PARTNERSHIP FOR RESILIENCE AND ECONOMIC GROWTH IN NORTHERN KENYA

PREG II

IMPACT EVALUATION: ENDLINE SURVEY TECHNICAL REPORT

MAY 2025

TANGO INTERNATIONAL
TECHNICAL ASSISTANCE to NGOs

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PREG II PARTNERS

Government of Kenya Partners:

Ministry of Agriculture and Irrigation (State Department of Livestock)
Ministry of Devolution
State Department for the Development of ASALs
National Drought Management Authority
Ministry of Water and Sanitation (Water Trust Fund and Water Resource Management Authority)
Ministry of Health (Public Health Department)
Ministry of Education
Ministry of Environment and Forestry
Kenya National Drought Mitigation Authority
Country governments: Baringo, Isiolo, Garissa, Marsabit, Mandera, Samburu, Tana River, Turkana and Wajir.

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Tetra Tech
Turkana Development Trust (TDT)
UNICEF
Urban Institute
Wajir South Development Agency (WASDA)
World Food Program (WFP)
World Vision.

ACRONYMS

ADP	Annual Development Plan
ASAL	Arid and semi-arid lands
ATT	Average treatment effect on the treated
CFW	Cash-for-Work
CG	County government
CIDP	County Integrated Development Plan
CNRM	Communal natural resource management
CRP	Comprehensive Resilience Programming
DiD-IPW	Difference-in-differences inverse probability weighting
DiD-NNM	Difference-in-differences nearest neighbor matching
DiD-PSM	Difference-in-differences propensity score matching
DRR	Disaster risk reduction
FAO	Food and Agriculture Organization
FFW	Food-for-Work
FGD	Focus group discussion
FLDAS	FEWS Net Land Data Assimilation System
GoK	Government of Kenya
HDDS	Household Dietary Diversity Score
IE	Impact evaluation
KII	Key informant interview
LIS	Land Information System
LMS	Livestock Market Systems
M&E	Monitoring and evaluation
MFI	Microfinance institution
MSWEP	Multi-Source Weighted-Ensemble Precipitation
NDMA	Keyna National Drought Management Authority
NRT	Northern Rangelands Trust
PREG	Partnership for Resilience and Economic Growth
REGAL	Resilience and Economic Growth in Arid Lands
RMS	Recurrent monitoring survey
RR	Realized Resilience
RTM	Regression to the Mean

SLI	Sequencing, layering, and integration
T/C	Treatment/comparison
USAID	United States Agency for International Development
WDPC	Ward Development Planning Committee
WFP	World Food Programme

EXECUTIVE SUMMARY

The Partnership for Resilience and Economic Growth in Northern Kenya (PREG II) program was implemented in nine counties of Kenya's arid and semi-arid lands (ASALs) from 2018 to 2023. Initiated by the United States Agency for International Development (USAID), the program was implemented in collaboration with over 15 partners, including the World Food Programme, the Government of Kenya, and various NGOs, with coordination and harmonization of resilience-building activities of humanitarian and development stakeholders.

The overall goal of PREG II was to **increase resilience and economic growth among pastoralist communities in the ASALs.** The program employed a strategy of layering, sequencing, and cross-sectoral integration of interventions, or Comprehensive Resilience Programming (CRP), to leverage cross-sectoral synergies in order to enhance impacts on resilience and well-being.

This report documents the analysis of the PREG II endline survey conducted in September 2023 as part of an impact evaluation of the program's interventions. The survey included 2,394 ASAL households residing in 108 villages. Both quantitative and qualitative data were collected.

The primary purpose of the analysis is to determine whether and how PREG II's package of interventions, including resilience interventions and humanitarian assistance, enhanced households' resilience to shocks. Did the interventions help households recover from the multiple shocks and stresses they faced over the program's operational period? What can we learn to enhance the effectiveness of future resilience-strengthening programs? It also examines the impact of the program on three key well-being outcomes: food security, poverty, and child malnutrition. Before doing so, the report sets the context by documenting the evolution of households' shock exposure, coping strategies, resilience, resilience capacities, and well-being outcomes over the program period.

Shock Exposure and Coping Strategies

Households in the PREG II program area experienced escalating shock exposure over the program's operational period marked by repeated episodes of both drought and flooding. Droughts occurred in five out of the six rainy seasons and severe flooding in three seasons. A shock exposure index calculated using data on household reports of the incidence and severity of 23 shocks increased by a full 54% over the program period. The most common shocks reported were drought, flooding, increased food prices, and livestock disease. Incidences of two shocks saw major jumps over the program period: drought (from 32.4% to 70.8%) and food price inflation (46.9% to 87.1%). In addition to confirming the large numbers of villages dealing with drought and food price inflation, the qualitative data point to livestock disease and losses as major downstream impacts of drought and flooding. They also highlight insecurity, ethnic-based conflict between neighboring communities, and theft of livestock as major problems. Qualitative analysis of the differing effects of shocks on women, men, and youth reveal the emotional toil of the multiple shocks households were facing as well as increased marital conflict, intimate partner violence, and substance abuse.

As households struggled to deal with escalating shock exposure, they both shifted and intensified their use of coping strategies. Five of the most common coping strategies all increased over the program period: reducing food consumption, reducing nonessential household expenses, buying food on credit, taking up new work, and drawing down on savings. Reliance on humanitarian assistance and on family or friends for food or money to deal with shocks also rose precipitously. Notably, and related to

livestock losses, two other common coping strategies—sending livestock in search of pasture and selling livestock—did not increase.

Household Resilience and Resilience Capacities

This impact evaluation conceptualizes resilience according to the USAID definition as "the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth."[1] The operational definition of resilience employed is: "the ability to recover from shocks." Household resilience *capacities* are the determinants of resilience and are the policy levers for strengthening households' resilience.

How did households fare in the face of the escalating shock exposure they experienced? While 64% of households were resilient—that is, able to get back to or improve upon their pre-program food security—a full 36% were not. Further, the average household in the area experienced a decline in its ability to recover, with particularly large declines for the two most common shocks: drought and food price inflation. By contrast, households' resilience capacities have largely improved over the program period. The measured index of absorptive capacity—*the ability to minimize exposure to shocks and recover quickly*—rose by 41%. The index of adaptive capacity—*the ability to make informed choices about alternative livelihood strategies in the face of change*—rose by 23%. The index of transformative capacity—*systems-level determinants enabling lasting resilience*—rose by 30.5%.

The program area saw improvements in a wide range of important specific capacities: informal safety nets, access to hazard insurance, disaster preparedness and mitigation, asset ownership, livelihood diversity, access to financial resources, human capital, exposure to information, access to infrastructure and services, and community social cohesion. Overall, there was an increase in asset ownership despite an almost 50% decline in livestock ownership. Of note, however, is that there were no improvements in households' social capital (whether bonding, bridging, or linking). There were also no improvements in access to markets, gender-equitable norms, or governance.

Food Security, Poverty, and Child Malnutrition

Households' **food security** declined over the program timeframe. The prevalence of moderate or severe food insecurity rose from 70.0% to 80.6% between the baseline and endline. The prevalence of severe food insecurity increased by 7.1 percentage points. There was a slight increase in households' dietary diversity, an indication that dietary quality was maintained. By contrast, the prevalence of **poverty**, measured here as asset-based poverty, *declined* from 44.3% of households at baseline to 37.2% at endline. Despite the reductions in food security, prevalences of **child malnutrition** also declined over the program period, perhaps due to improvements in caring practices for children. The prevalence of stunting (chronic undernutrition) fell from 22.4% to 16.9%, a total of 5.5 percentage points. Severe stunting fell by 3.1 percentage points. There was no change in the prevalence of wasting. Notably, stunting *increased* among one group of households: those with children under 5 years old at both baseline and endline. This group is singled out because it includes the households for which evaluation of the impact of PREG II on child malnutrition is conducted.

[1] USAID, 2012

Engagement in Resilience Programming and Access to Humanitarian Assistance

The PREG II program's resilience interventions can be categorized into 10 groups, or "intervention sets," that represent various sectors of the program's resilience programming:

- Livestock Rearing
- Agricultural Production
- Communal Natural Resource Management (CNRM)
- Financial Services
- Business Development
- Market Linkages
- Disaster Risk Reduction (DRR)
- Health and Nutrition
- Women's Human Capital
- Youth Human Capital.

In advance of the impact evaluation, measurement and descriptive analysis of households' exposure to and participation in each of these intervention sets, as well as resilience interventions overall, took place. Exposure is defined as living in a village where the intervention was implemented. Participation is defined as having taken direct actions related to the intervention. The intervention sets with the highest household prevalence of exposure were Financial Services (63.4%), Health and Nutrition (57.1%), and DRR (47.1%). Participation in interventions was far lower than exposure. It was less than 10% for all intervention sets except financial services, for which it was 30.3% of households.

Three summary measures are used to evaluate the *overall* impact of households' engagement in resilience interventions (as opposed to specific individual intervention sets). The **first**, exposure to Comprehensive Resilience Programming, is defined as exposure to seven or more of the intervention sets. It was engaged in by 25.7% of households. The **second** summary measure focuses on participation in multiple cross-sectoral interventions. Defined as participation in at least two of the intervention sets, it was engaged in by 15% of households.

The **third** summary measure is of "high exposure" to PREG II resilience programming. The measure is calculated from an administrative dataset of intervention allocation data at the village level provided by PREG II program partners and staff and is used to examine whether measured impacts can be attributed to the PREG II program itself. The percentage of households living in a village with high exposure to PREG II resilience programming is 23.5%.

Finally, indicators of households' access to four types of humanitarian assistance are examined: emergency food assistance (58.6 % of households), emergency cash assistance (48.1%), Food-for-Work (FFW) (24.8%), and Cash-for-Work (CFW) (40.6%). All four types of assistance increased in response to the escalating shock exposure households experienced over the program period.

Impact of PREG II: Quantitative Analysis

This evaluation finds that PREG II had widespread positive impacts on households' resilience and resilience capacities while also helping to reduce food insecurity, asset-based poverty, and child malnutrition.

