFIAS. However, less than 1 percent of households reported this as a coping strategy.

Recovery. Figure 13 shows the coping strategies that improve the probability of recovery. These are sending livestock to pasture, selling livestock, temporary migration of some household members, and taking up new wage labor. All had similar relationships to recovery, increasing the probability by about 0.05.

Figure 13: Coping strategies and recovery



Sources: USAID. 2016, 2017. Somalia household surveys.

TAKEAWAYS

Removing children from school is associated with a higher probability of moderate to severe hunger and higher HFIAS. Permanent migration improves HFIAS. Sending livestock to pasture, selling livestock, temporary migration of some household members, and taking up new wage labor all increase the probability of recovery from drought and/or late or variable rains.

Research Question 2 asks how resilience capacities affect well-being outcomes. This question examines a more detailed resilience pathway, asking how capacities can improve outcomes, by influencing coping strategies:

- Research Question 10: *Do the absorptive, adaptive, and transformative resilience capacities support constructive response strategies that support households' ability to maintain or improve their well-being in the face of shocks and stresses?*

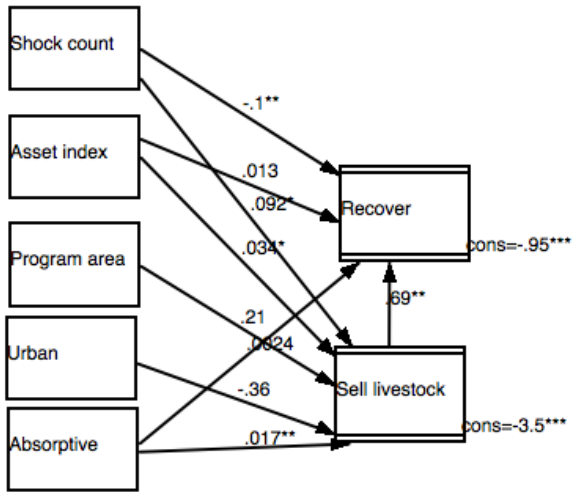
Because it has two parts, the estimation equation is more complicated. We used GSEM to answer this question. Results from research questions 3 and 4 provide a starting point; we limited this analysis to statistically significant relationships identified in those equations. Figure 11 (above) shows

how higher baseline levels of absorptive resilience capacity increase the probability that a household will sell livestock in R1. Figure 13 (above) links coping strategies and recovery and shows that selling livestock increases the probability of recovery. Research questions 3 and 4 provided estimates of the "direct effect" of an explanatory variable on an outcome. The equations used in Question 3 estimate the effect of each resilience capacity on a coping strategy ($RC \rightarrow CS$). Question 4 estimates the effect of using a coping strategy on well-being outcomes ($CS \rightarrow WB$). Path analysis combines the two equations and provides estimates of the "indirect effect" of each resilience capacity on well-being outcomes, mediated by coping strategies $RC \rightarrow CS \rightarrow WB$.

This section uses equations from questions 3 and 4 with statistically significant results. The combined equation computes (1) the effect of baseline absorptive capacity on the probability that a household will sell livestock in R1, and (2) the effect of selling livestock on recovery in R1. These results provide estimates of the indirect effect of absorptive resilience capacity on recovery, as mediated by livestock sales.

Figure 14 illustrates the results from the estimation equation. Only variables that were statistically significant ($p<0.05$) are included in the diagram. The values on the lines are coefficients (log-likelihoods) from the estimation question. Coefficients are combined to compute the indirect effects of absorptive capacity on the probability of recovery, mediated by selling livestock. The results show that absorptive capacity, mediated by livestock sales, increases the probability of recovery by 0.001. This is a statistically significant but very small effect.

Figure 14: Path diagram of baseline absorptive capacity, selling livestock and recovery in R1



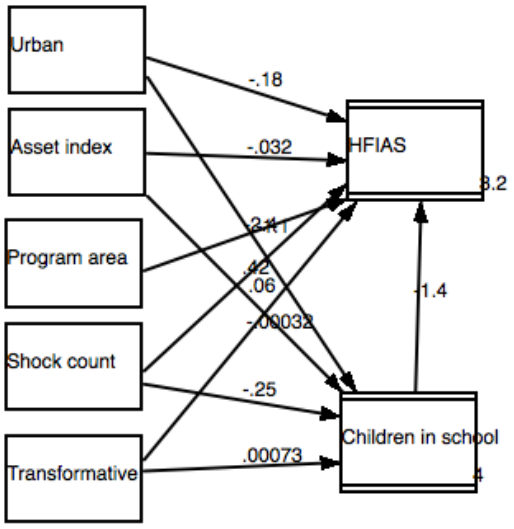
Sources: USAID. 2016, 2017. Somalia household surveys.

A similar analysis combines two findings presented previously: (1) removing children from school worsens HFIAS by 1.5 (Figure 12) and (2) baseline transformative capacity lowers the probability that a household will remove children from school in R1. To make better sense of this relationship,

we reverse-coded *taking children out of school* by subtracting it from one, creating a variable equal to one if households kept children in school (Figure 15). The hypothesis becomes: higher levels of baseline transformative capacity increase the probability that households will keep children in school in R1, which in turn, lowers HFIAS in R1. The equations estimate the effect of baseline transformative capacity, mediated by keeping children in school, on HFIAS.

The results show that again, coefficients are very small. The decrease in HFIAS due to transformative capacity mediated by keeping children in school is less than 0.1. Even though the effects are small, the results in this section improve our understanding of resilience pathways: resilience capacities affect well-being outcomes, mediated by coping strategies.

Figure 15: Path diagram of baseline transformative capacity, keeping children in school and HFIAS in R1



Sources: USAID. 2016, 2017. Somalia household surveys

TAKEAWAYS

This analysis provides empirical evidence of one hypothesized resilience pathway, that resilience capacities, mediated by coping strategies, influence well-being outcomes.

This section presents results from a series of multivariate regression equations testing the hypotheses that baseline resilience capacities and their components buffer the negative effects of shocks on well-being outcomes. These analyses allow us to answer research questions 2, 13, and 14:

- Research Question 2: *How do levels of resilience capacities before the onset of the shock improve households' ability to recover?*
- Research Question 13: *What are the specific components of the resilience capacities that help protect households from shocks?*
- Research Question 14: *Are different capacities more important for different types of shocks?*

The estimation equations used in this analysis include interaction terms to statistically test whether the resilience capacity indices and index components mitigate the negative effects of shocks on well-being outcomes.[54] The equations tested the effects of the indices at baseline and at each RMS round. These equations use three variables to measure shocks and resilience capacities: the resilience capacity index (or one of its components), shock exposure, and the interaction between shock exposure and the resilience capacity index (or one of its components). The equations also include control variables. The interaction terms are computed by multiplying shock exposure by the resilience capacity index (or component). Signs on the coefficients (positive or negative) indicate the relationship between explanatory variables and outcomes. If recovery is the outcome, the expected sign on shock exposure is negative, meaning that increases in shock exposure worsen recovery. The expected sign on the resilience capacity index is positive, meaning that higher levels of resilience capacity improve recovery. The expected sign on the interaction term is also positive, meaning that as shocks worsen, the resilience capacity provides extra protection against shocks.

Where the equations yielded interaction terms with a significance level of <0.05, the sign of the shock and resilience capacity interaction variables was the opposite of the hypothesized sign. The findings using this estimation model indicated that as shock count increases, HFIAS, hunger and recovery outcomes worsened fastest for households with higher levels of resilience capacities. Given that these findings are counter to the hypothesis – we would expect outcomes to improve for households with higher resilience – we explored an alternative estimation model that was better suited to the data.

Likelihood ratio tests[55] showed that omitting interaction terms from the equations better fits the data. We therefore modified the estimation equations to exclude the interaction terms. The discussion below presents the results using the modified equations.

- Research Question 2: *How do levels of resilience capacities before the onset of the shock improve households' ability to recover?*

To answer this question, we examined changes in the relationship between baseline scores on each of the three resilience capacities and hunger, HFIAS, or recovery outcomes in all three RMS rounds. Annex A presents the complete results of the analysis.

Baseline Absorptive Capacity and Outcomes

In Figure 16, the probability of moderate to severe hunger is plotted on the y-axis; higher values indicate higher probability (worse conditions). Baseline values for absorptive capacity are plotted on the x-axis at percentile intervals: the farther to the right, the higher the absorptive capacity. To interpret changes in the relationship of household hunger to baseline levels absorptive capacity, the

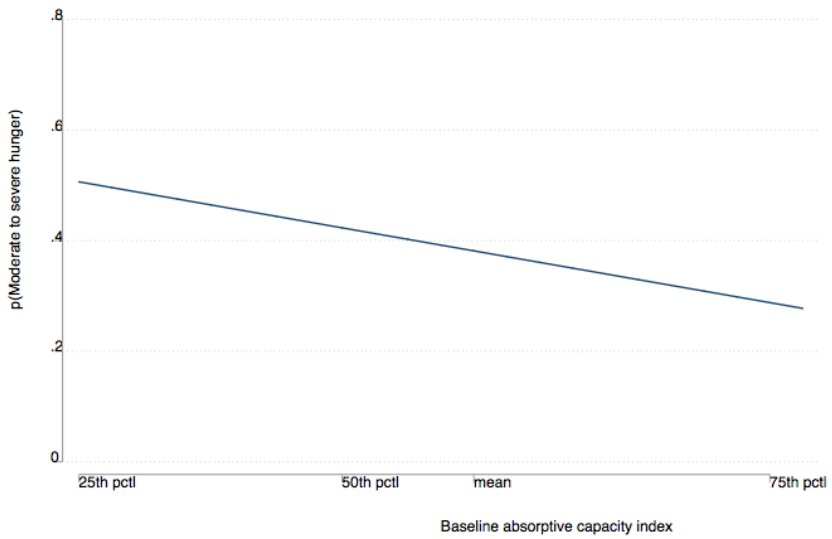
[54] Complete results are presented in Annex A.

[55] Likelihood ratio (LR) tests can be used compare the goodness of fit of two models where one model is a simpler (constrained) version of the second (unconstrained). In this study, LR tests compared models without interaction terms (coefficients of interaction terms were constrained to be zero) to unconstrained models with interaction terms. The formula: $LR=-2[(\text{log-likelihood})_c - (\text{log-likelihood})_u]$ produces a statistic, LR, with a chi-square (χ^2) distribution and degrees of freedom equal to the number of additional parameters (interaction terms) in the unconstrained model. When LR is not statistically significant ($p<0.05$), the most parsimonious model is preferred. In this study, the constrained model, without interaction terms, is the most parsimonious. Greene, W.H. 1993. Econometric Analysis, Second Edition, New York: Macmillan Publishing Company.

downward sloping line indicates that the more (higher) absorptive capacity households have at baseline, the lower the probability that they will experience moderate to severe hunger in R2. Moving from the 25th percentile of absorptive resilience capacity at baseline to the 75th percentile decreases the probability of moderate to severe hunger by almost half, from 0.51 to 0.37.

There are no statistically significant effects in R3, indicating that baseline levels of absorptive capacity are not high enough to reduce hunger in the late stages of a prolonged drought. A possible explanation for this is the presence of prolonged or repeated shocks, and/or the onset of downstream shocks – circumstances, which if they persist, require higher levels of absorptive capacity to overcome, compared to early stages with fewer downstream shocks.

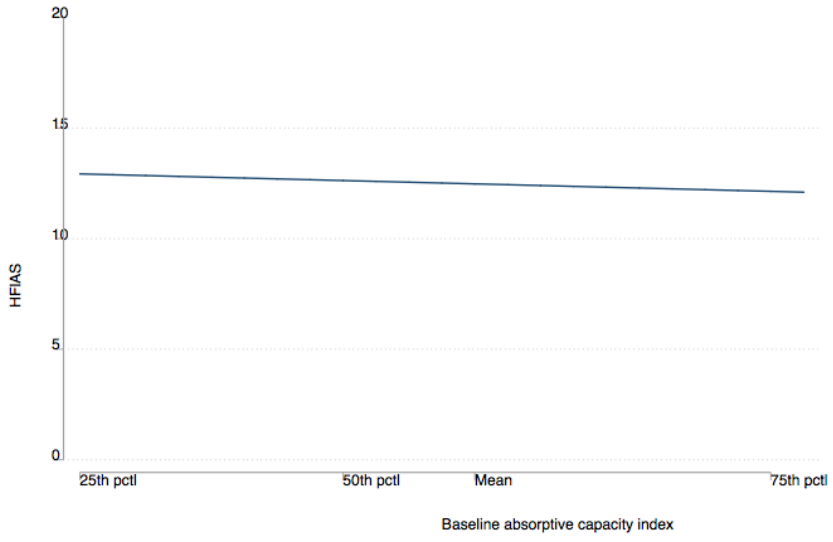
Figure 16: Baseline absorptive capacity and hunger in R2



Sources: USAID. 2016, 2017. Somalia household surveys.

As shown in Figure 17, baseline absorptive capacity also reduces HFIAS in R2: moving from the 25th to 75th percentile of the baseline absorptive capacity index reduces HFIAS from 12.9 to 12.4 (on a scale of 0-27). Even though the result is statistically significant, the effect is small.