Household exposure to resilience-building interventions spanning multiple sectors, or Comprehensive Resilience Programming, did indeed strengthen their resilience. Exposure to CRP raised the percentage of households resilient to the shocks they experienced over the program period by a full 15.5 percentage points. It also had strong, positive impacts on their absorptive and transformative resilience capacities, essential foundations for sustainable resilience, and thus contributed to the recorded improvements in these capacities over the program period. In terms of well-being outcomes, exposure to CRP led to a 10.4 percentage-point reduction in moderate or severe food insecurity and strong reductions in the prevalences of stunting and underweight among children under 5—16.0 and 15.9 percentage points, respectively. Evidence is presented that exposure to CRP had such success because of the synergistic effects of simultaneous implementation of cross-sectoral interventions in the same geographic locations.

The evaluation finds that direct participation by households in interventions, as opposed to only indirect exposure, had stronger impacts on some outcomes and was critical for inducing any positive change in others. Participation in resilience interventions had positive impacts on households' adaptive capacity and led to a 7.6 percentage-point reduction in asset-based poverty, while exposure to CRP had no impact.

Analysis of exposure to high-intensity PREG II programming using the PREG II administrative data confirms that PREG II resilience interventions, specifically, had positive impacts on households' resilience to shocks and on all three dimensions of resilience capacity (absorptive, adaptive, and transformative capacities). They also helped reduce food insecurity, asset-based poverty, and child malnutrition. The analysis shows that the systems-level interventions implemented in broader geographical areas of the PREG II area had positive impacts on households' resilience and well-being beyond those conferred by interventions implemented at the local level.

What worked? Examination of the relative impacts of the 10 PREG II intervention sets, whether through exposure or participation, finds that different intervention sets had positive impacts on different outcomes, as follows:

- Resilience: CNRM, Financial Services, Market Linkages, DRR, Youth Human Capital
- Resilience capacities: CNRM, DRR, Health and Nutrition, Women's Human Capital
- Food security: CNRM, Financial Services, Market Linkages, DRR, Health and Nutrition
- Asset-based poverty: Livestock Rearing, Agricultural Production, CNRM, Market Linkages, and Youth Human Capital
- Child malnutrition: Financial Services, Business Development, DRR, Women's Human Capital, Youth Human Capital.

Among these, those with positive impacts on the most outcomes are DRR, CNRM, Financial Services, Market Linkages, and Youth Human Capital. Note that a full evaluation of the impacts of Business Development interventions could not be undertaken due to data limitations.

Finally, the evaluation finds that the humanitarian assistance provided to households over the course of the PREG II program had widespread, positive impacts. All four types of assistance—emergency food aid, emergency cash aid, Food-for-Work, and Cash-for-Work—had positive impacts on households' resilience to shocks and food security. Consistent with the longer-term livelihood goals of FFW and CFW, only these types of assistance had positive impacts on resilience capacities. CFW also helped reduce severe stunting.

Impact of PREG II on Governance Capacities and Practices

PREG II has a tighter and more broad-based integration with county governments (CGs) than most NGO programs, as well as linkages with agencies such as the Kenya National Drought Management Authority (NDMA) and other national technical working groups and training institutions. It has a two-way synchronized relationship with CGs, with the open participation and strong sense of ownership by CG officials in directing PREG II designs and plans, while PREG II influences County Integrated Development Plans (CIDPs), Annual Development Plans (ADPs), policies, and various technical platforms. A particularly beneficial area of impact has been the numerous CG policies that were codeveloped and/or adopted with PREG II support. As such, CG capacity to play a more effective coordination role with all development partners has improved dramatically. Additionally, staff capacity for better service provision to communities has been strengthened. At the community level, PREG II support for the Ward Development Planning Committee (WDPC) proposed by the Livestock Marketing Systems project has been critical, and it has progressively become embedded in county policies.

Still, maintaining consistency with different government officers and levels was challenging, particularly as the program moved from preliminary consultation and planning to implementation. Policy development could have been better documented, and the final outcomes and benefits to communities and households more clearly demonstrated. The WDPC is very good on paper and there are numerous signs of advancement over the approximately 5 years since its introduction, but it has been inconsistent in its implementation. A key challenge is to ensure consistent participation and engagement at the village level, so that ward-level plans are more representative and impactful.

Implications for Programming

What can we learn from the experience of PREG II to enhance the effectiveness of future resilience-strengthening programs in the ASALs? The recommendations for programming of this impact evaluation are as follows.

- **Scale up CRP to take advantage of the synergies engendered by implementing cross-sectoral interventions in the same geographic locations.** PREG II interventions should be seen as demonstration activities to be scaled up by Kenya-based actors such as CGs and the NDMA in the future.
- **Support the direct participation of households in interventions (rather than only indirect exposure) to enhance program impacts**, especially to strengthen households' adaptive capacities and reduce poverty.
- **Continue to focus on the types of interventions found here to have had the most widespread impacts: DRR, CNRM, financial services, market linkages, and youth human capital**. Determine how the effectiveness of the other types of interventions can be enhanced.
- **Replicate the combination of systems-level and local interventions,** which is an important feature of resilience-enhancing programing, for optimal impacts.

- **Scale up programming focused on outcomes that showed little or no improvement over the program period (governance, social capital, market access, and gender-equitable norms) and/or explore new programming more specifically focused on them** in order to bring about stronger, positive change.
- **Integrate Humanitarian-Development-Peace coherence as a critical component of resilience programming.** Continue to respond to shocks with appropriate forms of humanitarian assistance (emergency assistance as well as Food/Cash-for-Work) to help households both maintain their well-being in the short run and protect and enhance their resilience capacities in the long run.
- **Strengthen the capacities of local and county governments for continuation of resilience building after PREG II programming ends,** as indicated by the qualitative analysis of the impact of PREG II on governance capacities and practices.

1 INTRODUCTION

The Partnership for Resilience and Economic Growth in Northern Kenya (PREG II) program was implemented in nine counties of Kenya's arid and semi-arid lands (ASALs) from 2018 to 2023. The overall goal of the program was to **increase resilience and economic growth among pastoralist communities in the ASALs of northern Kenya**.[2]

This report documents the analysis of the PREG II endline survey conducted in September 2023 as part of an impact evaluation of the program's activities. As will be seen in this report, the program's implementation period was marked by escalating shock exposure with repeated episodes of both drought and flooding, economic shocks, and restrictions associated with the COVID-19 pandemic.

The primary purpose of this endline report is to determine whether and how the PREG II program's package of interventions, including resilience interventions and humanitarian assistance, enhanced households' resilience to such shocks. Did the interventions help households recover from the multiple shocks they faced over the program's implementation period? What can we learn to enhance the effectiveness of future resilience-strengthening programs? It also examines the impact of the program on three key well-being outcomes: food security, poverty, and child malnutrition.

1.1 THE PREG II PROGRAM

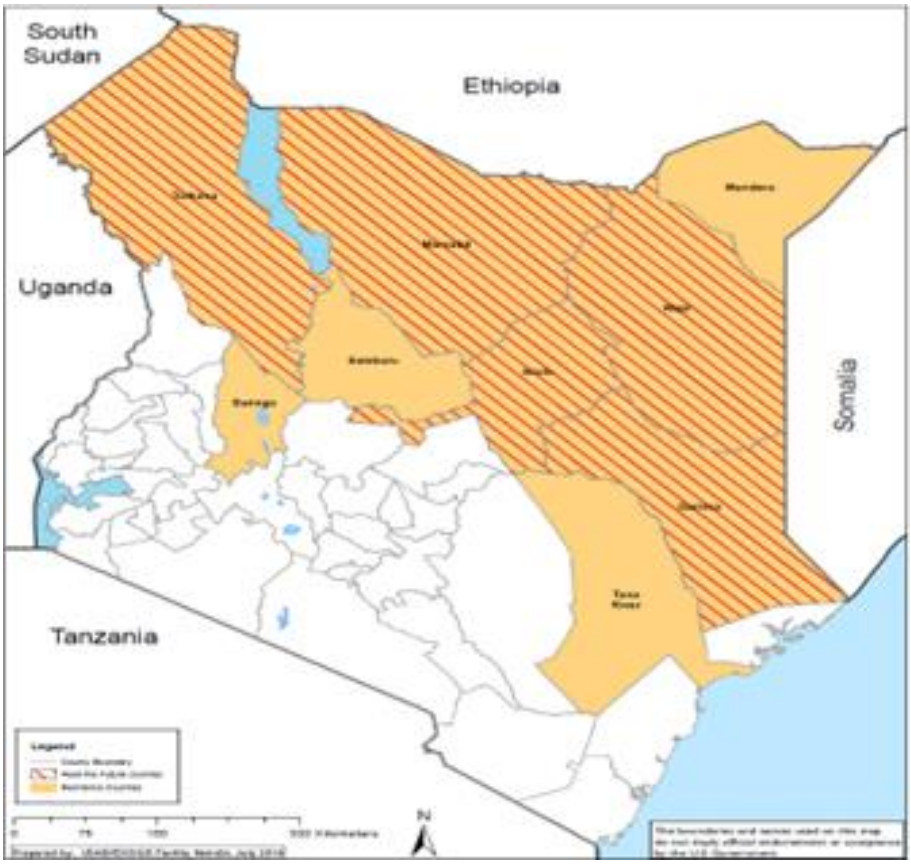
Following prolonged and severe droughts in northern Kenya in 2008 and 2011, the United States Agency for International Development (USAID) Feed the Future initiative began to address pastoralist vulnerability and resilience in the ASALs under the Resilience and Economic Growth in Arid Lands (REGAL) program. The program was implemented in partnership with the World Food Programme (WFP) and the Government of Kenya (GoK), with explicit coordination and harmonization of USAID-funded resilience-building activities of humanitarian and development stakeholders. In 2014, this partnership expanded to include over 15 partners from USAID, GoK, WFP, and other implementing agencies, forming the PREG program. The PREG model of collaboration has enabled partners to minimize redundancies, promote synergies, and achieve multi-partner collaboration and coordination.

PREG II, the subject of this report, is the second phase of the program. The nine program counties are shown in Figure 1.1. PREG II partners are listed in the front matter of this document.