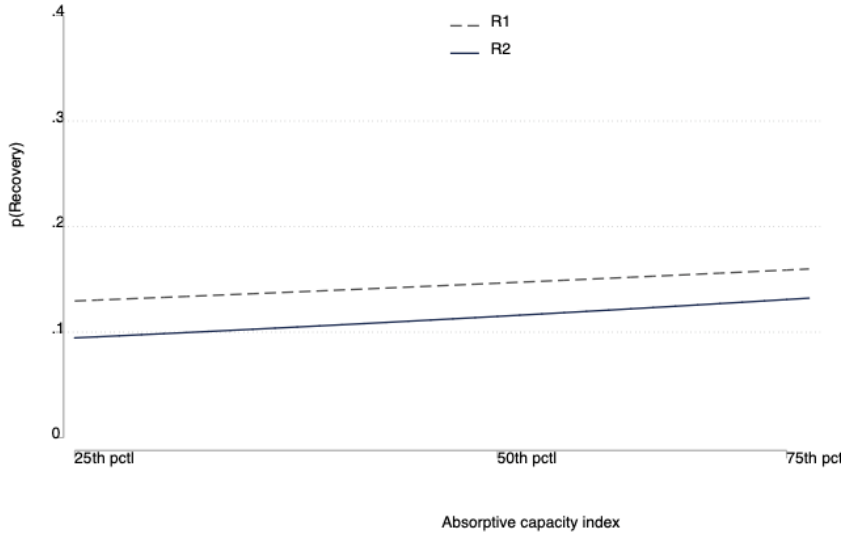
Figure 17: Baseline absorptive capacity and HFIAS in R2



Sources: USAID. 2016, 2017. Somalia household surveys.

Figure 18 shows that baseline absorptive capacity increases the probability of recovery in R1 and R2. Moving from the 25th to 75th percentile of baseline absorptive resilience capacity increases the probability of recovery from 0.08 to 0.11 in R1 and 0.12 to 0.14 in R2. There are no statistically significant results for R3.

Figure 18: Baseline absorptive capacity and recovery in R1 and R2

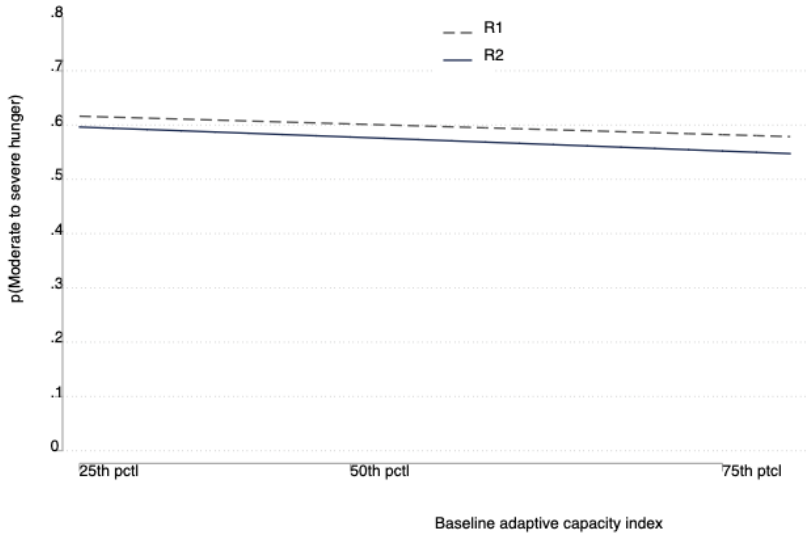


Sources: USAID. 2016, 2017. Somalia household surveys.

Baseline Adaptive Capacity and Outcomes

Higher levels of baseline adaptive capacity lowered the probability that a household experienced moderate to severe hunger in both R1 and R2. Figure 19 illustrates that the higher the baseline level of adaptive capacity, the lower the chance of moderate to severe hunger. Moving from the 25th to 75th percentile of baseline adaptive capacity lowered the probability of moderate to severe hunger from 0.61 to 0.58 in R1 and from 0.59 to 0.56 in R2.

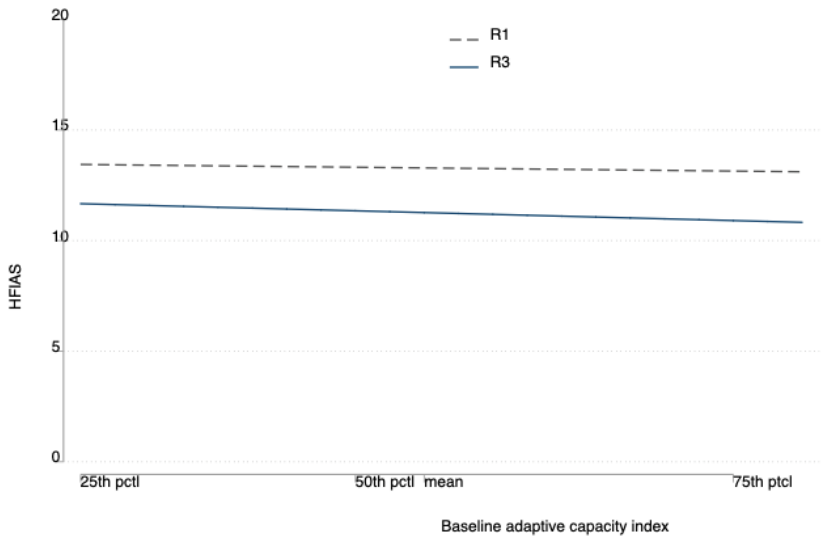
Figure 19: Baseline adaptive capacity and hunger in R1 and R2



Sources: USAID. 2016, 2017. Somalia household surveys.

Figure 20 displays the findings regarding baseline adaptive capacity and HFIAS. Baseline levels of adaptive capacity improve HFIAS in R1 and R3. The effect is statistically significant but very small (illustrated by the slope of the line, which is downward though slight). Moving from the 25th percentile to the 75th percentile of baseline adaptive resilience capacity reduces HFIAS in R1 from 13.4 to 13.1, and in R3 from 11.7 to 10.8.

Figure 20: Baseline adaptive capacity and HFIAS in R1 and R3

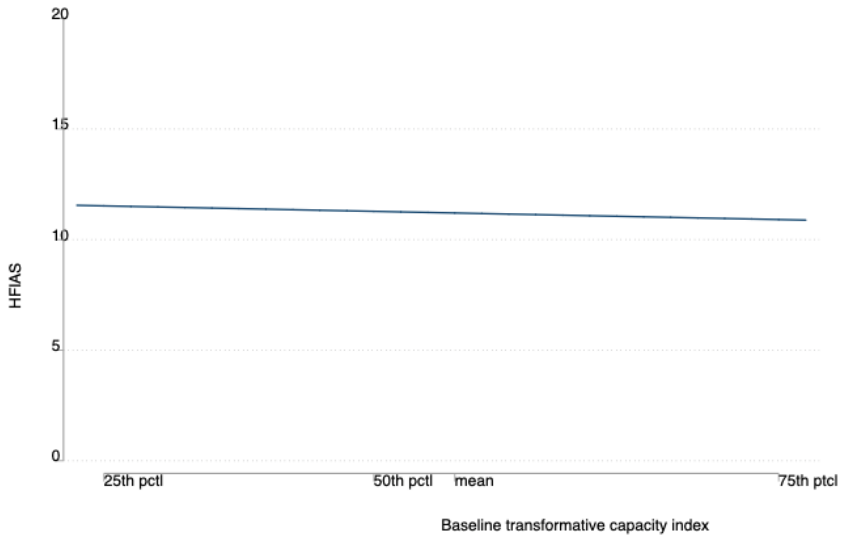


Sources: USAID. 2016, 2017. Somalia household surveys.

Baseline Transformative Capacity and Outcomes

Figure 21 shows that baseline levels of transformative resilience capacity lead to lower HFIAS scores in R3, but the effects are small. In R3, as households move from the 25th to 75th percentile of transformative capacity, HFIAS decreases from 11.5 to 10.9.

Figure 21: Baseline transformative capacity and HFIAS in R3



Sources: USAID. 2016, 2017. Somalia household surveys.

Discussion

As noted in the previous section, all capacities increased between baseline and R1 (Table 19) and were higher than baseline in all RMS rounds. In addition, while the probability of both hunger and recovery both improved significantly in R3 (see Table 10 and Table 8), according to the analysis, baseline levels of resilience capacities does not explain these outcomes.

We thus return to the results from the estimation equations, which can also test whether resilience capacities in R1 and R2 affected hunger and recovery in R3. The results indicate that absorptive capacity in R1 reduced the probability of moderate to severe hunger in R3, indicating that higher than baseline levels of absorptive capacity are required to reduce hunger during late stages of a drought. Absorptive capacity in R1 and R2 increased the probability of recovery in R3. Adaptive capacity in R1 and R2 reduced the probability of moderate to severe hunger in R3.

TAKEAWAYS

Baseline levels of resilience capacities continue to improve outcomes for more than 12 months into the shock exposure period:

- Baseline absorptive capacity improved hunger and recovery in R1 and R2 and HFIAS in R2.
- Baseline adaptive capacity improved hunger in R1 and HFIAS in R1 and R3.
- Baseline transformative capacity improved HFIAS in R2 and R3.

Baseline levels of resilience capacities did not contribute to the lower prevalence of hunger and improvements in recovery seen in R3. However, higher levels of absorptive and adaptive capacities (measured at R1 and R2) affected those improvements.

More detailed analysis of the relationship between resilience capacity indices and outcomes provides an answer to Research Question 13:

- Research Question 13: *What are the specific components of the resilience capacities that help protect households from shocks?*

Testing individual components of resilience capacity indices against hunger, food security, and recovery outcome variables showed that different components influenced outcomes in R1, R2, and R3. This section deepens that analysis, organized by resilience capacity index. Discussion of each resilience capacity starts with a table identifying which of the components was statistically significant, the direction of change in the outcome variables in regression equations, and the level of statistical significance.

Absorptive capacity components. Table 20 shows the results from equations estimating the effect of components of absorptive capacity on the probability of moderate to severe hunger, HFIAS and the probability of recovery from drought and/or late rains. Of the baseline household-level components, household assets improved all three outcomes: hunger and HFIAS in all RMS rounds and recovery in R2. Livestock assets improved all three outcomes in R2.

Of the baseline community-level components, conflict mitigation improves all three outcomes in R2. Informal safety nets improved HFIAS and recovery in R2. Because VSLA and SILC programs are

components of ISN and a USAID program focus, the analysis looked specifically at the role of savings and micro-credit groups such as VSLA/SILCs on well-being outcomes. Even though ISN was not statistically significant, having a micro-credit group in a community at baseline improved outcomes in R2, reducing the probability of hunger from 0.56 to 0.46 and lowering HFIAS by 1.6. Having a VSLA group increased the probability of recovery in R1 (from 0.14 to 0.18) and in R2 (from 0.14 to 0.24). Disaster preparedness and mitigation is another focus area for all three USAID programs. Increasing the types of baseline disaster management programming from 0 to 4 improved the probability of recovery from 0.09 to 0.22 in R2.

Table 20: Baseline absorptive capacity components and outcomes, by survey round

	p(Moderate to severe hunger)			HFIAS			p(Recovery from drought/late rains)		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
Household-level components									
SC bonding									
Remittances									
Livestock assets		↓**			↓**			↑*	
HH assets	↓***	↓***	↓***	↓***	↓***	↓***		↑***	
Savings									
Community-level components									
Informal safety nets					↓***			↑***	
Disaster preparedness and mitigation								↑***	
Conflict mitigation		↓*			↓*			↑***	
Finance/insurance	↓*				↓*				

Asterisks denote levels of statistical significance: * p<0.05, ** p<0.01, *** p<0.001
For hunger and HFIAS, down arrows indicate improvement. For recovery, up arrows indicate improvement. Asterisks indicate level of statistical significance. Coefficients (estimates of the magnitude of change) are provided in Annex A.
Sources: USAID. 2016, 2017. Somalia household surveys

Adaptive capacity components. Table 21 follows the structure of the previous table; all components of the adaptive capacity index are household-level measures. Higher levels of education and training at baseline reduced the probability of moderate to severe hunger in R1. Most households (70.5 percent) received no information at baseline but access to information, (an EREGS program focus) reduced HFIAS and increased the probability of recovery in R1. Higher baseline scores on the aspirations index increased HFIAS and reduced the probability of recovery in R1. Note that this is opposite of the expected result. Higher productive assets at baseline, measured as a weighted index, reduced the probability of hunger in R2 and lowered HFIAS in R3.

Table 21: Baseline adaptive capacity components and statistical significance in estimation equation results, by survey round

	p(Moderate to severe hunger)			HFIAS			p(Recovery from drought/late rains)		
Components	R1	R2	R3	R1	R2	R3	R1	R2	R3
SC bridging									
SC linking									
Education and training	↓*								
Livelihood diversification									
Information exposure				↓*			↑***		
Aspirations				↑*			↓*		
Productive assets		↓**				↓**			
Livestock assets (TLU)	included in absorptive capacity								
HH assets	included in absorptive capacity								

Asterisks denote levels of statistical significance: * p<0.05, ** p<0.01, *** p<0.001
Sources: USAID. 2016, 2017. Somalia household surveys

Transformative capacity components. As shown in Table 22, baseline levels of formal safety nets increased the probability of moderate to severe hunger in R3 and increased the probability of recovery in R2. Access to health and education services at baseline reduced the probability of moderate to severe hunger.[56]

Table 22: Baseline transformative capacity components and statistical significance in estimation equation results, by survey round

	p (Moderate to severe hunger)			HFIAS			p(Recovery from drought/late rains)		
Components	R1	R2	R3	R1	R2	R3	R1	R2	R3
Formal safety nets			↑*					↑**	
Access to markets									
Access to infrastructure	↓*			↓*					
Access to services		↓*	↓***		↓***	↓***			
Access to ag extension services					↓*				
Access to veterinary services									
Access to communal resources			↓*			↓***	↓**		
Governance									↑*

Asterisks denote levels of statistical significance: * p<0.05, ** p<0.01, *** p<0.001
Sources: USAID. 2016, 2017. Somalia household surveys

[56] Moving from 0 to 5 on the access to services index reduced the probability of hunger in R2 from 0.64 to 0.47 and in R3 from 0.67 to 0.23. Baseline access to services reduced HFIAS from 13.7 to 10.4 in R2 and from 13.1 to 8.3 in R3. Access to agricultural extension services at baseline reduced HFIAS in R2. Moving from 0 to 2 on the scale reduced HFIAS from 12.4 to 10.8.

TAKEAWAYS

The findings suggest that household assets can improve all three well-being outcomes throughout a drought. They also suggest that beside assets, different capacity components are important at different times. This may be because resources become exhausted as the drought worsens, or different components come into play as downstream shocks worsen. For example, the data indicate that access to health centers is more important as disease outbreaks worsen, and conflict mitigation planning became more important as conflicts increase.

The findings also suggest that elements of development programming (EREGS and other donors) helped to improve outcomes when drought exposure was highest. These include access to information, infrastructure and services, conflict management and disaster risk reduction planning.

Research Question 14 examines the relationship between resilience capacities and outcomes in more detail:

- Research Question 14: *Are different capacities more important for different types of shocks?*

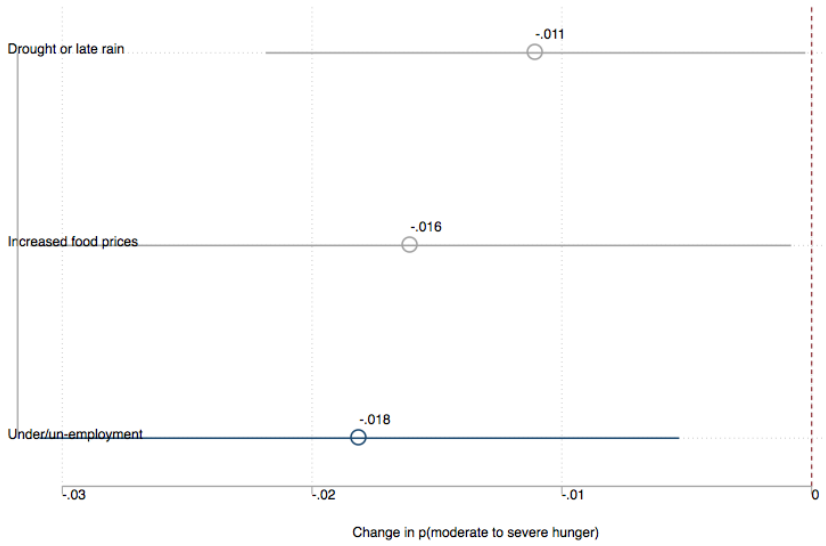
These analyses examine the relationship between exposure to specific types of shocks and the three resilience capacity indices. This analysis focused on the following top 10 shocks:

- **Crop and livestock shocks:** livestock disease, crop disease and pests, low soil productivity
- **Economic shocks**: food price fluctuations, increased input prices, lower livestock/crop prices, un/underemployment
- **Health shocks:** measles, chronic illness (malaria, TB), cholera/diarrhea

The equations were the same as those used to answer research questions 2 and 13 (page 1). The dependent variables are the three well-being outcomes, with separate equations for each resilience capacity. However, this analysis included only households exposed to each of the 10 shocks (9 equations x 10 shock types, for a total of 90 equations). Complete results for all equations are presented in Annex A.

Figure 22 shows the decrease in the probability of moderate to severe hunger for a 10-point increase in baseline absorptive capacity with respect to different shocks for which results were statistically significant. Shock exposure was used as a control variable. The results show that a 10-point increase in absorptive capacity leads to a decrease in the probability of moderate to severe hunger of about 0.01.

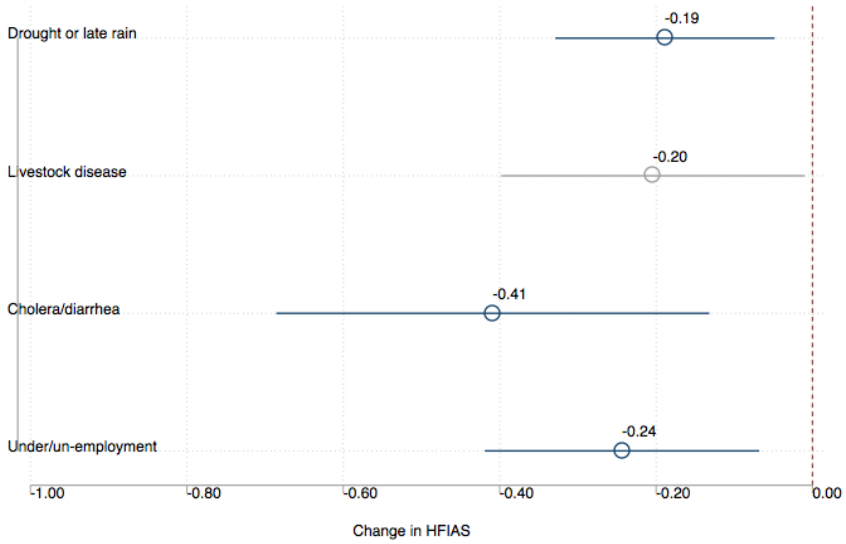
Figure 22: Effect of baseline absorptive capacity on hunger in R1



Sources: USAID. 2016, 2017. Somalia household surveys.

Figure 23 shows the reduction in the probability of moderate to severe hunger for a 10-point increase in baseline adaptive capacity with respect to different shocks for which results were statistically significant. The results show that such an increase leads to a 0.01 decrease in the probability of moderate to severe hunger. These findings mean that baseline absorptive capacity reduces the probability of moderate to hunger in RMS 1 for households exposed to livestock disease, cholera or diarrhea, or un/under-employment.

Figure 23: Effect of adaptive capacity on hunger in R1



Sources: USAID. 2016, 2017. Somalia household surveys

5.4. Humanitarian Assistance

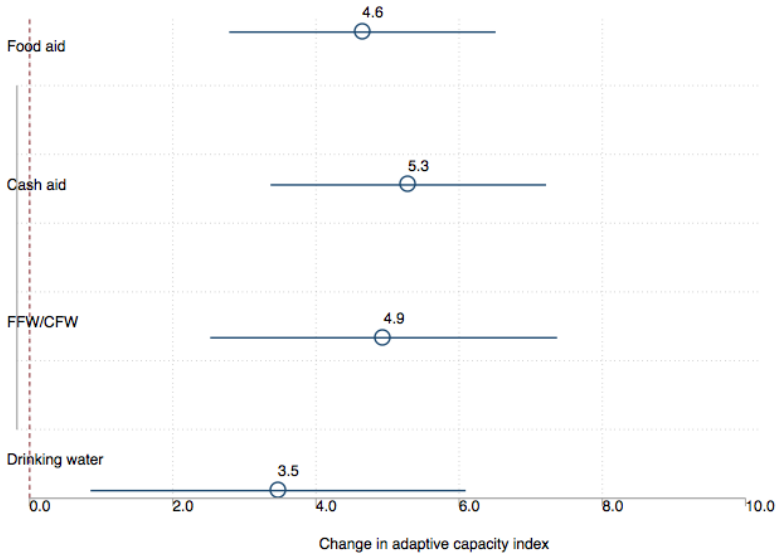
Two research questions address humanitarian assistance:

- Research Question 8: *How does humanitarian assistance support resilience capacity in promoting recovery after shock?*
- Research Question 9: *Are recovery profiles for households receiving humanitarian assistance different for households with differing levels of pre-shock resilience capacities?*

To answer the first question, we examined the effects of different levels of humanitarian assistance on absorptive, adaptive, and transformative capacities. The statistically significant results are that access to irrigation water increases absorptive capacity index scores by 2.5.

Food aid, cash aid, FFW/CFW and access to drinking water all improved adaptive capacity. Figure 24 illustrates that for each of these types of humanitarian assistance, the adaptive capacity index score increases by about 4.5 points, a trend that remains steady over all three RMS rounds.

Figure 24: Effect of different types of humanitarian assistance on adaptive capacity



Sources: USAID. 2016, 2017. Somalia household surveys

Research Question 9 adds outcomes to the analysis of humanitarian assistance. The equations estimated well-being outcomes based on baseline levels of the three resilience capacity indices and receipt of food and/or cash assistance and/or CFW/FFW. In these equations, the humanitarian assistance variables are measured in the same survey round as outcomes.

The analysis found that baseline levels of the three resilience capacities were not statistically significant in the equations estimating moderate to severe hunger or HFIAS for households receiving humanitarian assistance. However, some types of humanitarian assistance were associated with improved outcomes (results not graphed). Food aid reduced the probability of experiencing

moderate to severe hunger by 0.06. FFW/CFW, drinking water, and/or access to irrigation water all lowered HFIAS (reflecting increased food security), but the change was very small: a decrease in HFIAS of less than 1 point for each type. HFIAS increased (reflecting worsened food security) for households that received cash assistance – an unexpected finding. Equations estimating recovery did not yield any statistically significant results for humanitarian assistance variables.

TAKEAWAYS

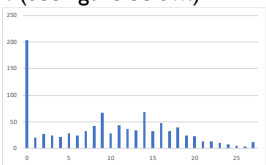
Different elements of humanitarian assistance increase absorptive and (more so) adaptive resilience capacity index scores and reduce hunger, though the effects are very small. Surprisingly, HFIAS scores were higher (worse) for households receiving cash assistance.

5.5. Positive Deviants

- Research Question 12: *Depending on households' capacities and responses, are some types of households better able to maintain their food security in the face of the shock?*

The hypothesis relating to this research question is that households with greater levels of all types of resilience capacity will experience fewer negative impacts from shocks and recover more quickly. This analysis identifies households that have fared well or whose outcomes have improved despite the intensity and duration of the drought. This study identifies three types of "positive deviant" households based on the three well-being outcomes. Households can be positive deviants in terms of (1) hunger, (2) food security or (3) recovery from drought and/or late or variable rains. Hunger-positive deviant households are those that report little to no hunger and sustain that status through remaining survey rounds. Table 23 shows that 15.1 percent of households meet the first criterion: they reported little or no hunger at baseline and all subsequent survey rounds. Similarly, food-secure-positive deviant households are those categorized as "food secure" (using HFIAS categories Table 9) and their categorization does not worsen in later rounds.[57] Recovery-positive deviants are households that reported recovery from drought and/or late or variable rains and whose status did not change in remaining rounds.

[57] Other studies (Frankenberger, T and L. Smith. 2015) defined positive deviant households as households whose well-being outcomes improved or stayed the same (did not worsen). The dependent variable is computed as the change in the outcome between two rounds. It is equal to HFIAS at baseline subtracted from HFIAS at a later round. In this sample, computing change between two rounds as the difference between the two scores is mathematically incorrect because of the way the scores are distributed. HFIAS scores range from 0-27 and approximately 20 percent households have an HFIAS equal to 0 at the baseline. These households can only change in one direction. (See figure below.)



Similarly, using HFIAS categories, we cannot determine whether the status of the ~62 percent of households categorized at the bottom of the scale as "severely food insecure" at baseline worsened because there is no lower category. Because HFIAS has a lower percentage of observations at the limit of the range (censored observations) than does the HFIAS categories variable, we tested equations defining positive deviants as households that maintained or improved their HFIAS score and sustained improvements over subsequent rounds. None of the capacities is statistically significant in the estimation equations.

Table 23 shows the percentage of positive deviant households in each survey round. Percentages increase because the denominator in the definition (remaining survey rounds) decreases. This is controlled for in the estimation equations by using survey round as a variable.

Table 23 Positive deviant households, by survey round

	Baseline		R1		R2		R3	
	%HH	*n*	%HH	*n*	%HH	*n*	%HH	*n*
Hunger	15.1	976	21.3	976	33.7	602	52.1	568
Food secure	2.6	971	5.6	976	7.0	602	8.6	568
Recover	0.0	366	7.3	926	10.1	565	37.7	496

Source: USAID. 2016, 2017. Somalia household surveys.

Multivariate regression analysis did not show any of the three resilience capacities to increase the probability that a household is a positive deviant. However, some of the control variables did. Households with more assets are more likely to be positive deviants in all three areas (hunger, food security and recovery). Urban and peri-urban households are more likely to be hunger-positive deviants than are rural households. Households in the STORRE program area are more likely to be hunger- and food-secure positive deviants than households in PROGRESS or REAL program areas.