The theory of change for PREG II is illustrated in Figure 1.2. To generate the economic growth needed to reduce poverty and hunger and to achieve the GoK's vision of a commercial and modern agricultural sector, Feed the Future invests in transforming agriculture and livestock production through two means: (a) improved competitiveness of high-potential value chains; and (b) promotion of diversification into higher-return, on- and off-farm activities. While these investments in economic growth are seen as necessary for reducing poverty and hunger, they are not sufficient. Also needed are targeted interventions that address the needs of three vulnerable populations: agro-pastoralists (the rural poor), women, and youth.

[2] USAID, 2022

Figure 1.1. PREG II areas of implementation



By improving links to markets and input access, providing affordable business development and financial services, and promoting greater diversification—specifically tailored to the needs of agro-pastoralists, women, and youth—value chain activities aim to "pull" rural households into income-generating activities. Additionally, to "push" vulnerable households toward market-oriented activities, PREG interventions take a pro-poor approach that emphasizes buying down risk, improving nutritional status, improving access to knowledge tools, and enhancing natural resource management.

The PREG II program employs a strategy of layering, sequencing, and cross-sectoral integration of interventions, termed in this report Comprehensive Resilience Programming (CRP). This strategy draws on cross-sectoral synergies to enhance impacts on resilience and well-being.

Figure 1.2. PREG II theory of change

Note: This is the original REGAL Theory of Change. Source: USAID (2015).

1.2 OBJECTIVE OF THIS STUDY AND RESEARCH QUESTIONS

The objectives of this endline survey analysis are twofold:

1. Conduct descriptive analysis of changes between the baseline (2018) and endline (2023) surveys in key variables needed for conducting resilience analysis: households' shock exposure and coping strategies, resilience to shocks and resilience capacities, food security, poverty, and child malnutrition.
2. Evaluate the impact of PREG II interventions and humanitarian assistance on households' resilience, resilience capacities, coping strategies, and well-being outcomes.

PREG II resilience interventions can be classified into the following 10 categories:

- Livestock Rearing
- Agricultural Production
- Communal Natural Resource Management (CNRM)
- Financial Services
- Business Development
- Market Linkages
- Disaster Risk Reduction (DRR)
- Health and Nutrition
- Human Capital: Women
- Human Capital: Youth

The study evaluates the impact of each of these intervention sets and, importantly, the impact of the program's Comprehensive Resilience Programming to determine the effectiveness of cross-sectoral integration of the interventions.

The study is based on both quantitative and qualitive data analysis.

What Are Resilience and Resilience Capacities?

PREG II conceptualizes resilience according to the USAID definition: "[Resilience is] the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth."[3]

The operational definition of resilience employed in this study is: "The ability of households to recover from shocks."

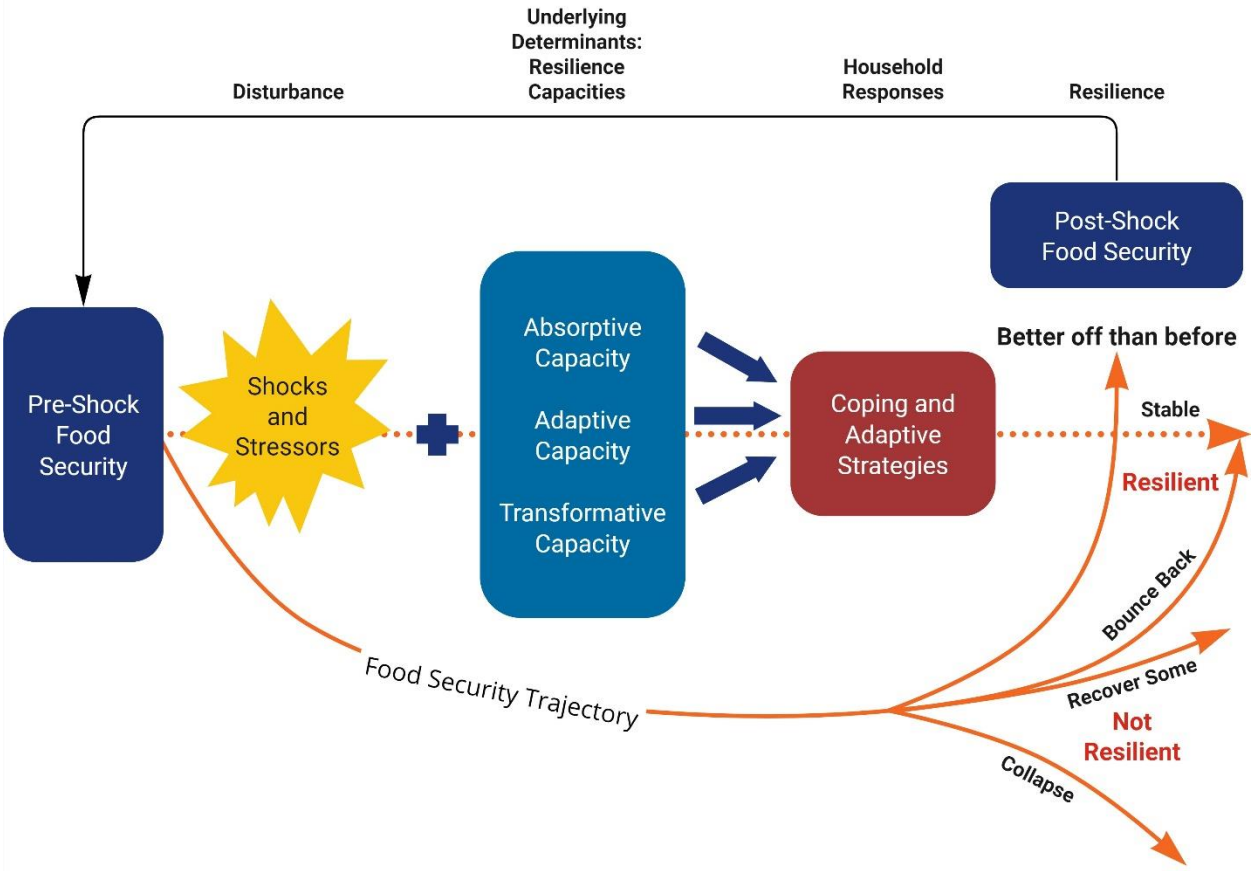
While resilience itself is an ability to manage or recover, resilience capacities are conditions thought to enable households to achieve resilience in the face of shocks. These determinants of resilience are the policy levers for strengthening households' resilience. The three dimensions of resilience capacity are:

- **Absorptive capacity** is the ability to minimize exposure to shocks and stresses (ex ante) where possible and to recover quickly when exposed (ex post).
- **Adaptive capacity** involves making proactive and informed choices about alternative livelihood strategies based on changing conditions.
- **Transformative capacity** relates to governance mechanisms, policies/regulations, infrastructure, services, community networks, and formal safety nets that are part of the wider system in which households and communities are embedded. Transformative capacity refers to system-level changes that enable more lasting resilience.[4]

The conceptual framework for resilience measurement and analysis guiding the study is shown in Figure 1.3. It lays out the key elements of resilience analysis and how they are related to one another. Shocks induce behaviors associated with households' coping and adaptive strategies, which are themselves mediated by their resilience capacities. This process alters the trajectory of well-being outcomes such as food security, ultimately determining whether households are resilient to shocks (bounce back or are better off) or not (collapse or only recover some).

[3] USAID, 2012
[4] Frankenberger et al., 2012

Figure 1.3. TANGO Conceptual Framework for Resilience Measurement



The following are the impact evaluation research questions.

1. What impact did PREG II interventions have on households' resilience to shocks?[5] Did the program's approach of sequencing, layering, and cross-sectoral integration of investments, or Comprehensive Resilience Programming, help strengthen their resilience? Which types of PREG II interventions strengthened their resilience?

2. What impact did PREG II interventions have on households' resilience capacities, including their absorptive, adaptive, and transformative capacities?

3. What impact did PREG II interventions have on key household well-being outcomes: food security, poverty, and child malnutrition?[6]

4. Did humanitarian assistance strengthen households' resilience and resilience capacities?

5. What impact did PREG II have on governance capacities and practices? What have been the successes and challenges of coordinating PREG II planning and operations with county government (CG) planning and operations? Do households perceive that there have been improvements in CG provision of services after such coordination?

[5] For ease of exposition, in this report "shocks and stresses" are referred to simply as "shocks" under the understanding that both are important aspects of the resilience conceptual framework.

[6] In addition to child malnutrition, this list originally included child illness and feeding practices. The impact evaluation could not be conducted for these latter two due to insufficient sample sizes.

1.3 ORGANIZATION OF THE REPORT

Section 2 of this report presents the data collection and analysis methodologies. Sections 3 through 5 contain the descriptive analysis of changes in key indicators over the program period. In particular, Section 3 documents the changes in households' shock exposure and coping strategies. Section 4 examines how resilient households were to the shocks they faced and changes in their resilience and resilience capacities over the program period. Section 5 looks at changes in well-being outcomes. Section 6 then lays out the measurement of households' exposure to and participation in resilience-strengthening interventions as well as their receipt of humanitarian assistance over the program period. The quantitative impact evaluation results are presented in Section 7, and qualitative assessment of impacts on governance in Section 8. Finally, implications for programming are given in Section 9.

2 METHODOLOGY: DATA AND EMPIRICAL STRATEGY

The PREG II impact evaluation (IE) was conducted using a mixed-methods approach combining quantitative and qualitative analyses.

2.1 QUANTITATIVE DATA COLLECTION

To conduct the IE, a suite of surveys was administered, including a baseline survey, two recurrent monitoring surveys (RMSs), and an endline survey. The dates of these surveys and sample sizes are given in Table 2.1. The impact evaluation is conducted using the baseline and endline surveys only, while all four surveys are used for descriptive analysis of how key shock exposure and outcome indicators have changed over the course of the program.

Table 2.1. PREG II datasets: Dates of data collection and sample sizes

Survey	Start date	End date	Number of communities	Number of households
Baseline	September 2018	September 2018	108	2,820
RMS 1 (rounds 1–4)	September 2019	June 2020	30	616
RMS 2 (rounds 1–4)	February 2020	January 2023	40	729
Endline	October 2023	November 2023	108	2,394

Note: The sample sizes are for the "analysis dataset," giving the number of households after data cleaning.

2.1.1 Survey Logistics

The data collection for the baseline survey and RMSs was conducted by TANGO along with Kimetrica. The endline survey data collection was conducted by TANGO and Hermon Research Ltd (formerly Kimetrica). All included both household and community surveys. The respondents for the household surveys were adult household members; those for the community surveys were a group of four to six knowledgeable community members, including village leaders.