Examination of the relationship between humanitarian assistance and positive deviants shows that various forms of humanitarian assistance increased the probability of being a hunger-positive deviant and a recovery-positive deviant:

- Food aid increases the probability of being a hunger-positive deviant by 0.06 and being a recovery-positive deviant by 0.02.
- Provision of drinking water increases the probability of being a recovery-positive deviant by 0.05.
- Providing access to irrigation services increases the probability of being a recovery-positive deviant by 0.07.

These findings indicate that humanitarian assistance can protect households that are no longer experiencing moderate to severe hunger and are recovering from drought and/or late or variable rains to maintain these statuses.

TAKEAWAYS

Humanitarian assistance can protect households that are no longer experiencing moderate to severe hunger and are recovering from drought and/or late or variable rains to maintain these statuses.

Research Question 16 addresses household remittances.

- Research Question 16: *How do households that receive remittances respond differently to shocks with respect to impacts, coping strategies, and recovery?*

This question has three components: how remittances affected shock impacts; how remittances affected coping strategies; and how remittances affected the three well-being outcomes.

None of the estimation equations yielded statistically significant results.[58] The equations tested remittances from either (1) within or outside Somalia or (2) outside Somalia (only). Dependent variables were whether a household experienced a shock (23 shocks), coping strategies (30) and outcomes (3). Lagged values of remittances (i.e., the household received remittances in the prior survey round) were the main explanatory variables.

The estimation equations for this question did not yield any statistically significant relationships; this is more likely due to poor data reliability than to the lack of an underlying relationship, as a much smaller share of households surveyed in this RMS reported remittances than in similar surveys. Because the data do not reliably measure remittances, there is no way to accurately measure their effect on shock exposure, coping strategies, or outcomes.

TAKEAWAYS

Estimation equations did not yield any statistically significant relationships between remittances and well-being outcomes. This is more likely due to poor data reliability than to the lack of an underlying relationship.

Research Question 17 addresses diaspora funding for schools, health centers, and veterinary clinics:

- Research Question 17: *Is private investment, common in Somalia for public services such as schools and health services - including community-level investment from the diaspora - an effective substitute, in the context of community resilience and the mitigation of shock exposure on outcomes, for an underdeveloped public sector?*

The findings about diaspora investment in public services are based on responses to an RMS community survey question about funding sources for building primary and secondary schools, health centers, and veterinary facilities. The data indicate that this kind of investment was minimal in the sample area. None of the health or veterinary centers in the surveyed communities had been built using funds from Somalians living outside of Somalia. One community reported that Somalis living outside Somalia funded construction of the secondary school. Two communities in R1 and R2 reported that the diaspora funded construction of the primary school and in R3; two more communities reported that they built a primary school using diaspora funding.

A determination regarding the effectiveness of diaspora-funded services as substitutes for public sector would require an examination of the quality of those services – an assessment that is beyond the scope of this survey. Moreover, the survey did not collect information regarding publicly funded services, so there is no empirical basis for determining the level of development of the public sector in the sample area, and thus the need that the diaspora may potentially fill.

[58] Complete results are in Annex A.

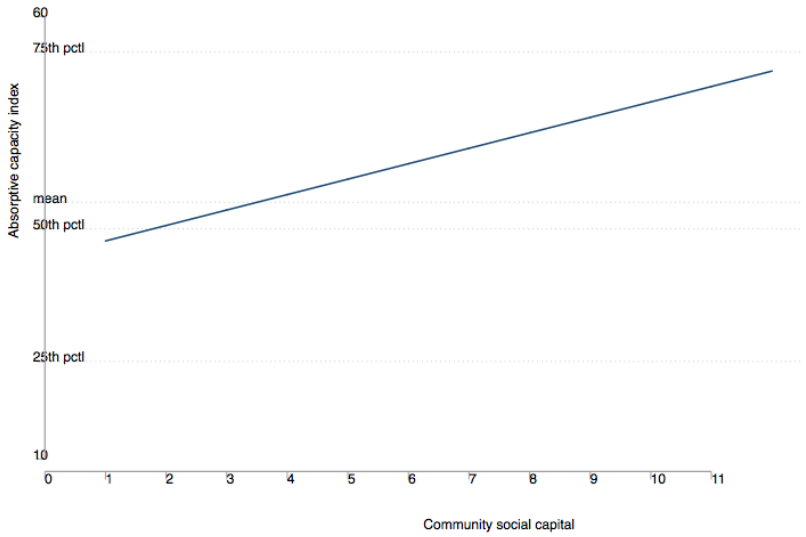
5.6. Relationships between Household and Community Resilience Capacities

Research questions 6 and 7 address the relationship between household and community resilience capacities:

- Research Question 6: *How do community resilience capacities support household resilience capacities and outcomes?*
- Research Question 7: *How do household resilience capacities support community resilience capacities and outcomes?*

The analysis for Research Question 6 estimates changes in adaptive and absorptive capacities associated with increases in community social capital (Table 18). Questions about community social capital were included in the RMS rounds only, and ask about the frequency of community-level meetings, events, and celebrations. The equations estimate the relationship between the absorptive resilience capacity index, adaptive resilience capacity index and community social capital in the same survey round. The significant results, graphed in Figure 25, are that for each type of meeting or event that meets more than three times per year, the absorptive capacity index increases by about 1.75 (on a scale of 0-100). The relationship is statistically significant but the change is small.

Figure 25: Changes in the absorptive resilience capacity index associated with community social capital



Sources: USAID. 2016, 2017. Somalia community and household surveys.

Question 7 uses survey information about household participation in the following 12 activities over the past 12 months:

- Protecting crop land from flooding
- Protecting structures from flooding/landslides
- Soil conservation (terracing, gully improvement, bunds)
- Reforestation
- Improving access to drinking water
- Improving access to electricity
- Improving access to health services
- Improving road quality
- Forming cooperative
- Improving/repairing market infrastructure
- Education or schools/education supplies
- Providing support through zakat

The equations tested whether higher levels of participation (i.e., participation in more types of activities) were associated with increases in the transformative capacity index. Figure 26 shows that each additional activity increases the transformative capacity index by about 2.6. As with absorptive capacity, the change is small.

Figure 26: Household participation in collective action activities and transformative capacity

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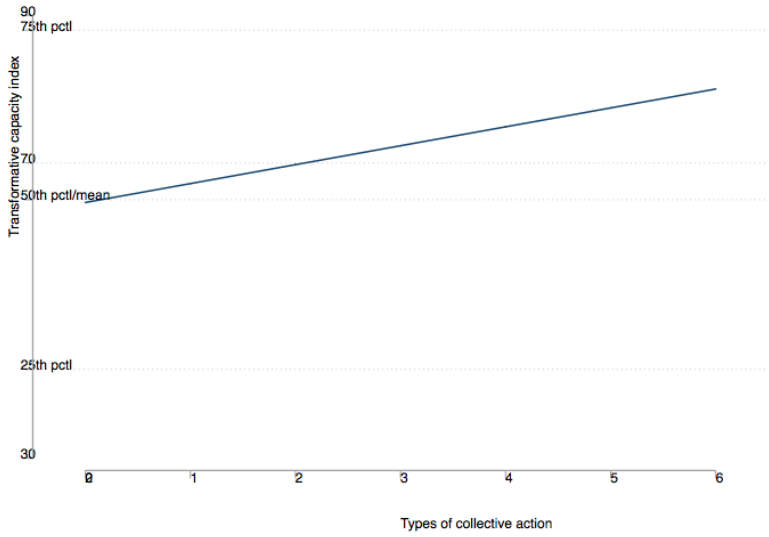


Sources: USAID. 2016, 2017. Somalia community and household surveys

TAKEAWAYS

Household participation in community-level meetings, events and celebrations increases absorptive capacity. Similarly, household participation in group activities increases transformative capacity. Both relationships are statistically significant but the effects are small.

6. Summary

This research studied household responses to shocks over a two-year period (2016-2018) using data from a baseline survey and three RMS rounds of household and community surveys. The sample covered households participating in three projects under the EREGS program in Somalia. The overall purpose of the research was to examine what factors influenced household resilience; the analysis sought to address 17 specific research questions around this theme. The study period spanned a drought from its onset to near its end.

Starting in mid-2016, households began to report the effects of what became a severe and prolonged drought. The drought was followed by a complex array of downstream shocks affecting agriculture and livestock, prices, employment and health. After 18 months, the drought began to ease, but it was followed by severe flooding. Downstream shocks from the drought continued and flooding set off its own series of downstream shocks.

Household food (in)security was at its worst in R1 and R2. Household hunger decreased in R3, but was still higher than baseline level.

Households were resilient in terms of recovery: recovery from drought and/or late or variable rains was higher in all RMS rounds than at baseline. The largest share of households reporting recovery was in R3.

Absorptive, adaptive and transformative capacity index values increased from the baseline (early stages of drought) until well into the drought. These resilience capacities increased even though households were drawing down assets. Resilience programming was shown to account for higher levels of resilience capacities; however, this study cannot attribute improvements to a specific donor. Elements of programming that contributed to resilience capacities are provision of tools and equipment to farmer, VSLAs, information, conflict mitigation and disaster risk management planning, and formal safety nets.

Resilience capacities were lowest at the start of the drought, but contributed to improved outcomes in R1 and R2. However, baseline levels resilience capacities did not explain changes in R3. The increases in resilience capacities that occurred during the drought (R1 and R2) improved outcomes in late stages of drought (R3).

A summary of the results of analysis, organized by research question, is presented below.

6.1. Shock Exposure

How does the degree of exposure to specific shocks affect households' ability to recover from those shocks?

The study examined three shock measures: drought, measured using AFDM satellite data; self-reported shock exposure – a count of up to 23 different shocks; and self-reported shock impact – the impact of each of the 23 shocks on food consumption. All three showed that higher levels of shock exposure worsened households' ability to recover, as measured by moderate to severe hunger, HFIAS, and recovery from drought and/or late or variable rains.

What are the downstream effects of shocks on households and how do these evolve over the survey period?

Households were beginning to report drought in the baseline survey, when overall shock exposure was at its lowest (1.7). The RMS surveys did not start until 12 months after the baseline, so we do not know how downstream shocks evolved during that time. However, RMS data do show that households experienced shocks in addition to drought, with a mean of around five shocks per household during RMS rounds. As the percentage of households reporting drought and/or late or variable rainfall fell in R3, exposure to downstream economic, crop and livestock, and health shocks continued to rise. Price shocks, health shocks and employment shocks were at their highest levels in R3.

6.2. Coping Strategies

How does pre-shock household resilience capacity level influence its use of different types of coping strategies during and after a shock?

This question focuses on baseline levels of resilience capacity indices. Higher levels of baseline absorptive and adaptive capacities increase the probability that a household sold livestock in R1. Higher levels of transformative capacity lower the probability that a household will remove children from school. This is a good outcome because removing children from school is a negative coping strategy with adverse long-term impacts. This study cannot address the final part of the question regarding "after a shock" because shock exposure was still high in R3.

Which coping strategies are associated with households' success in recovering from shocks?

Sending livestock to pasture, selling livestock, temporary migration and taking up new wage labor all increased the probability of recovery from shocks.

How do households respond to shocks, and how do these response strategies change over time?

> *In particular, what are the relationships between resilience capacity, asset destocking as a shock response strategy, and recovery?*
>
> *Do the absorptive, adaptive, and transformative resilience capacities support constructive response strategies that support households' ability to maintain or improve their well-being in the face of shocks and stresses?*

The purpose of the analysis around these questions was to provide empirical evidence for a resilience pathway whereby the effect of resilience capacities on well-being is mediated by coping strategies. These questions were addressed using GSEM to estimate the relationships between resilience capacities, coping strategies, and outcomes. The statistically significant results from earlier equations estimating the relationships between resilience capacities and coping strategies, and between coping strategies and outcomes, provided information to specify the models. The results confirm that resilience capacities, mediated by coping strategies, affect well-being. However, the effect is quite small.

6.3. Resilience Capacities and Outcomes

How does resilience capacity, both household and community, change over time?

Factor analysis found that all resilience capacity indices increased between baseline and R1. This is noteworthy, considering that by R1 households were deep into a prolonged drought. The absorptive capacity index rose again in R2 and remained steady through R3. Much of the increase was due to improvements in community-level capacities, which have higher factor scores (weights) in the computation; the increases may also be attributed to interventions in areas that are components of community-level capacities (VSLA/SILC credit and savings groups, disaster preparedness and management, and conflict mitigation, which are USAID program foci).

Adaptive capacity rose between baseline and R1 then dropped in R2, where it remained steady through R3. The initial increase in adaptive capacity was due to higher levels of bridging social capital, information exposure, and education and training. Exposure to information about climate and weather, animal husbandry and child nutrition and health – all USAID program areas – increased sharply from baseline to R1. The increase in bridging social capital between baseline and R1 may be due to changes in the survey questions that increased data reliability.

The transformative capacity index rose between baseline and R1, continued to increase in R2, and then dropped in R3. Increased agricultural extension services, livestock services and access to communal resources contributed to the increase. These are also USAID program areas.