TANGO worked closely with the USAID Kenya Mission, the USAID Center for Resilience, and Hermon Research Ltd. to develop the PREG II baseline survey questionnaire. This same questionnaire was employed for the endline survey, with the exception that the original modules on exposure to and participation in PREG II interventions were expanded. Each enumerator was provided with an Android-based tablet running ODK/CSPro programmed with the survey questionnaire including the necessary skip patterns and validation rules. Team supervisors reviewed each filled questionnaire for completeness and accuracy daily. The data were transmitted via cellular network to a remote secure server where they were aggregated and reviewed daily by TANGO staff who gave feedback to supervisors and enumerators on any inconsistencies in the data.

Enumerators received approximately 8 days of training including practice and pre-testing. The training focused on interview techniques and protocol, localization of the survey questionnaire, data collection using tablets, and data quality control. In addition, enumerators undertook a pilot test in a village.

TANGO worked with Hermon Research Ltd. for the ethical review of the endline survey, which was a two-stage process. The protocol and other relevant documents (informed consent protocol, English and local language translated data collection tools, and support letters) were submitted to the AMREF Ethics and Scientific Review Committee. Once this approval was obtained, similar documents were submitted to Kenya's National Commission for Science, Technology and Innovation to obtain a research permit. As part of the training for the field team, Hermon Research Ltd. also included sessions on data handling and issues related to the protection of human subjects and respondent confidentiality.

2.1.2 Sampling Design

All surveys listed in Table 2.1 are panel surveys, with the later surveys containing sub-samples of the same households that were included in the baseline. The baseline survey thus serves as the anchor on which the sampling of the later surveys is based. Baseline sampling followed a stratified, two-stage design.

To facilitate the impact evaluation, the sample was stratified into "comparison" and "treatment" groups at the county level based on *expected* PREG II resilience programming intensity.

The strata were defined as follows:

1. **Comparison households:** Households residing in sub-locations[7] in Baringo, Mandera, Samburu, and Tana River Counties, where humanitarian assistance and/or other non-PREG II USAID programming was expected to be implemented. USAID considered that their programming in these counties would not be directly focused on strengthening households' resilience capacities.
2. **Treatment households:** Households residing in sub-locations in Garissa, Isiolo, Marsabit, Turkana, and Wajir Counties, where USAID considered that their programming would be directly focused on addressing multiple resilience capacities through a Comprehensive Resilience Programming (CRP) strategy. The sub-locations in each treatment county were further placed into three categories of expected programming intensity: "low intensity," "medium intensity," and "high intensity."

In stage one of the sampling, sub-locations in each stratum were randomly selected using probability proportional to size (PPS) sampling. In the second stage, 30 households in each sub-location were randomly selected from within each sub-location's Census Enumeration Areas using household listings.

It is important to note that the comparison and treatment groups used for sampling purposes are not the comparison and treatment groups used for the impact evaluation. As discussed in Section 2.4.2 below, the latter groups are based on the *actual* patterns of participation in and exposure to interventions that occurred over the course of the program. The comparison and treatment groups used here for sampling were designed to facilitate the impact evaluation by ensuring a sufficient number of households for the groups eventually employed for the evaluation.

Sample size calculations were based on achieving the minimum sample size required to detect a 38% reduction in Global Acute Malnutrition, from 17% to 10.5% with 95% confidence and 80% power,

[7] Prior to 2010, Kenya had an administrative structure comprised of 8 provinces, 69 districts, 497 divisions, 2,427 locations, and 6,612 sub-locations. In this structure, sub-locations are the smallest administrative unit for which census data, which are needed for sampling, are reported. Since this time, the administrative structure has changed. In 2010 it became a structure of counties, sub-counties, wards, and villages. However, the available census data at the time of PREG II baseline sampling in 2018 were from the 2009 census, which followed the old system (note: a new census was conducted in 2019).

assuming a design effect of 2.0.[8] This starting minimum sample size, at 880 per stratum, was adjusted upward to account for households with no eligible children under 5 (to 1,273), but then deflated to 1,154 to account for households with two or more eligible children. Finally, allowing for a 3% non-response rateand a 15% rate of attrition between the baseline and endline surveys yielded a sample size of 1,366, rounded up for a final sample size of 1,400 for the comparison group stratum and 1,400 for the treatment group stratum.[9] The final planned sample size was 2,800. As can be seen in Table 2.1, the actual baseline sample size was a sufficient 2,820 households.

2.1.3 Locating Endline Panel Sample Households and Testing for Attrition Bias

During the baseline data collection, teams gathered geographic data necessary for implementing a panel survey at endline. To follow households as members move away and form new households, or move out of the community, households were linked by the residence of the male primary respondent or, in his absence, the residence of the majority of household members.[10] During the household verification phase for the endline survey, the field team attempted to locate households that moved since the time of the baseline. If a moved household could be located within the original sub-location, it was included in the sample. If it moved outside of the sub-location, it was dropped from the endline sample and considered an attritor.

Attrition of households between the baseline and endline surveys may bias the impact evaluation results if the new sample does not represent the original population. The attrition rate was 15.1% over 5 years. Table 2.2 compares baseline values of the full original baseline sample with that of the reduced endline panel sample. The size of endline survey households is slightly larger than baseline households, leading to lower asset ownership and expenditures per capita. Otherwise, the samples are largely the same.

[8] Sample size was calculated following the Addendum to FANTA Sampling guide by Robert Magnani (1999), "Correction to Section 3.3.1 Determining the number of households that need to be contacted" (See Stukel 2018).

[9] The Kenya National Bureau of Statistics 2008-09 Demographic and Health Survey non-response rate was 2.3% and the 2005-2006 Kenya Integrated Household Budget Survey response rate was 2.0%.

[10] This technique is being used based on the positive experience gained from panel surveys conducted for the PREG II RMS, USAID Ethiopia Pastoralist Areas Resilience Improvement through Market Expansion (PRIME), and the USAID Resilience in the Sahel-Enhanced (RISE) impact evaluation in Niger and Burkina Faso.

Table 2.2. Comparison of baseline socio-demographic characteristics, food security, resilience capacity, and shock exposure across baseline and endline samples

	Baseline sample	Endline sample	Percent difference	
Socio-demographic characteristics				
Female-headed household (%)	47.60	48.99	2.92	
Female adult-only household	18.47	18.62	0.78	
Age of household head	43.45	44.24	1.80	
Household size	5.06	5.26	4.03	***
Household adult equivalents	3.78	3.92	3.73	***
Percent of females 0–16 years	20.55	21.56	4.92	
16–30 years	12.97	12.75	-1.72	
30+ years	15.37	15.91	3.48	
Percent of males 0–16 years	22.05	22.78	3.27	
16–30 years	12.75	11.45	-10.14	***
30+ years	16.30	15.55	-4.62	
Adult member with formal education	50.28	47.22	-6.09	
Literate adult member	51.38	48.44	-5.72	
Economic status				
Consumption asset index	2.77	2.55	-7.82	***
Agricultural productive asset index	1.49	1.55	3.74	
Tropical Livestock Units	7.91	8.40	6.18	
Total expenditures per capita	3.21	2.87	-10.59	***
Food security	5.20	5.32	2.36	
Resilience capacity				
Absorptive capacity	29.44	28.56	-2.99	
Adaptive capacity	32.62	31.92	-2.17	
Transformative capacity	28.52	27.10	-4.98	***
Shock exposure (HH-reported measure)	9.72	9.80	0.82	
Number of households	2,820	2,394		

Note: Stars indicate the difference is statistically significant at the 10%(*), 5%(**), and 1%(***) level.

2.2 MEASURES OF RESILIENCE

In accordance with the operational definition of resilience of this study—the ability of households to recover from shocks—and the conceptual framework (Figure 1.3), resilience is measured using two indicators. The first, "realized resilience," is an ex ante, objective indicator that captures the trajectory of food security over the course of a shock period. The second, households' perceived ability to recover, is a subjective or "experiential" indicator measured using data from households' own reports of their ability to recover.

2.2.1 Realized Resilience

Realized resilience is measured as the total change in food security over the 5 years between the baseline and endline surveys. It is a direct measure of households' ability to recover from the specific series of shocks that occurred over this period. The continuous measure is complemented by a dichotomous variable indicating whether a household was able to maintain or increase its food security and is thus considered "resilient" to the shocks.

The indicator of food security employed is the inverse of an experiential indicator of food insecurity, the Food Insecurity Experience Scale (FIES) (see Section 5 for details).[11] The FIES is an index constructed from responses to eight questions regarding people's experiences of food insecurity in the 30 days prior to the survey, ranging from worry about not having enough food to actual experiences of food deprivation associated with hunger. The inverse of the index is used so that the measure increases with increasing food security. The resulting food security index potentially ranges from 0 to 8, and the Realized Resilience Indicator from -8 to +8.

2.2.2 Perceived Ability to Recover

The perceived ability to recover (ATR) indicator is measured using data on survey respondents' answers to the question, for each of $X_j, j = 1, \dots, q$ shocks experienced, "To what extent were you and your household able to recover?" The possible responses, with assigned values in parentheses, are:

- Did not recover (1)
- Recovered some, but worse off than before (2)
- Recovered to same level as before (3)
- Recovered and better off (4)
- Not affected (5)

The responses are used to calculate an ATR index for each household "*I*" using data collected at baseline and endline as follows:

$$ATR_i = \frac{\sum_{j=1}^{q} X_{ij}}{q}. \qquad (1)$$

[11] Ballard et al., 2013

2.3 QUANTITATIVE DATA ANALYSIS: DESCRIPTIVE ANALYSIS OF TRENDS

The baseline, two RMSs, and endline household and community survey data are used to conduct descriptive analysis of changes between the baseline and endline surveys in key variables needed for conducting resilience analysis. These are: households' shock exposure and coping strategies (Section 3), resilience and resilience capacities (Section 4), and food security, poverty, and child malnutrition (Section 5). Indicator values are presented as percentages and means, and the statistical significance of differences between the baseline and endline surveys are assessed.

Representativeness of the sample is maintained by applying survey sampling weights that account for the different probabilities of selection at the stratum and household level, respectively, as well as to account for survey non-response.