How do levels of resilience capacities before the onset of the shock improve households' ability to recover?

Baseline levels of absorptive, adaptive, and transformative resilience capacities were measured 12 months before the first RMS round. USAID programs were being implemented for around two years prior to the baseline survey, so the baseline resilience capacity indices measure some but not all of the effects of programming. All three capacities were higher in the RMS rounds than at baseline. Baseline levels of absorptive and adaptive capacity were found to improve well-being outcomes in RMS rounds. Baseline absorptive capacity lowered the probability of moderate to severe hunger and reduced HFIAS in R2. It increased the probability of recovery in R1 and R2. Baseline adaptive capacity reduced hunger in R1 and R2 and reduced HFIAS in R1 and R3. The higher levels of resilience capacity measured at R1 and R2 lead to fairly large improvements in hunger and recovery in R3.

What are the specific components of the resilience capacities that help protect households from shocks?

Household-level components. Household assets, a component of both absorptive and adaptive capacity indices, is the only component that improves hunger and HFIAS in all three rounds; it also improves recovery in R2. Livestock assets, also a component of both absorptive and adaptive resilience capacity indices, improved all three outcomes in R2. Productive assets increased in R1 and reduced the probability of hunger in R2. USAID programming between baseline and R1 that included providing agricultural tools to farmers.

Baseline information exposure improved HFIAS and recovery in R2. Information about early warning, climate, rainfall, animal health, market prices, and child nutrition accounted for most of the increase; these are components of EREGS and other programming. Baseline levels of aspirations, a component of adaptive capacity, worsened HFIAS and recovery in R1 – findings that are opposite of the expected result.

Community-level components. Nearly all community-level indicators were at or near their lowest levels at baseline (Table 18). The exceptions were access to markets and infrastructure. This analysis showed three kinds of relationships between community-level indicators and well-being outcomes:

(1) Even low levels of some community-level resilience capacity components were found to improve outcomes. While formal financial services and insurance were accessible in only a few communities at baseline, access to these services at baseline (which was 0.02 on a scale of 0-2) reduced the probability of moderate to severe hunger in R1. Similarly, even though disaster preparedness and mitigation levels were lowest at baseline, households in communities with disaster preparedness and mitigation plans at baseline had higher levels of recovery in R2. Higher values for the disaster preparedness and mitigation indicator in R1 and R2 improved recovery in R3.

(2) Improving well-being outcomes required higher than baseline values of indicators. We see this with ISNs. Baseline levels of ISN did not affect well-being outcomes in any of the RMS rounds, but ISN levels in R1 and R2 improved outcomes in later rounds.

(3) Different resilience capacity components were important at different times, such as when the drought worsened, or when downstream shocks were triggered. Conflict mitigation indicator values did not change significantly over the survey rounds. However, having a functioning conflict and mitigation committee improved outcomes: this reduced hunger and HFIAS and increased the probability of recovery in R2 and R3, when exposure to conflict shocks was at its highest level (Table 6). Access to services (health centers and schools) at baseline reduced hunger and lowered HFIAS in R2 and R3. The importance of access to health services in particular may have become more important as health shocks worsened.

The analysis looked specifically at VSLA/SILC groups, which are ISN components and USAID program areas, to see their impact on the three outcomes. Even though baseline levels of ISN did not have a statistically significant effect in the equations estimating hunger, VSLA/SILC micro-credit groups, analyzed separately, lowered the probability of moderate to severe hunger in R2.

Are different capacities more important for different types of shock?

The data indicate that none of the capacities are more or less important for responding to any type of shock.

6.4. Humanitarian Assistance

How does humanitarian assistance support resilience capacities in promoting recovery after shock?

About two-thirds of households reported receiving food aid, cash aid, FFW/CFW or drinking water during the RMS rounds. Receipt of any one type of assistance increased the adaptive capacity index by about 4.5. Receiving more than one type of food or cash assistance (not overlapping, but sequentially) also increased adaptive capacity.

Are recovery profiles for households receiving humanitarian assistance different for households with differing levels of pre-shock resilience capacities?

The analysis found that when humanitarian assistance[59] and baseline levels of the three resilience capacities are all included in equations estimating moderate to severe hunger and HFIAS, the resilience capacities indices were not statistically significant. However, some types of humanitarian assistance were associated with improved outcomes (results not graphed). Food aid reduced the probability of experiencing moderate to severe hunger by 0.06. FFW/CFW, drinking water, and/or access to irrigation water all lowered HFIAS (reflecting increased food security), but the change was very small: a decrease in HFIAS of less than 1 point for each type. HFIAS increased (reflecting worsened food security) for households that received cash assistance – an unexpected finding which may reflect program targeting since cash assistance and HFIAS were measured in the same survey round. Equations estimating recovery did not yield any statistically significant results for humanitarian assistance variables.

6.5. Positive Deviants

How does household food security change over the shock period? Depending on households' capacities and responses, are some types of households better able to maintain their food security in the face of the shock?

This analysis examined positive deviant households, which were defined for each of the three well-being outcomes. Hunger-positive deviant households had achieved little to no hunger in one of the survey rounds and maintained this status through remaining rounds. Food-secure-positive deviant households are those that achieved food security (based on HFIAS categories) and maintained it through remaining rounds. Similarly, recovery-positive deviants had recovered from drought and/or late or variable rains and maintained their recovery through remaining rounds.

The data do not indicate that any of the three resilience capacities increases the probability of being a positive deviant. However, humanitarian assistance increases the probability of being a hunger-positive deviant and a recovery-positive deviant. In addition, drinking water and access to irrigation services provided as part of humanitarian assistance increase the probability of being a recovery-positive deviant.

6.6. Remittances

How do households that receive remittances respond differently to shocks – with respect to impacts, coping strategies, and recovery?

Analysis of shock impacts, coping strategies, and the three outcome variables did not yield statistically significant results. This is more likely because remittances were underreported and erratically reported than because there is no relationship between the variables.

6.7. Private Investment

Is private investment, common in Somalia for public services such as schools and health services - including community-level investment from the diaspora - an effective substitute, in the context of community resilience and the mitigation of shock exposure on outcomes, for an underdeveloped public sector?

[59] In these equations, the humanitarian assistance variables are measured in the same survey round as outcomes.

Too few communities reported that they received diaspora funding for public services to enable an analysis of its effects on community resilience and outcomes.

6.8. Household and Community Resilience

How do household resilience capacities support community resilience capacities?

This study uses the indicator *community social capital* to measure community resilience capacity. *Community social capital* is an index (range 0-11) reflecting how many of the following types of meetings and activities occur more than three times per year (Table 18):

- private or family celebrations
- community celebrations
- mosque
- friends and family activities
- meetings of clan elders (betw. clans)
- women's organizations
- community organizations
- tea shops
- market places
- khat-chewing clubs
- sporting events

Participation in the listed meetings and activities typically reflects bonding social capital, though because the survey question does not ask the respondent to specify whether the meeting or activity is within one's own community or outside of it, there may be a few that additionally (or alternatively) reflect bridging social capital.

The analysis indicates that the community social capital index was initially low but rose to 5.1 in R3, a moderate level of social capital. Additional analysis shows that with each additional type of meeting or gathering, there is a statistically significant but small increase of 1.75 in the absorptive capacity index (range 1-100). Community social capital was not statistically significant in equations estimating adaptive capacity, nor was it significant as a predictor of moderate to severe hunger, HFIAS, or recovery.

How do household resilience capacities support community resilience capacities?

Household resilience capacity is measured as household participation in up to 12 community activities (collective action). Participation in one additional activity is associated with an increase of 2.6 in the transformative capacity index (range 0-100). This was the only statistically significant finding for this question.

6.9. Social Capital

How do revised measures of social capital more accurately reflect the relationships between social capital in the Somali context, household resilience capacity, and outcomes?

Presnall, et al.[60] and other reviewers of the baseline report noted that the high percentages of households reporting that they had no one on whom they could rely or with whom they could share was contrary to qualitative findings from the baseline survey and to findings from other

[60] Presnall, C., P. Finan, M. Vallet, and P. Sutter in *Social Capital in Somalia* Discussion Paper (March 2017)

studies. Possible explanations were: high and consistent exposure to shocks, increasing conflict, rapid price increases, mistrust, decreases in remittances, and household reluctance to report what they are receiving. After the baseline, this study revised survey questions related to social capital to address people's reluctance to reveal resources they have received. Data collected since the baseline indicate that the revised questions improved social capital measures. Two findings provide evidence: (1) Comparing the RMS survey rounds to the baseline shows that far fewer households in RMS rounds than baseline reported "no one" that they could help or on whom they could rely (Table 36). This is consistent with other research showing high levels of social capital in Somalia. (2) Looking at the RMS rounds separately from the baseline shows a decline in bonding and bridging social capital over the course of the drought. The second finding is consistent with other studies showing that social capital is depleted during a drought. It also indicates that baseline levels were under-reported: If social capital is depleted during a drought, values should have been highest at baseline.

The way social capital information was captured in the baseline may have affected the resilience capacity indices and the larger analysis. Bonding social capital contributes conceptually to the resilience capacity indices. This study used baseline values from factor analysis to compute indices. Baseline bonding social capital did not have a positive factor loading in the computation of baseline absorptive capacity and so was not included in the index. The negative factor loading may have been due to baseline data collection. If factor analysis had been conducted at each round, bonding would have been included.

Despite the improvements in the social capital data and analysis, its measurement may still be incomplete, if we assume that access to social capital improves well-being outcomes. In separate equations using bonding and bridging social capital to estimate the three well-being outcomes, neither was statistically significant. Similarly, and counter to expectation, community social capital was not statistically significant in similar equations.

How to improve the measurement of social capital should be part of a broader discussion, including pre-testing questions in an interview setting to learn how respondents understand the intent of the questions and to make sure that translations are correct. Additional analysis should include looking at borrowing (cash and non-cash) in the context of social capital[61]. RMS survey rounds should include a qualitative component[62]..

7. Programmatic Implications

The complex and shifting array of shocks indicates that programming should focus on more than the initial drought shock. Programs need to factor in the totality of the shock environment, especially the downstream effects of drought that continue long after the drought is over.

One lesson learned was that as the drought was waning, reports of conflict and trade disruptions increased (Table 6). At the same time, social capital measures were at their lowest. These findings

[61] Ibid.
[62] Ibid.

suggest that a programming goal should be to strengthen and leverage conflict mitigation mechanisms and nurture the social bonds and mechanisms required for trade to function .

Another important finding is that informal safety nets improved well-being outcomes. More detailed analysis of ISNs showed that VSLAs were the most important element of ISNs for improving outcomes. Few households reported cash savings, and savings was quickly depleted during the drought. These results suggest that programming to expand access to cash before and at the start of a drought could prevent households from engaging in negative coping strategies.

Access to information was also found to increase resilience and improve outcomes. Yet the share of households reporting that they received information is still very low. Programming should expand both the types of information provided and the ways to provide information.

Finally, based on the evidence presented here, that food/cash assistance and development programming helped to improve well-being outcomes, programming should continue to layer humanitarian assistance and development programming in shock-prone contexts.

8. Research Recommendations

Recommendation 1: Conduct an additional survey round to determine whether the improved outcomes seen in R3 continued after the drought and after EREGS programming ended. In the analysis, compare the continued positive deviant households with households that failed to maintain gains.

Recommendation 2: Re-run parts of the analysis using resilience capacities that were recomputed at each round (see Appendix D). Recomputed indices may be more accurate predictors of well-being outcomes (yielding more statistically significant relationships between indices and outcomes).

Recommendation 3: Expand resilience measurement and analysis into urban areas. This will require customizing data collection and computation methods for urban areas.

Recommendation 4: Include a qualitative research component in RMS studies. For this study, focus group discussions or key informant interviews could have explained anomalies in remittance data, changes in the social capital measures and whether diaspora funding for public services mitigates the effects of shocks. It could have also provided contextual information about out-migration—who is leaving and why—and about other donor funded programs operating during the drought.

Appendix A: Computing Food Security Indicators

This appendix describes the computation of food-security-based measures of well-being: the Household Food Insecurity Access Scale (HFIAS) and the Household Hunger Scale (HHS). The computation of both measures follows indicator guidelines.[63] The HFIAS is based on household access to food and responses to shortages in access to food over a 30-day recall period. This indicator is based on the household's: (1) perceptions of uncertainty over food access in the past 30 days; (2) perceptions of insufficiency in quantity and quality of food over the past 30 days; (3) reported reductions in food intake; and (4) reported consequences of reductions in food intake. An HFIAS score variable is calculated for each household by summing the codes for each frequency-of-occurrence question (see Table 24). The maximum score (27) corresponds to the highest level of food insecurity (access); the minimum score (0) corresponds to the lowest level.[64] Households are classified into different food security categories using information from the HFIAS: food secure, mildly food insecure, moderately food insecure, and severely food insecure.