2.4 QUANTITATIVE DATA ANALYSIS: IMPACT EVALUATION

The purpose of the quantitative component of the impact evaluation is to evaluate the causal impact of resilience-building interventions and humanitarian assistance on households' resilience, resilience capacities, and well-being outcomes.

An impact evaluation (IE) is a study conducted to determine whether changes in outcomes can be directly attributed to a program or intervention. A rigorous evaluation of such attribution requires comparing what happened to the outcome *with* an intervention or "treatment" (i.e., the factual) to what would have happened to the outcome *without* the treatment (referred to as the counterfactual). The counterfactual is never known with certainty because the exact same households that are exposed to an intervention are not able to **not** be exposed to it at the same time.[12] Given this issue, two basic conditions for an impact evaluation to be conducted in a rigorous manner are that (1) a non-treatment comparison group be available so that a counterfactual can be identified; and (2) any selection bias be adequately addressed. Selection bias can arise because of purposeful targeting of interventions to specific populations (e.g., the most poor) and/or self-selection of households with particular characteristics (e.g., more highly educated) into interventions. Targeting and self-selection render comparison and treatment groups fundamentally different from one another prior to the commencement of program activities, thus biasing results if not corrected.[13]

Selection bias can be addressed by randomizing interventions, which overcomes these differences between comparison and treatment groups. Randomization with an experimental design was not possible in the case of PREG II. Treatment villages were purposively selected for implementation of program interventions, and households within them self-selected to participate in interventions. The quasi-experimental technique used in this impact evaluation to address selection bias is Difference-in-Differences Propensity Score Matching (DiD-PSM).

[12] The term "exposed" is used here for expository purposes, but later we make a clear distinction between households' exposure to and direct participation in interventions (Section 2.4.2).
[13] Gertler et al., 2016; Glewwe & Todd, 2022; Khandker et al, 2010; White & Raitzer, 2017

2.4.1 Difference-in-Differences Propensity Score Matching

After identifying households that were exposed to the sets of PREG II interventions, DiD-PSM is used to identify a valid comparison group from among households that were not exposed to serve as the counterfactual. The **"matching"** aspect of DiD-PSM takes place using measured indicators of community and household characteristics that are believed to influence households' exposure to interventions and to be correlated with of outcomes of interest. Matching is intended to render these "matching variables" similar for the treatment and comparison groups. The **"difference-in-differences"** aspect of DiD-PSM refers to the use of differences between *changes* in outcomes over time for the treatment and comparison groups, the calculation of which panel data make possible. Using changes over time in outcome variables, rather than levels, allows us to control for all unobserved (that is, unmeasured) characteristics that might influence exposure and/or the outcomes that are time invariant. Examples of such variables are cultural traditions, persistent health conditions and disabilities, and topographical features.

Three conditions must be met to produce unbiased estimates of impact:[14]

1. **Conditional independence.** All household and community characteristics that potentially affect exposure to interventions and are correlated with the outcomes of interest must be controlled for. This condition ensures that there are no unobservable differences in the treatment and comparison groups that might affect the outcomes. It is addressed in this impact evaluation by matching on a wide range of relevant community and household characteristics that potentially affect exposure to PREG II interventions and our outcomes of interest (see Section 2.4.2 below), and by controlling for unobserved time-invariant factors through applying Difference-in-Differences.

2. **Characteristics used for matching must be unaffected by exposure to interventions.** Estimates will be biased if the matching variables are already affected by the interventions at the time the variables are measured. This condition is addressed by only using matching variables measured at baseline—before the program started—or that are exogenous to interventions (in the case of climate shock exposure).

3. **The Parallel Trends Assumption is met**. Specific to Difference-in-Differences analysis, the Parallel Trends Assumption requires that in the absence of the treatment, the treatment and comparison groups would have the same trend over time in the outcomes being evaluated: "equal trends in the absence of treatment." We address this assumption by matching on baseline values of outcomes (see Section 2.4.3)

2.4.2 Identification of Treatment and Comparison Groups for the Impact Evaluation

The treatment and comparison groups described in Section 2.1 above were established at baseline for sampling purposes. They cannot be employed as the treatment and comparison groups for the impact evaluation because they do not reflect the actual intensity of households' exposure to interventions that ensued after the program started and they do not identify interventions implemented with the specificity needed. Additionally, there were no stated eligibility requirements for village or household engagement in interventions, and records were not maintained regarding where specific interventions

[14] Glewwe & Todd, 2022; White & Raitzer, 2017

were implemented and which households participated in them. Thus, as part of the endline survey, data were collected to gather this information directly from household and village survey respondents using retrospective recall.

Impact analysis is conducted for the 10 sets of interventions listed in Section 1 representing PREG II resilience programming. These intervention sets, repeated here, are:

1. Livestock rearing
2. Agricultural Production
3. CNRM
4. Financial Services
5. Business Development
6. Market Linkages
7. DRR
8. Health and Nutrition
9. Human Capital: Women
10. Human Capital: Youth

It is also conducted for households' access to humanitarian assistance over the program period.

Treatment and comparison groups are needed for two types of engagement in program interventions: exposure (sometimes referred to as "intent to treat") and participation. Regarding exposure, many PREG II interventions, such as market strengthening, were implemented at a systems level. Households were not targeted for direct participation in them but may nevertheless have been exposed to them and benefited indirectly, for example, through induced price changes, employment, or information made available. On the other hand, households were given the opportunity to directly participate in some interventions (e.g., savings groups). Additionally, they may have made a decision to take advantage of an intervention implemented at a broader systems level (e.g., purchasing medications at a veterinary clinic). This direct participation has been found in other settings to have a stronger impact on the outcomes of interest here, such as food security and resilience.[15]

For this study, a household is considered to have been **exposed** to an intervention if it resides in a village in which the intervention was implemented. To collect the exposure data, community survey respondents were asked whether at any time in the previous 5 years specific interventions falling into the 10 categories were implemented in their community.

A household is considered to have **participated in** an intervention if any household member personally took actions related to the intervention, such as joining a marketing cooperative, using a mobile banking service, or participating in a leadership skills training. To collect the participation data, household survey respondents were asked whether at any time in the previous 5 years any household member participated in each specific type of intervention falling into the 10 categories.

To capture the overall impact of the program, separate measures of exposure and participation are also employed. In the case of **exposure**, the impact of exposure to Comprehensive Resilience Programming (CRP) is evaluated. Consistent with the cross-sectoral, integrative approach of PREG II, exposure to CRP is defined as exposure to at least seven out of the 10 intervention sets at some time over the program's operational period. As will be seen in Section 6, **participation** in interventions by households was far less

[15] Smith et al., 2022; Smith and Frankenberger, 2022, 2023

common than exposure to them. Thus it was not possible to construct a measure of participation in CRP. Instead, a measure that captures whether households had at least some moderate level of participation is employed: participation in at least two of the 10 intervention sets. The differing number of intervention sets used to define these two measures is taken into account in the interpretation of impact estimates.

A final measure capturing households' overall engagement in resilience interventions is of "high-intensity" exposure to PREG II interventions. Other development actors were present in the PREG II area during the program period. While these entities were not programming using CRP, it is possible that they implemented activities that are part of or similar to the 10 PREG II intervention sets. This final measure is used for analysis of whether impacts can be attributed, *specifically*, to the PREG II program. It is based on information provided by PREG II staff on the types of interventions implemented in each sublocation (roughly corresponding to survey villages) over the program period. These data are not granular enough to categorize interventions into the 10 intervention sets as we have done for the survey data. However, they do allow a count of the number of different kinds of interventions implemented and subsequent calculation of a high-intensity exposure treatment variable (see Section 6 for details).

To summarize, 24 treatment/comparison (T/C) groups are employed for this impact evaluation:

1. Exposure to the 10 intervention sets (10 T/C groups)
2. Participation in the 10 intervention sets (10)
3. Access to humanitarian assistance (1)
4. Exposure to CRP (1)
5. Participation in multiple resilience interventions (1)
6. High-intensity exposure to PREG II interventions (1)

Measurement of these groups is described in detail in Section 6.

2.4.3 Choice of Matching Variables

The choice of matching variables for the DiD-PSM analysis is based on careful consideration of a wide range of factors potentially affecting households' exposure to and participation in PREG II interventions as well as determinants of the many outcomes of interest. Based broadly on these and our knowledge of the program area, PREG II programming, and the TANGO Conceptual Framework for Resilience Measurement and Analysis (Figure 1.3 above), the variables are in the following categories:

- Pre-program outcome levels
- Shock exposure
- Household socio-demographic characteristics
- Household economic status
- Intervention exposure at the start of PREG II
- Village characteristics

The matching variables used for the main analysis are listed in Table 2.3.

Table 2.3. Propensity Score Matching: Household and village characteristics used for matching

Core matching variables	
Outcome variables	
Food security	Pastoralist household
Absorptive capacity	Bonding social capital
Adaptive capacity	Bridging social capital
Transformative capacity	Linking social capital
Poverty	Absence of fatalism
Shock exposure	Sense of individual power
Household shock exposure index	Exposure to alternatives
Number of shocks in the last 5 years	Access to informal safety nets
Human disease outbreak	Gender-equitable norms
Months of meteorological drought (BL to EL)	**Household economic status**
Months of meteorological flooding (BL to EL)	Consumption asset index
Months of agricultural drought (BL to EL)	Agricultural productive asset index
Months of agricultural flooding (BL to EL)	Tropical Livestock Units
Household socio-demographic characteristics	Land owned (ha)
Female-adult-only household	**Intervention exposure (village-level)**
Female household head	Number of gov't/NGO programs in previous 5 years
Age of household head	Number of NGOs in village in previous 5 years
Household size	Food assistance services in village
Percent males 0–16	Livestock loss assistance
Males 16–30	Emergency food assistance
Males 30 plus	Emergency cash assistance
Females 0–16	**Village characteristics**
Females 16–30	Village size (population)
Females 30+	Distance to nearest town
Any member has a formal education	Number of types of infrastructure
Variables used on a case-by-case basis (village-level) a/	
Piped water	Distance to nearest livestock market
Paved road	Distance to nearest abattoire
Public transport	Member of Somali ethnic group
Mobile phones: All or most HHs	Communal grazing land
Urban	Security service within 1 hour
Electricity	Agricultural extension services
Secondary school	Financial services
Primary school	Somali is one of largest ethnic groups

Core matching variables	
Metal roofs: All or most HHs	Gender-neutral practices

Note: All variables are measured at baseline unless otherwise noted.
a/ Not included if lead to violation of PSM common support or balancing conditions.

As noted above, all are either measured at baseline or are exogenous to treatment (e.g., indicators of meteorological and agricultural drought). The "core matching variables" are used in all analyses (unless otherwise noted), while the "case-by-case" variables differ depending on the type of intervention being evaluated.

The matching variables employed for the evaluation go far beyond those typically included in PSM impact evaluations to include many considered "unobservables" but that often influence intervention allocations and participation, such as resilience capacities, aspirations, social capital, social cohesiveness, and gender norms. This increases the validity of the resulting impact estimates.

Note that analysis of impacts on child malnutrition necessarily took place for a sub-sample of households in the overall sample. This was the 731 households with children under 5 years old at both baseline and endline. Given this substantially smaller sample size, the list of matching variables satisfying the conditions for implementing PSM (see below) was also necessarily smaller for exposure to intervention sets,[16] focusing on those most directly associated with child malnutrition. These matching variables are listed in Table 2.4.

As noted in Section 2.4.1, matching on baseline levels of key outcomes of the analysis is undertaken in order to meet the Parallel Trends Assumption of Difference-in-Differences analysis.[17] Doing so is especially important because, as is the case for many development programs, PREG II interventions may have been targeted to areas of greater need based on the very outcomes (e.g., food security) the program was trying to improve. Further, many of the outcomes exhibit Regression To the Mean (RTM) such that differing initial levels for the treatment and comparison group are associated with differing trends over time that have nothing to do with household exposure to and participation in interventions.

There has been some debate over the appropriateness of matching on pre-intervention outcomes in the Difference-in-Differences literature (Roth et al. 2022; McKenzie 2022; Ryan 2018; Daw and Hatfield 2018a,b). Ryan (2018) and Daw and Hatfield (2018a) have now resolved this debate by clarifying that matching on pre-intervention outcomes solves the RTM problem—and helps reduce bias—in situations where targeting or self-selection based on outcomes takes place at the "unit level" (e.g., households or villages) for treatment and comparison units belonging to a single population (and thus drawn from the same outcome distribution). This is a typical scenario in international development program evaluations. However, matching on outcomes causes an RTM problem—and potentially increases bias—in situations where treatment is assigned at the population level and treatment and comparison households are drawn from different populations. This happens, for example, if the treatment group is entirely sampled from within one locality (e.g., district) and the comparison group entirely sampled from a separate locality (e.g., neighboring district) before matching, a common scenario in the health sciences. Recent

[16] Analysis of participation in intervention sets employed the variables listed in Table 2.3.
[17] Gertler et al., 2016, p. 136

Table 2.4. Propensity Score Matching: Subset of households and village characteristics used for matching in impact analysis of child malnutrition

Core matching variables	
Outcome variables	**Household economic status**
Food security	Consumption asset index
Poverty	Agricultural productive asset index
Shock exposure	Tropical Livestock Units
Household shock exposure index	Land owned (ha)
Number of shocks in the last 5 years a/	**Intervention exposure (village-level)**
Human disease outbreak	Number of gov't/NGO programs in previous 5 years
Household socio-demographic characteristics	Food assistance services in village
Female-adult-only household	Emergency food assistance
Female household head	Emergency cash assistance
Age of household head	**Village characteristics a/**
Household size	Village size (population)
Percent males 0–16	Distance to nearest town
Males 16–30	Number of types of infrastructure
Males 30+	
Females 0–16	
Females 16–30	
Females 30+	
Any member has a formal education	
Gender-equitable norms	

Note: All variables are measured at baseline unless otherwise noted.
a/ Not included if lead to violation of PSM common support or balancing conditions.

contributions to this literature are Varga et al. (2021), Illenberger et al. (2020), Geroa and Gui (2023), and Ham and Miratrix (2024).[18]

For this PREG II impact evaluation, since the comparison and treatment group households are drawn from the same population, we match on pre-intervention outcomes such as food security to avoid RTM problems and violation of the Parallel Trends Assumption.[19]

[18] A helpful explanation of how one should choose whether or not to match on pre-intervention outcomes from the Health Policy Data Science Lab of Harvard and Stanford can be found here: https://diff.healthpolicydatascience.org/#matching.
[19] The population is the nine program counties, and the "unit level" at which targeting takes place is households, whether targeted directly for participation in interventions or indirectly by being exposed to interventions targeted at the village level.

2.4.4 Steps for Implementing DiD-PSM, Including Matching Diagnostics

For any intervention, we implement DiD-PSM in five steps.

The **first** step is to compute a propensity score for each household using a Probit treatment model:

$$P(T = 1|X_1, \ldots, X_n) = \Phi(\beta_0 + \beta_1 X_1 \ldots + \beta_n X_n),$$

where T is a treatment indicator variable (0,1), the Xs are matching variables, and $\Phi(\bullet)$ is the cumulative standard normal distribution function.[20]

In the **second** step, the matching is conducted. Treatment group households are matched with a group of non-treated households based on similarity of propensity scores. An important condition for the success of this step is "common support." Treatment households must be similar enough to non-treated households in the matching variables so that there are sufficient non-treated households close by in the propensity score distribution with which to make matches. Any treated households whose propensity scores are higher than the maximum or lower than the minimum of the non-treated distribution are dropped. The criterion used to ensure adequate common support is that at least 80% of treatment households lie on the common support and thus remain in the analysis.

In the **third** step, matching effectiveness is evaluated based on the criteria that the Mean Standardized Percent Bias across all matching variables post matching is less than or equal to 10.0, and all matching variables have an individual bias less than 25.0.[21] These criteria ensure that there are no unacceptably large differences in characteristics between the comparison and treatment groups—i.e., that the comparison group was essentially the same as the treatment group before the interventions were implemented.

In the **fourth** step, the average values of the (change in the) outcome variables of the matched treated and non-treated groups of households are compared to calculate an estimate of the impact of the intervention, or the "Average Treatment Effect on the Treated" (ATT). Of the many techniques available, DiD-PSM is conducted using kernel matching, for which each treated household is matched on propensity score to a group of non-treated households with a weight inversely proportional to

[20] Sampling weights are not employed in the estimation of the propensity scores. The literature on the use of sampling weights for estimating propensity scores in the context of complex survey data has conflicting recommendations, with some advocating that they be used (e.g., Ridgeway et al., 2015; Glewwe & Todd, 2022) and others that they not be used or are unable to determine from the evidence presented (e.g., Leuven & Sianesi, 2003; Lenis et al., 2019; Austin et al., 2018).

[21] The Standardized Percentage Bias (SPB) is the percent difference of the sample means in the treated and non-treated sub-samples as a percentage of the square root of the average of the sample variances in the treated and non-treated groups. Heinrich, Maffioli, and Vazquez (2010) reference Rosenbaum and Rubin's (1985) suggestion that a bias for any matching variable that is 20 or higher should be considered "large." Garrido et al. (2014) write that "there is no rule regarding how much imbalance is acceptable in a propensity score. Proposed maximum standardized differences for specific covariates range from 10 to 25" (p. 6). Note that in the rare cases of matching variables with SPBs greater than 25.0, these variables are noted and the results interpreted in light of the potential direction of bias in impact estimates.

distance.[22] The comparison group outcome is computed as a weighted average, with a lower weight given the greater is the propensity score difference from that of the treated household.[23]

As an example, the ATT for the Realized Resilience (RR) indicator (see Section 2.2.1), with baseline and endline time periods denoted {t=1,2}, is:

$$ATT = \underbrace{\frac{\sum_{i \in T}(Y_{i2}^{T} - Y_{i1}^{T})}{n^{T}}}_{\text{Mean RR of treated households}} - \underbrace{\frac{\sum_{j \in C}\omega(i,j) \cdot (Y_{j2}^{C} - Y_{j1}^{C})}{n^{T}}}_{\text{Weighted mean RR of comparison households}},$$

where Y denotes food security, treated (T) and comparison (C) households are indexed i and j, respectively, n^T is the number of treated households, and ω is the weight used to aggregate the outcomes for the matched comparison group households. The ATT for the Perceived Ability to Recover (or ATR—see Section 2.2.2 above) indicator is calculated similarly, but with the Ys replaced with ATRs. The statistical significance of ATT estimates is calculated using bootstrapping (with 100 repetitions),[24] which yields valid standard errors in the context of PSM.[25]

In the **fifth** step, we determine whether our impact estimates are robust to methodology by comparing the Kernel matching DiD-PSM estimates for key outcomes to those generated using two alternative propensity-score based methods. The first is Nearest Neighbor Matching with Difference-in-Differences (DiD-NNM) in which treated households are matched to the five households in the comparison group with the closest propensity scores. The second technique is Inverse Probability Weighting, in this case DiD-IPW, which is distinct from PSM as it uses the calculated propensity scores to weight values of the outcome variable for comparison and treatment households.[26]

The analyses are conducted using the "psmatch2" and "teffects" commands in Stata.

[22] The matches are only conducted for households with a certain radius (the distance between propensity scores of the treated and non-treated households). The radius depends on the bandwidth of the kernel, which is set at 0.06 for all ATT estimates reported.

[23] Sampling weights are not employed in the calculation of the ATTs. International development impact evaluation methods publications (including Khandker et al., 2010; Gertler et al., 2016; White and Raitzer, 2017; and Glewwe & Todd, 2022) give no guidance on this topic. However, some studies do recommend sampling weights be used in estimating PSM ATTs in the context of complex survey data (e.g., Ridgeway et al., 2015; Lenis et al., 2019; Austin et al., 2018). We ran the results for the impact of exposure to CRP on key outcomes (Realized Resilience, percent of households resilient, the three resilience capacity indexes, food insecurity and poverty) with and without including sampling weights and found little difference in the ATT estimates.

[24] Bootstrapped standard errors are calculated using repeated random draws of the sample data to measure variance properties of estimates.

[25] Khandker et al., 2010

[26] Glewwe & Todd, 2022; Khandker et al., 2010

2.4.5 Potential Limitations of the Quantitative Data Analysis

Some potential limitations of the quantitative analysis are as follows.