The last three of the nine questions used for the HFIAS (Table 24) provide data to compute the HHS and the percentage of households experiencing moderate to severe household hunger.[65]

Table 24: HFIAS frequency-of-occurrence questions

In the past 30 days how often did you or were you:
1) …worry that your household would not have enough food
2) …not able to eat the kinds of foods you preferred
3) …eat a limited variety of foods
4) …eat some foods that you really did not want to eat
5) …have to eat a smaller meal than needed
6) …eat fewer meals in a day
7) …have no food to eat of any kind in your household
8) …go to sleep at night hungry
9) …go a whole day and night without eating anything

Responses: rarely (value = 1), sometimes (value = 2), often (value = 3)

[63] Coates, J., A. Swindale and P. Bilinsky. 2007. Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3). Washington, D.C.

[64] Maximum value = household response to all nine frequency-of-occurrence questions is "often," coded with a response code of 3. Minimum value = household responds "no" to all occurrence questions or frequency-of-occurrence questions were skipped by the interviewer; coded as 0.

[65] Ballard, T., J. Coates, A. Swindale, and M. Deitchler. Household Hunger Scale: Indicator Definition and Measurement Guide. Washington, DC: Food and Nutrition Technical Assistance II Project, FHI 360.

Appendix B: Coping Strategies by Urban, Peri-Urban and Rural

Table 25: Coping strategies, by urban, peri-urban and rural

Survey round	Coping strategy	Urban		*n*	Peri-urban		*n*	Rural		*n*
Baseline	Livestock to pasture	17.1	a	*170*	12.0	b	*25*	32.7	ab	*171*
R1		7.5	a	*411*	7.9	b	*139*	21.0	ab	*376*
R2		5.5		*256*	10.6		*104*	9.3		*205*
R3		6.1	ab	*244*	17.6	a	*85*	15.6	b	*167*
Baseline	Sell livestock	2.4	ab	*170*	12.0	a	*25*	12.3	b	*171*
R1		7.5		*411*	13.7		*139*	10.6		*376*
R2		5.9		*256*	5.8		*104*	6.8		*205*
R3		17.6		*244*	18.8		*85*	18.0		*167*
Baseline	Slaughter livestock	0.0	ab	*170*	4.0	a	*25*	4.7	b	*171*
R1		1.0		*411*	2.2		*139*	1.6		*376*
R2		1.6		*256*	5.8		*104*	4.4		*205*
R3		7.0	a	*244*	0.0	ab	*85*	12.0	b	*167*
Baseline	Lease out land	0.0		*170*	0.0		*25*	0.0		*171*
R1		0.5		*411*	0.0		*139*	1.1		*376*
R2		0.0		*256*	1.0		*104*	0.5		*205*
R3		0.0		*244*	0.0		*85*	0.0		*167*
Baseline	Temporary migration (some HH members)	2.4	a	*170*	0.0	a	*25*	9.9	a	*171*
R1		5.6	a	*411*	2.2	ab	*139*	8.0	b	*376*
R2		1.6	a	*256*	4.8		*104*	6.3	a	*205*
R3		0.0		*244*	1.2		*85*	2.4		*167*
Baseline	Temporary migration (entire HH)	9.4		*170*	4.0		*25*	4.1		*171*
R1		4.9	a	*411*	0.7	ab	*139*	4.0	b	*376*
R2		3.9		*256*	3.8		*104*	1.5		*205*
R3		2.5		*244*	3.5		*85*	1.2		*167*
Baseline	Permanent migration (some HH members)	0.0		*170*	4.0		*25*	1.8		*171*
R1		1.9	a	*411*	0.0	ab	*139*	2.1	b	*376*
R2		0.0		*256*	0.0		*104*	1.5		*205*
R3		0.8		*244*	0.0		*85*	0.6		*167*
Baseline	Send boys to other HH	0.0		*170*	0.0		*25*	0.0		*171*
R1		0.2		*411*	0.7		*139*	0.8		*376*
R2		0.4		*256*	2.9		*104*	0.5		*205*
R3		0.0		*244*	0.0		*85*	0.6		*167*
Baseline	Send girls to other HH	0.6		*170*	0.0		*25*	0.0		*171*
R1		0.2		*411*	0.0		*139*	0.3		*376*

Table 25: Coping strategies, by urban, peri-urban and rural

Survey round	Coping strategy	Urban		*n*	Peri-urban		*n*	Rural		*n*
R2		0.0		*256*	0.0		*104*	0.0		*205*
R3		0.4		*244*	0.0		*85*	1.2		*167*
Baseline	Take children out of school	3.5	a	*170*	0.0	ab	*25*	2.3	b	*171*
R1		9.7		*411*	0.7		*139*	4.0		*376*
R2		1.2		*256*	0.0		*104*	0.0		*205*
R3		1.2		*244*	0.0		*85*	1.8		*167*
Baseline	Move to less expensive housing	0.0		*170*	0.0		*25*	0.6		*171*
R1		1.0		*411*	0.0		*139*	1.1		*376*
R2		0.4		*256*	1.0		*104*	0.0		*205*
R3		0.0		*244*	0.0		*85*	0.0		*167*
Baseline	Reduce food consumption	38.8	ab	*170*	20.0	a	*25*	11.7	b	*171*
R1		24.8	a	*411*	5.0	a	*139*	11.7	a	*376*
R2		6.6		*256*	2.9		*104*	3.4		*205*
R3		4.1		*244*	1.2		*85*	2.4		*167*
Baseline	Take up new wage labor	17.1	a	*170*	44.0	ab	*25*	17.0	b	*171*
R1		37.2	a	*411*	8.6	a	*139*	15.2	a	*376*
R2		28.1		*256*	13.5		*104*	17.1		*205*
R3		30.3	a	*244*	60.0	ab	*85*	25.7	b	*167*
Baseline	Charcoal production	0.0		*170*	0.0		*25*	0.0		*171*
R1		2.7	a	*411*	0.7		*139*	2.7	a	*376*
R2		1.6		*256*	1.9		*104*	1.5		*205*
R3		1.2		*244*	1.2		*85*	1.8		*167*
Baseline	Firewood sales	0.6		*170*	0.0		*25*	1.8		*171*
R1		3.4	a	*411*	10.1	ab	*139*	3.2	b	*376*
R2		2.0		*256*	2.9		*104*	1.0		*205*
R3		2.5		*244*	8.2	a	*85*	1.2	a	*167*
Baseline	Sell HH items	0.0		*170*	0.0		*25*	0.0		*171*
R1		0.7		*411*	0.0		*139*	0.0		*376*
R2		0.8		*256*	1.0		*104*	1.0		*205*
R3		0.4		*244*	0.0		*85*	0.0		*167*
Baseline	Sell productive assets	0.0		*170*	0.0		*25*	0.0		*171*
R1		0.5		*411*	0.7		*139*	1.1		*376*
R2		0.4		*256*	0.0		*104*	1.0		*205*
R3		0.0		*244*	0.0		*85*	0.0		*167*
Baseline	Loan from NGO	1.2		*170*	0.0		*25*	0.0		*171*
R1		1.9		*411*	0.7		*139*	1.6		*376*

Table 25: Coping strategies, by urban, peri-urban and rural

Survey round	Coping strategy	Urban		*n*	Peri-urban		*n*	Rural		*n*
R2		0.0		*256*	0.0		*104*	1.0		*205*
R3		0.4		*244*	0.0		*85*	0.0		*167*
Baseline	Loan from bank	0.0		*170*	0.0		*25*	0.0		*171*
R1		0.2		*411*	0.7		*139*	0.5		*376*
R2		0.0		*256*	0.0		*104*	1.0		*205*
R3		0.0		*244*	1.2		*85*	0.6		*167*
Baseline	Loan from money lender	3.5	a	*170*	0.0	ab	*25*	4.1	b	*171*
R1		5.8	ab	*411*	15.1	a	*139*	10.4	b	*376*
R2		1.2		*256*	2.9		*104*	2.9		*205*
R3		2.9	a	*244*	18.8	ab	*85*	1.8	b	*167*
Baseline	Loan from friends or relatives	4.1		*170*	8.0		*25*	3.5		*171*
R1		8.5		*411*	12.2		*139*	10.1		*376*
R2		6.6	a	*256*	1.0	ab	*104*	6.8	b	*205*
R3		3.7	ab	*244*	25.9	a	*85*	16.8	b	*167*
Baseline	Send children to work	0.0		*170*	0.0		*25*	0.0		*171*
R1		0.7		*411*	0.7		*139*	0.5		*376*
R2		0.0		*256*	0.0		*104*	0.0		*205*
R3		0.8		*244*	0.0		*85*	0.6		*167*
Baseline	Receive money or food family: local	0.0		*170*	0.0		*25*	0.0		*171*
R1		2.2		*411*	1.4		*139*	3.2		*376*
R2		2.0		*256*	2.9		*104*	3.4		*205*
R3		8.2	ab	*244*	0.0	a	*85*	1.2	b	*167*
Baseline	Food aid from government	0.0		*170*	0.0		*25*	0.0		*171*
R1		1.7		*411*	1.4		*139*	3.2		*376*
R2		3.9		*256*	3.8		*104*	6.3		*205*
R3		3.3	a	*244*	0.0	ab	*85*	6.6	b	*167*
Baseline	Food aid from NGO	0.6		*170*	0.0		*25*	0.6		*171*
R1		5.4		*411*	3.6		*139*	5.6		*376*
R2		3.9		*256*	7.7		*104*	10.7		*205*
R3		7.4	a	*244*	1.2	ab	*85*	9.0	b	*167*
Baseline	Savings	0.6		*170*	0.0		*25*	0.0		*171*
R1		0.2		*411*	0.7		*139*	0.5		*376*
R2		1.2		*256*	1.0		*104*	1.0		*205*
R3		4.5	ab	*244*	0.0	a	*85*	1.2	b	*167*
Baseline	Remittances	0.0		*170*	0.0		*25*	0.0		*171*
R1		1.2	a	*411*	0.0	ab	*139*	1.6	b	*376*

Table 25: Coping strategies, by urban, peri-urban and rural

Survey round	Coping strategy	Urban		*n*	Peri-urban		*n*	Rural		*n*
R2		0.8	a	*256*	0.0	b	*104*	4.4	ab	*205*
R3		2.0	a	*244*	0.0	ab	*85*	2.4	b	*167*
Baseline	Help from local organizations or companies	0.0		*170*	0.0		*25*	0.0		*171*
R1		0.7		*411*	0.7		*139*	0.3		*376*
R2		0.4		*256*	0.0		*104*	0.0		*205*
R3		0.4		*244*	0.0		*85*	0.0		*167*
Baseline	Other (specify)	5.9		*170*	12.0		*25*	8.8		*171*
R1		10.9		*411*	15.8		*139*	8.5		*376*
R2		9.4	ab	*256*	19.2	a	*104*	18.0	b	*205*
R3		15.6		*244*	12.9		*85*	12.0		*167*
Baseline	No coping strategy	21.8		*170*	20.0		*25*	29.8		*171*
R1		37.7		*411*	43.9		*139*	40.4		*376*
R2		52.0		*256*	59.6		*104*	53.2		*205*
R3		25.4	a	*244*	20.0	b	*85*	44.9	ab	*167*

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.
Sources: USAID. 2016, 2017. Somalia household surveys

Appendix C: Formal Safety Nets—Detail

Table 26 shows that the percentage of communities where households had access to food assistance and non-food assistance increased sharply from baseline to R1. Food assistance decreased in R2 but was still much higher than at baseline. Non-food assistance dropped in R3, but again, was still higher than baseline. In addition, private sector provision of non-food assistance was highest in R2.

Table 26: Formal safety nets (mean, 0-2)

	Baseline		R1		R2		R3	
Formal safety nets (mean, 0-2)	0.1	ab	1.3	a	0.8	b	0.7	a
n	*60*		*36*		*25*		*39*	
Food assistance (% communities)	10.0	ab	63.9	a	44.0	b	48.7	a
n	*60*		*36*		*25*		*39*	
Source of food assistance (% communities)								
Government	16.7	ab	4.3		0.0	a	0.0	b
NGO	83.3		87.0		63.6		84.2	
Religious organization	16.7	ab	4.3		0.0	a	0.0	b
UN organization (e.g. WFP)	33.3		39.1	a	81.8	ab	21.1	b
Zakat (individual/direct giving)	16.7	abc	0.0	a	0.0	b	0.0	c
n	*6*		*23*		*11*		*19*	
Non-food assistance (% communities)	3.3	ab	61.1	a	40.0	b	25.6	a
n	*60*		*36*		*25*		*39*	
Source of non-food assistance (% communities)								
Government	0.0		4.5		0.0		0.0	
NGO	50.0		81.8		50.0		70.0	
Religious organization	0.0		4.5		0.0		10.0	
Private sector	50.0		31.8	a	90.0	ab	20.0	b
n	*2*		*22*		*10*		*10*	

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Sources: USAID. 2016, 2017. Somalia household surveys.

Appendix D: Resilience Capacity Indices and Factor Analysis

One of the purposes of the study was to test whether resilience capacities are stable over time, as framed in Research Question 11: *How does resilience capacity, both household and community, change over time?* This appendix provides a detailed discussion on computing resilience indices in the baseline and three survey rounds. USAID/TANGO methods to compute resilience capacity indices are summarized on page 12; factor analysis is the key feature of these methods. Accordingly, the first factor is retained and variables with negative loadings are dropped. Factor analysis is re-run until the remaining variables all have positive loadings. This study required some modifications to the methods to compute the transformative capacity index.

Table 27 shows baseline factor loadings for the components of the absorptive capacity index. The "initial baseline loadings" column shows that bonding social capital and productive assets had negative loadings; these were thus dropped from the index. The "final baseline loadings" column shows the variables and loadings that were used to compute the absorptive capacity index in all survey rounds. The same column shows that community-level components – ISN, conflict mitigation, and disaster preparation and mitigation – had the highest factor loadings. This means that they have the highest weights or scores in the index.

Table 27: Baseline absorptive capacity factor loadings

	Initial baseline loadings	Final baseline loadings
Component variables		
ISN	0.840	0.828
Conflict mitigation	0.719	0.724
Disaster management plan	0.675	0.678
Livestock assets	0.422	0.442
Financial/insurance services	0.419	0.426
Savings	0.216	0.218
HH assets	0.066	0.072
Remittances	0.033	0.004
Productive assets	-0.184	drop
Bonding social capital	-0.008	drop
Eigenvalues	2.12	2.10
Proportion of variance explained	21.2	16.8

drop: variable was dropped because it had a negative factor loading

Sources: USAID. 2016, 2017. Somalia household and community surveys

Table 28 shows baseline factor loadings for adaptive capacity components. As with absorptive capacity, adaptive capacity baseline factor scores were used for all survey rounds. All the components had positive loadings, thus none were dropped.

Table 28: Baseline adaptive capacity factor loadings

	Baseline factor loadings
Component variables	
HH assets	0.621
Education and training	0.570
Bridging social capital	0.445
Aspirations	0.408
Livestock assets (TLU)	0.335
Livelihood diversification	0.300
Information exposure	0.275
Linking social capital	0.202
Productive assets	0.072
Eigenvalue	1.40
Proportion of variance explained	15.6

Sources: USAID. 2016, 2017. Somalia household and community surveys

Table 29 shows initial factor loadings for transformative capacity index components. This study computed separate indices for urban, peri-urban, and rural households to account for different livelihoods and services available for households in these three community contexts.

Table 29: Initial baseline transformative capacity factor loadings

	Urban	Peri-urban	Rural
Bridging social capital	-0.19	0.46	0.03
Linking social capital	-0.14	0.05	0.05
FSN	0.58	0.29	0.28
Access to markets	0.54	-0.08	0.72
Access to infrastructure	0.63	-0.66	0.05
Access to services	0.70	0.42	-0.67
Access to agricultural extension	0.23	0.46	-0.55
Access to veterinary services	na	0.66	na
Access to communal natural resources	0.49	0.96	-0.40
Governance	-0.05	0.34	0.56
Eigenvalue	1.81	2.58	1.83
Proportion of variance explained	*22.6*	*28.7*	*22.8*
n	*431*	*159*	*386*

Sources: USAID. 2016, 2017. Somalia household and community surveys

Table 30 shows final factor loadings for transformative capacity index components. Bridging and linking social capital and governance were dropped from the urban index. Access to markets and infrastructure were dropped from the peri-urban index. Veterinary services were not available in rural or urban communities at baseline.

Computation of the transformative capacity index for rural households required modifying USAID/TANGO methods: initial loadings on factor 1 were split between positive and negative values. Five of the variables had positive loadings and four had negative loadings (eigenvalue=1.83, proportion of variance=22.8). Dropping those variables and re-running the factor analysis did not result in positive

loadings for all remaining variables. Computing the index required several iterations of factor analysis. Dropping variables, one or two at a time, resulted in a factor with all positive loadings (Table 30). The factor included linking social capital, FSN, access to markets, access to health and education services, access to agricultural extension services, communal natural resources, and governance (eigenvalue=1.81, proportion of variance=30.2). However, this was the second factor instead of factor 1 (which is usually retained).

Table 30: Final baseline transformative capacity factor loadings

	Urban	Peri-urban	Rural
Bridging social capital	drop	0.52	drop
Linking social capital	drop	0.05	0.28
FSN	0.55	0.00	0.64
Access to markets	0.50	drop	0.00
Access to infrastructure	0.64	drop	drop
Access to health and education services	0.71	0.36	0.24
Access to agricultural extension	0.30	0.64	0.10
Access to veterinary services	na	0.86	na
Access to communal natural resources	0.53	0.87	0.64
Governance	drop	0.23	0.48
Eigenvalue	1.84	2.36	1.81
Proportion of variance explained	30.7	39.3	30.2
n	*431*	*159*	*386*

An alternate method to compute the three resilience capacity indices, using factor scores computed separately for each survey round, produced very different results; factor loadings were not stable over time. The drawback of the method, and the reason it was not used, is that resilience capacity index values are not comparable across survey rounds. We did not re-estimate equations using recomputed resilience capacity measures as it is beyond the scope of this study, but this is a potentially interesting area for further analysis.

Table 31 shows how the loadings for absorptive capacity component variables change over survey rounds. As noted earlier, bonding social capital and productive assets had negative loadings at baseline. However, they both had positive loadings in R1 and R3, so would have been included in the absorptive capacity indices if they had been computed separately for each round. Other household variables (household assets, savings, remittances) also changed signs (positive⇔negative) across survey rounds.

Table 31: Absorptive capacity factor loadings, by survey round (alternate method)

	Baseline	R1	R2	R3
Bonding social capital	-0.01	0.06	-0.01	0.21
Livestock assets (TLU)	0.42	0.14	-0.23	0.50
Household assets	0.06	0.10	-0.22	0.27
Productive asset index	-0.18	0.00	-0.23	0.40
Savings	0.22	-0.02	-0.05	0.19
ISN	0.84	0.87	0.78	0.68
Financial/insurance services	0.42	0.16	0.06	0.77

Disaster risk management	0.68	0.79	0.62	0.78
Conflict mitigation	0.72	0.86	0.66	0.35
Eigenvalue	2.12	2.19	1.58	2.35
Proportion of variance explained	23.5	24.3	17.5	26.1
n	*961*	*967*	*602*	*568*

Sources: USAID. 2016, 2017. Somalia household and community surveys

Table 32 shows factor loadings for adaptive capacity components across survey rounds. Except for bridging social capital in R2, components have positive loadings in all rounds.

Table 32: Adaptive capacity factor loadings, by survey round (alternate method)

	Baseline	R1	R2	R3
Bridging social capital	0.44	0.43	-0.08	0.36
Linking social capital	0.20	0.42	0.51	0.26
Education and training	0.57	0.25	0.54	0.14
Livestock asset (TLU)	0.33	0.48	0.58	0.59
Household assets	0.62	0.54	0.68	0.40
Productive asset index	0.07	0.35	0.40	0.73
Livelihood diversification	0.30	0.56	0.15	0.67
Information exposure	0.28	0.31	0.21	0.71
Aspirations	0.41	0.43	0.38	0.21
Eigenvalue	1.40	1.68	1.73	2.25
Proportion of variance explained	15.5	18.6	19.2	25.0
n	*961*	*958*	*602*	*568*

Sources: USAID. 2016, 2017. Somalia household and community surveys

As shown in the corresponding table for urban transformative capacity (Table 33), several component variables changed signs across the rounds.

Table 33: Transformative capacity factor loadings for urban households (alternate method)

	Baseline	R1	R2	R3
Bridging social capital	0.00	0.18	0.04	-0.14
Linking social capital	-0.11	-0.06	0.00	0.05
FSN	0.34	-0.08	0.75	0.51
Access to markets	0.39	0.56	0.84	0.63
Access to infrastructure	0.63	0.87	0.70	0.55
Access to services	0.74	0.53	0.92	0.83
Access to agricultural extension	0.61	0.70	-0.13	0.89
Access to communal natural resources	0.57	-0.25	0.77	0.64
Governance	0.36	0.72	0.29	0.52
Eigenvalue	2.04	2.99	3.75	3.14
Proportion of variance explained	22.7	33.3	41.7	34.9
n	*431*	*422*	*240*	*278*

Table 34 shows factor loadings for transformative capacity component variables for households in peri-urban areas. The table shows that access to markets and access to infrastructure had negative loadings in the baseline but not in later rounds.

Table 34: Transformative capacity factor loadings for peri-urban households, by survey round (alternate method)

	Peri-urban Households			
	Baseline	R1	R2	R3
Component variables				
Bridging social capital	0.496	0.168	0.153	-0.293
Linking social capital	0.058	0.263	0.446	0.123
FSN	na	0.833	0.900	0.570
Access to markets	-0.096	0.783	0.856	0.702
Access to infrastructure	-0.571	0.789	0.643	0.765
Access to services	0.360	0.280	0.264	-0.371
Access to veterinary services	0.721	0.789	0.754	na
Access to ag extension services	0.521	0.898	0.884	0.879
Communal natural resources	0.948	0.773	0.650	0.920
Governance	0.369	-0.706	0.060	0.870

na: Service was not available at the time of the survey

Sources: USAID. 2016, 2017. Somalia household and community surveys

Table 35 shows transformative capacity factor loadings for rural households. At baseline, four variables had positive loadings and five had negative loadings.

Table 35: Transformative capacity factor loadings for rural households, by survey round (alternate method)

	Rural Households			
	Baseline	R1	R2	R3
Component variables				
Bridging social capital	-0.009	-0.069	-0.292	-0.240
Linking social capital	0.087	0.061	-0.146	-0.035
FSN	0.541	0.732	0.614	0.832
Access to markets	0.762	0.660	0.623	-0.729
Access to infrastructure	-0.039	-0.433	-0.467	0.185
Access to services	-0.658	0.798	0.798	0.350
Access to veterinary services	na	0.797	0.852	na
Access to ag extension services	-0.484	0.158	na	-0.594
Communal natural resources	-0.276	-0.448	-0.036	0.117
Governance	0.565	0.383	0.091	0.505

na: Service was not available at the time of the survey

Sources: USAID. 2016, 2017. Somalia household and community surveys

Appendix E: Social Capital—Reassessed

This appendix contains a more detailed discussion of social capital indices, addressing Research Question 15: *How do revised measures of social capital more accurately reflect the relationships between social capital in the Somali context, household resilience capacity, and outcomes?*

One explanation for the changes in bridging and bonding social capital index values between baseline and R1 is the revisions made to the social capital survey module: the indices use the same variables for calculation, but additional framing questions added after the baseline may have prompted respondents to identify more sources of social capital and thus improve the completeness and quality of the data.

The need to revise the survey became evident after results from the baseline study and other TANGO/USAID research showed lower levels of bonding and bridging social capital among ethnic Somali populations than for other ethnic groups.[66] This finding was contradicted by qualitative findings of the same studies, as well as evidence within development literature suggesting a strong Somali tradition of helping one another.[67]

Table 36 shows the percentage of households reporting that there was "no one" who could help them if they needed food or money urgently. The high levels at baseline led researchers to reassess the way data were collected, and TANGO and USAID reassessed the methods used to measure social capital within their resilience framework.

[66] Langworthy, M., M. Vallet, S. Martin, T. Bower and T. Aziz. 2016. *Baseline Study of the Enhancing Resilience and Economic Growth in Somalia Program*. Prepared by TANGO International for Save the Children Federation, December.
Smith, L., T. Frankenberger, B. Langworthy, S. Martin, T. Spangler, S. Nelson, and J. Downen. (2015). Ethiopia Pastoralist Areas Resilience Improvement and Market expansion (PRIME) Project impact evaluation baseline survey report. Report for USAID Feed the Future FEEDBACK project. January.
https://www.agrilinks.org/sites/default/files/resource/files/EthiopiaPRIMEVol1final.pdf

[67] Presnall, C., P. Finan, M. Vallet, and P Sutter. (2017). *Social Capital in Somalia* Discussion Paper. March 2017.
Hedlund, K. et al., 2013. *Final Evaluation of the Unconditional Cash and Voucher Response to the 2011–12 Crisis in Southern and Central Somalia*, https://www.unicef.org/somalia/SOM_resources_cashevalfinep.pdf.
Maxwell, D. et al., 2015. *Facing famine: Somali experiences in the famine of 2011*, Somerville, MA. http://fic.tufts.edu/assets/Facing-Famine-high-quality.pdf.
Maxwell, D. & Fitzpatrick, M., 2012. The 2011 Somalia famine: Context, causes, and complications. *Global Food Security*, 1(1), pp.5–12. http://dx.doi.org/10.1016/j.gfs.2012.07.002.

Table 36: Percentage of households reporting "no one" for support, by survey round

	Baseline	R1	R2	R3
Bonding receive	43.3 [ab]	20.1 [ab]	26.4 [a]	24.3 [b]
n	*968*	*969*	*602*	*568*
Bonding give	30 [ab]	12.2 [ab]	16.3 [a]	16.2 [b]
n	*971*	*972*	*602*	*568*
Bridging receive	45.6 [ab]	23.9 [a]	28.6 [a]	25.7 [b]
n	*970*	*967*	*602*	*568*
Bridging give	34.4 [ab]	12.6 [ab]	19.1 [a]	18.7 [b]
n	*969*	*969*	*602*	*568*

Subgroups with the same superscript are significantly different at the 0.05 level. Comparisons are across columns.