Exposure to non-PREG II interventions: As noted above, other development actors, while not utilizing the PREG II Comprehensive Resilience Programming strategy, were operating in the program area during its implementation period. The data collected from households and communities on their exposure to and participation in resilience-strengthening interventions will not allow us to distinguish between PREG II's and these other actors' interventions. Nevertheless, the indicators of exposure to and participation in interventions used for evaluating impact are for the specific types of interventions implemented by the program, and we can gain valuable information knowing about their impacts. We also use data on the intensity of households' exposure to PREG II-*specific* interventions to provide evidence on whether impacts can be attributed to PREG II (see Sections 6.2 and 7.3 for this analysis).

Recall bias in collection of data on exposure to and participation in interventions: As noted above, these data were collected from household and community survey respondents using 5-year recall, which corresponds to the length of the PREG II program. Respondents were asked simple yes/no questions similar to an "event history" approach, as opposed to those requiring fine-tuned responses (for example, exact quantities consumed of items). Yet the possibility of recall bias remains. Triangulation of the exposure and participation data is used to cross-check for accuracy and minimize bias.

Bias due to previous exposure to PREG I interventions: Some households in the PREG II survey sample may have been engaged in REGAL or PREG I interventions, which could have been implemented in the same geographic areas. The 5-year recall period in the collection of data on exposure and participation is meant to demarcate a "before-and-after" point between the two programs. Nevertheless, households may mistakenly include PREG I interventions in their responses.

Spillovers: There is a risk of spillovers affecting impact estimates in the case of exposure to some systems-level interventions. For example, market strengthening interventions in treatment sublocations (direct exposure) could have positive spillover effects in sublocations where there were no interventions in this area (indirect exposure), such as effects on prices and availability of various products. Households in one village without a health facility could use one in another village. These spillovers would bias impact estimates downward.

Inability to conduct county-level analyses: The PREG II program area encompasses a very large geographic area with nine counties that differ in many ways. However, because of insufficient sample size, we were not able to conduct the descriptive analysis or the impact evaluation separately by county.

2.5 QUALITATIVE DATA COLLECTION AND ANALYSIS

Qualitative research was carried out at the community, county, and regional levels to capture the perspectives of program participants and other stakeholders. One of the key functions of qualitative research is to triangulate input from different sources in order to better understand and explain quantitative outcomes. Qualitative information helps explain the local context (e.g., the shock environment, why people respond differently to different shocks), provides more in-depth understanding of local concepts and definitions of resilience, and enables a better understanding of the perceived significance of changes that are measured quantitatively. Qualitative methods are key to

understanding situational awareness of the drivers of resilience and provide a deeper understanding of the processes and interrelationships relevant to household and community resilience.

2.5.1 Research Questions Addressed

The qualitative component of the impact evaluation addressed the research questions listed in Section 1 and provided respondents with an opportunity to speak about local conditions, resilience, and the extent and manner in which PREG II and other development programs have impacted their lives. In particular, the qualitative inquiry sought to understand how and why PREG II interventions worked or not, what impact they had on their lives, and whether—and why—they feel better able to deal with future shocks and stressors. Qualitative inquiry was also used to better understand the effectiveness of layering and coordination of interventions through Comprehensive Resilience Programming and the extent to which governance, access to services, and other transformative resilience capacities were strengthened.

Questions were designed to explore the various components of resilience: (a) the types, frequency, and severity of shocks and stressors experienced by communities; (b) their absorptive, adaptive, and transformative resilience capacities for dealing with those shocks and stressors; (c) their responses (i.e., coping strategies) to the shocks and stressors they experienced; and (d) perceptions of changes in their own well-being and ability to manage future shocks and stressors. Additional focus was placed on gender dynamics, the importance of social capital, social cohesion, government effectiveness (e.g., quantity and quality of services provided), access to community and institutional resources, governance, and collective action, among others.

2.5.2 Qualitative Data Collection Approach

The qualitative data collection plan was developed in coordination with the USAID/Kenya Mission and the Reliance Learning Activity. Qualitative data collection occurred simultaneously with the quantitative survey. Teams of three people were deployed across a subsample of PREG II counties, including Isiolo, Turkana, Marsabit, Garissa, and Tana River. Teams were gender-balanced, multidisciplinary, and included personnel with knowledge of the dominant local language in each county. Overall, teams visited 22 villages over 3–4 weeks, staying for 2–3 days in each village to gather in-depth information. Villages were purposively selected to represent the range of PREG II interventions and to reflect different rural/urban and agroclimatic contexts. Access and security considerations also influenced village selection.

Focus group discussions (FGDs) and key informant interviews (KIIs) occurred at the village level with separate groups of women, men, and youth; community leaders; and others with specialized knowledge specific to the community (e.g., livestock traders; savings and health promoters; committee members for natural resources, peace, and water management). KIIs often offer a broader, more in-depth perspective than FGDs and can provide greater contextual details to help inform analysis. KIIs at the county level were conducted with government officials, market actors, financial service providers, PREG II staff, and staff from other development programs in the area. In total, teams carried out four KIIs in each county.

Participatory tools (Venn diagrams, transect walks, wealth ranking, visits to individual households) were used as needed to promote maximum engagement of respondents. The local survey firm, Hermon Research Ltd, worked with target communities to identify FGD participants with a wide diversity of

perspectives. They also worked with community members to identify a diversity of key informants who could speak to different aspects of resilience; changes in government policies or programs; external and internal coordination of PREG II activities; market dynamics; community social capital and relations with neighboring communities; and changes in household and community responses to shocks.

In order to ground-truth the qualitative research approach and ensure accurate local contextualization and adaptation, in-country advance planning meetings were carried out in June and July, 2023. The TANGO qualitative team leader met with counterparts from Hermon Research, USAID, and other PREG II partners to review the research questions and their relevance to PREG II, and to formulate/refine the topical outlines and respondent lists. This helped ensure that the qualitative survey team was well-prepared with tools that were already thoroughly reviewed and translated and with detailed plans in place.

2.5.3 Qualitative Data Analysis

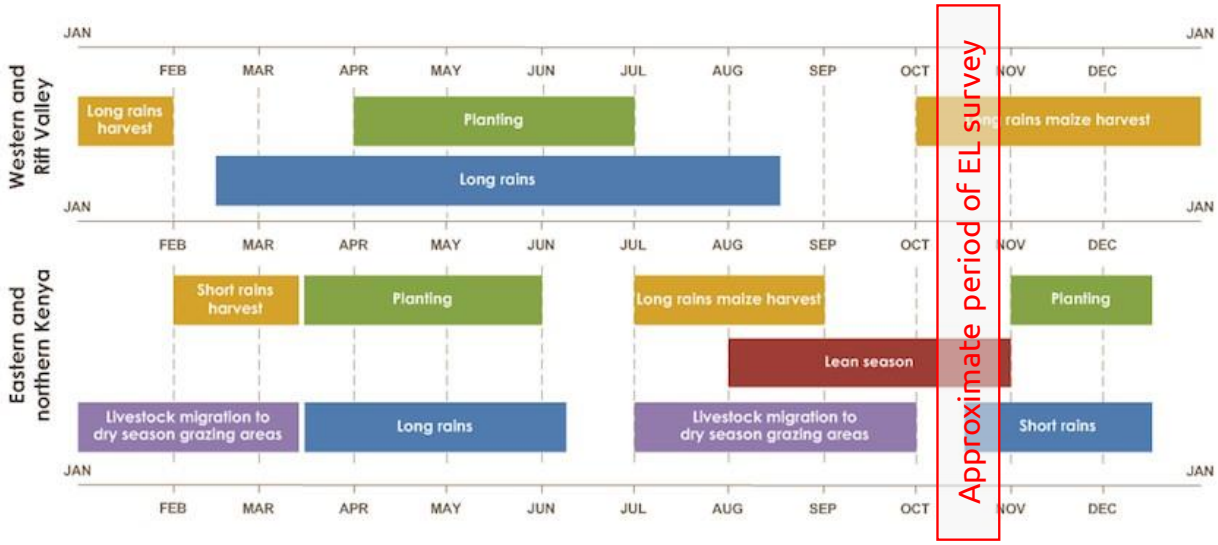
Qualitative information collected from FGDs and KIIs was prepared for analysis with NVivo and analyzed to identify patterns and differences in responses, and specific contextual information important to analyze those responses. Responses from participants were triangulated between FGDs, KIIs, households, and others to cross-check the reliability of information and to identify differences in perception between groups based on gender, social or economic status, or ethnicity. Findings from the analysis of qualitative data was integrated into the discussion of quantitatively derived results throughout this report.

3 SHOCK EXPOSURE AND COPING STRATEGIES

As will be seen in this chapter, households in the PREG II program area experienced increasing shock exposure over its operational period, especially in climate shocks, including drought and flooding. As households struggled to deal with the shocks, they both shifted and intensified their use of coping strategies in response. A full understanding of the extent of households' shock exposure, the types of shocks they faced, and how they coped with them is essential background for the resilience analysis of the rest of this report.

This chapter starts by describing the evolution of climate conditions over the program period using data from a global database of rainfall and related hydrological indicators. For context, **Error! Reference s ource not found.** gives the seasonal agricultural calendar of the PREG II area in Kenya (FEWS NET, 2023b). The chapter then looks at the shock exposure data reported directly by households, including those for climate, conflict, and economic shocks. Next, changes between the baseline and endline surveys in the strategies households reported using to cope with the shocks they faced are examined.