Sources: USAID. 2016, 2017. Somalia household surveys

As part of this reassessment, questions were added to the social capital module of the survey instrument, beginning with the R1 survey. Findings from the analysis of those data address Research Question 15: *How do revised measures of social capital more accurately reflect the relationships between social capital in the Somali context, household resilience capacity, and outcomes?*

The baseline social capital module started with this question: *If your household had a problem and needed money or food urgently, who within this village could you turn to for assistance?* In the revision, this module began by asking respondents whether they agreed or disagreed with the next two statements, intended to better frame the social capital questions:

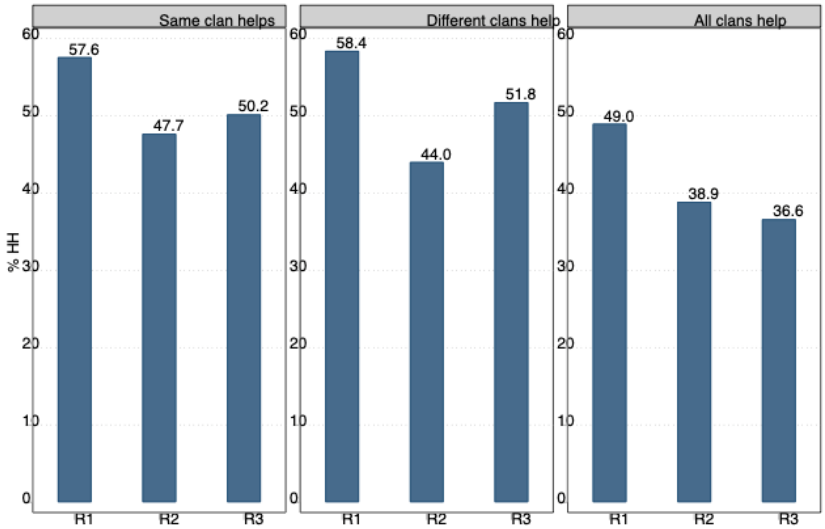
- *Since the drought, members of my clan are helping each other cope.*
- *Since the drought, members of other clans are helping each other cope.*

Framing the issue of social capital in this way has two advantages: it helps the respondent conceptualize the ability to give or receive help within their social networks in response to a current and relevant event (i.e., the ongoing drought) and removes any incentive to respond in a way perceived to trigger more future assistance (i.e., underreporting assistance received in order to appear more vulnerable).

Survey respondents were asked to rank their agreement with each statement on a scale of 1-5, where 1 is *strongly disagree* and 5 is *strongly agree*. Agreement with either statement triggered follow-up questions regarding the types of assistance provided or received during the drought (e.g., food or water). These are followed by the baseline versions of the social capital questions, which provide data to compute the bonding and bridging social capital indices.

Figure 27 shows the results from the two framing questions described above. Response scales were collapsed into two categories: “agree” and “disagree.” Nearly 60 percent of respondents in R1 indicated that those from the same clan or those from different clans were helping each other during the drought. This percentage dropped slightly in R2 and R3 to 47.7 percent and 50.2 percent, respectively. Households agreeing that those in other clans were helping one another dropped in R2 to 44.0 percent, but subsequently rose to 51.8 percent in R3.

Figure 27: Respondents' views on clan-based support, by survey round



Source: USAID. 2016, 2017. Somalia household surveys

These results indicate that in R1, a majority believed people were helping one another. This may or may not be consistent with prior perceptions of social capital levels in Somalia, as there are two components to social capital as we measure it: the *ability* to help and the *willingness* to help. Social capital as measured by using the framing questions and baseline survey questions, may be picking up people's sense of their ability to help, as opposed to their willingness to help. A similar study in the Somali region of Ethiopia showed that social capital, much like other forms of capital (i.e., economic, physical, natural), can be depleted, and depletion rates can be exacerbated by covariate shocks.[68] In the current analysis, this lower ability to help may be reflected in the decrease over time in the proportion of households agreeing that members of the same and other clans are helping each other during the drought.

The survey asked if respondents agreed with the statement: "Since the drought, members from different clans are helping each other cope." This generated follow-up questions asking about five types of assistance and an open-ended "other" category. The data illustrated in Figure 28 and Figure 29 show that both within and among clans, food and water were the most prevalent types of assistance provided among those impacted by the drought (90-93 percent for food and 56-63 percent for water) and that the provision of these forms of social capital assistance did not vary over the course of the drought.

[68] Frankenberger, T and L. Smith. 2015. Ethiopia Pastoralist Areas Resilience Improvement and Market Expansion (PRIME) Project Impact Evaluation: Report of the Interim Monitoring Survey 2014-2015. Report for USAID Feed the Future FEEDBACK project. January. September.

Figure 28: Types of potential assistance from same clan, by RMS rounds

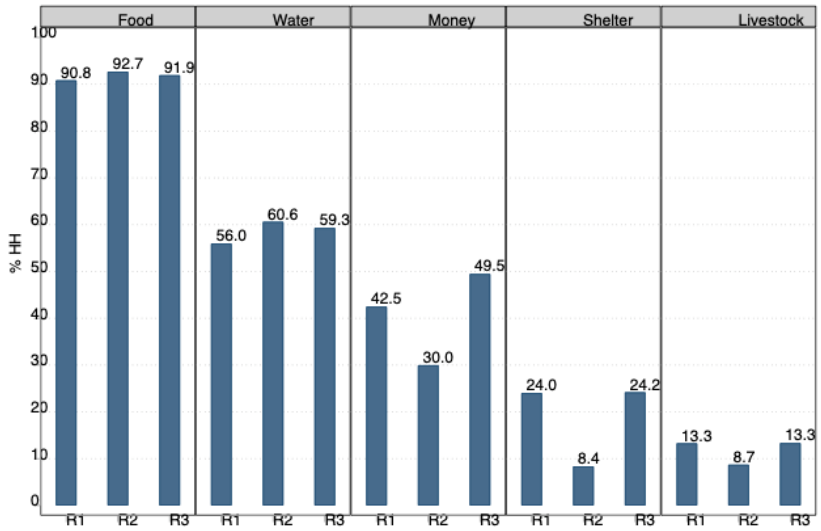
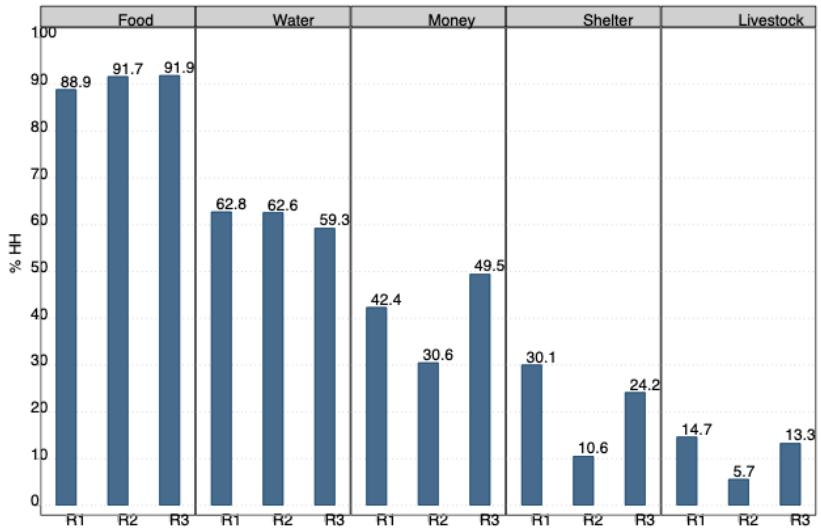


Figure 29: Types of potential assistance from different clan by RMS round

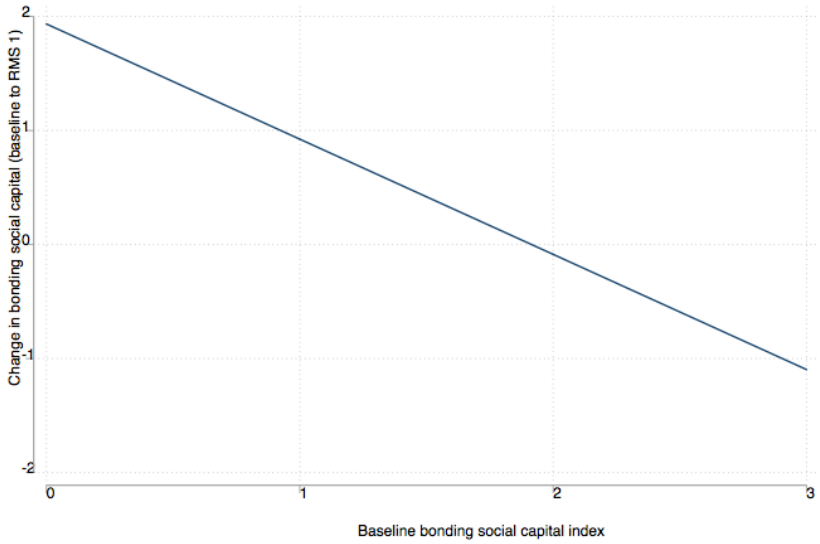


Source: USAID. 2016, 2017. Somalia household surveys

Modifications to the questionnaire in the RMS rounds provided important information about social capital. We did a more detailed analysis to understand whether social capital increased between baseline and R1 or if the increase was due to changes in the questionnaire. The analyses showed that the increase in bonding social capital from baseline to R1 could have been due to a combination of three factors: reversion to the mean, increased shock exposure and/or support for the statement, "All clans help during a drought."

Figure 30 illustrates results from a multivariate regression equation estimating change in the bonding social capital index from baseline to R1.[69] The vertical axis is the change in the bonding social capital index between the baseline and R1. The horizontal axis shows baseline values of the bonding social capital index. The downward slope of the line shows that the change in the index is inversely related to baseline scores, and that social capital index values increased most for households with the lowest values at baseline. These results imply that the main driver of the increase in bonding social capital between baseline and R1 is mathematical. It is known as "reversion-to-mean," whereby extreme values in one period will tend toward the average in later time periods. Reversion to the mean resulted in an overall increase in mean values of the bonding social capital index because a large share (25 percent) of households in the baseline reported zero bonding social capital; scores cannot be less than zero. The upward movement in social capital could be caused by other unobserved factors that result in movement toward a natural equilibrium level (i.e., higher than zero) of social capital for Somali households.

Figure 30: Change in bonding social capital from baseline to R1

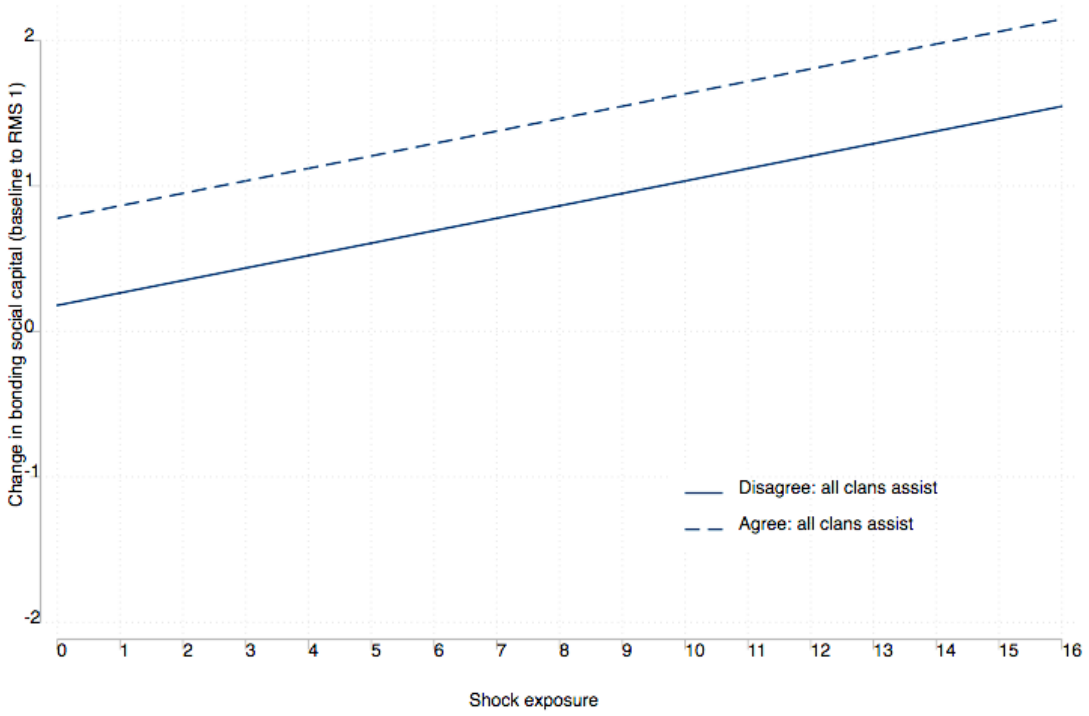


Sources: USAID. 2016, 2017. Somalia household surveys

Additional results show the effects of two other variables on the social capital index: shock exposure and respondent views on sharing amongst clans during a drought. Figure 31 shows that each additional shock at baseline led to a 0.05 increase in the social capital index at R1. The figure also shows that agreement with statements that all clans share during a drought added 0.60 to the bonding social capital index score.

[69] Complete results are in Annex A.

Figure 31: Effects of shock exposure and respondent views on clan sharing on bonding social capital index, baseline to R1



Sources: USAID. 2016, 2017. Somalia household surveys