Figure 3.1. Seasonal calendar for the PREG II area



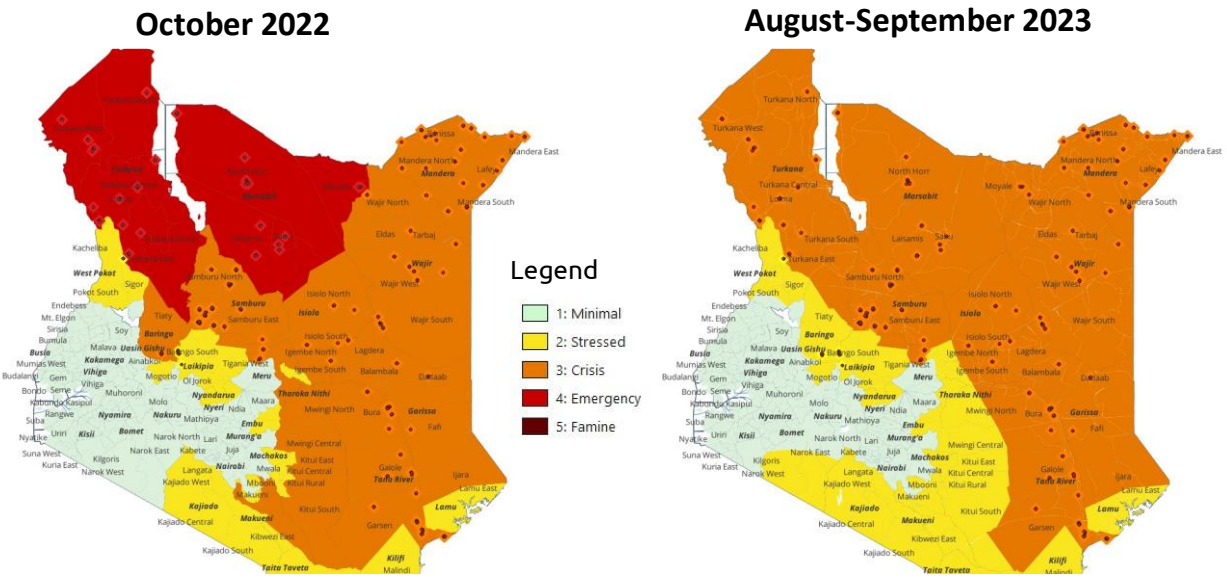
3.1 CLIMATE SHOCK: EVOLUTION OF CLIMATE CONDITIONS OVER THE PROGRAM PERIOD

As background, Figure 3.2 illustrates Integrated Phase Classification (IPC) levels 1 year prior to the endline survey (October 2022) and during the survey itself (August–September 2023).[27] The locations of endline survey villages are denoted by red dots.

27 FEWS Net, 2022a. The IPC Acute Food Insecurity Scale allows for the classification of food insecurity at both the household and area level (FEWS NET, 2024). Classification is based on a convergence of available data and evidence, including indicators related to food consumption, livelihoods, malnutrition, and mortality. Analysts use this evidence alongside IPC reference tables that provide illustrative thresholds for each of the five IPC phases to classify the severity of the current or projected food security situation.

In the year immediately prior to the PREG II endline, the program area experienced either Stressed (IPC Phase 2), Crisis (Phase 3), or Emergency (Phase 4) conditions. According to FEWS NET, these conditions prevailed following a fifth consecutive below-average rainy season.[28]

Figure 3.2. Integrated Phase Classification (IPC) levels in Kenya in the year prior to the PREG II endline survey



*Note: Red dots are locations of PREG II survey villages. County names are in **bold** while district names are not.*

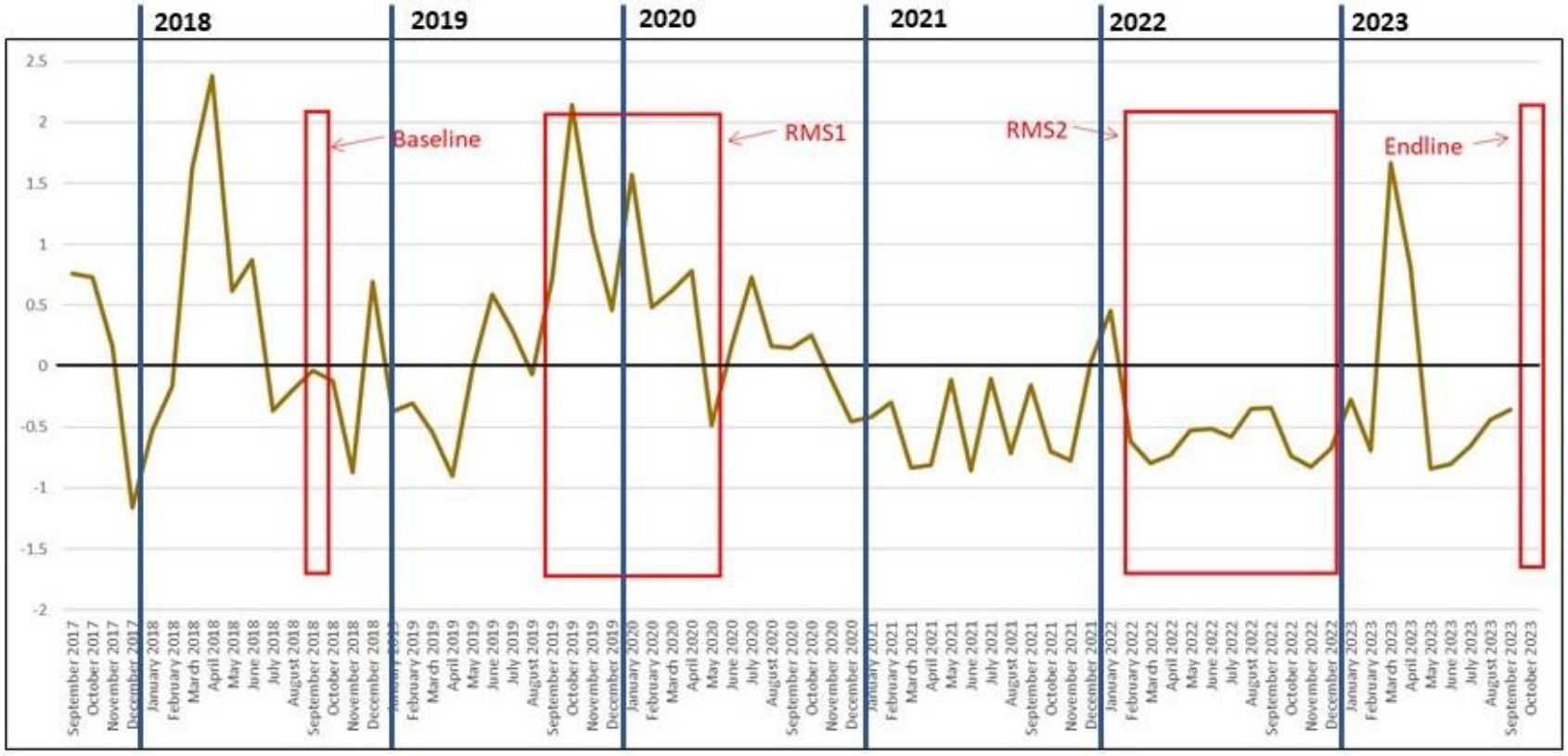
The Kenya National Drought Management Authority (NDMA) reported in mid-2023 that the drought was the worst the country had faced in over 4 decades. The number of people facing acute food insecurity was estimated at 4.9 million, with increased malnutrition across the ASALs and the loss of 2.6 million livestock.[29]

Figure 3.3 illustrates the rainfall pattern observed over the program period using data from the Multi-Source Weighted-Ensemble Precipitation (MSWEP) database of rainfall and related hydrological indicators, which has 0.1° spatial resolution.[30]

Current conditions are compared to historical data beginning in 1979 to calculate measures of climate anomalies, with the zero line being the norm. Values consistently close to this norm represent the rainfall stability needed for normal pastoral and agricultural activity. As can be seen, the program period, which encompassed six rainy seasons, was one of great rainfall volatility with repeated episodes of both drought and flooding.

[28] FEWS Net, 2022b
[29] NDMA, 2023
[30] GloH20, 2021

*Figure **3.3***. Rainfall deviation from the norm in the PREG II program area, September 2017–October 2023



For reference, meteorological drought and flooding are defined as follows:[31]

- Drought: rainfall deviation ≤-0.8 (severe drought ≤ -1.3)
- Flooding: rainfall deviation ≥ +1 (severe flooding ≥ +1.5)

From Figure 3.3, the PREG II area saw repeated episodes of both drought and flooding over the program's operational period. Drought occurred in five out of the six rainy seasons, and severe flooding occurred in three seasons.

Table 3.1 (upper panel) reports on summary measures of rainfall deficits and surpluses as well as the number of months of meteorological drought and flooding for various time periods. The data show that while both flooding and drought were problems, drought was more frequent and prolonged, and thus the average total rainfall deficit was greater than the total rainfall surplus (735.3 versus 590.6). The average number of months of drought was 11.9, while that of flooding was 7.5.

Also shown in the table are summary measures of climate anomalies derived from soil moisture data. The data come from the FEWS NET Land Data Assimilation System (FLDAS) Noah Land Surface Model L4.[32] Soil moisture surpluses were higher than soil moisture deficient, the opposite pattern from the rainfall data, perhaps due to soil moisture retention properties.

[31] U.S. Drought Monitor, 2021. The flooding cut-offs are derived from the "wet" and "very wet" category cutoffs used by the National Drought Mitigation Center.

[32] The FLDAS is a custom instance of the NASA Land Information System (LIS) that has been "adapted to work with domains, data streams, and monitoring and forecast requirements associated with food security assessment in data-sparse, developing countries" (U.S. Geological Survey, 2018). The data are available at the same 0.1° spatial resolution as the MSWEP data and were downloaded for the locations of each household in the PREG II dataset.

Table 3.1. Rainfall and soil moisture deficits and surpluses over the PREG II period

	Year before baseline (Sept 2017–Aug 2018)	Year before RMS 1 (Sept 2018–Aug 2019)	Year before RMS 2 (Feb 2021–Jan 2022)	Year before endline (Oct 2022–Sept 2023)	Total baseline to endline (Sept 2018–Oct/Nov 2023)
Rainfall					
Total rainfall deficit (mm)	82.7	159.6	205.6	180.2	**735.3**
Total rainfall surplus (mm)	270.0	71.7	53.8	110.5	**590.6**
Months of meteorological drought	1.3	2.3	3.3	3.4	**11.9**
Months of meteorological flooding	3.2	1.0	0.9	1.1	**7.5**
Soil moisture					
Total soil moisture deficit (m3/m3)	0.09	0.10	0.13	0.09	**0.43**
Total soil moisture surplus (m3/m3)	0.32	0.09	0.08	0.11	**0.89**
Months of agricultural drought	1.0	1.1	1.4	0.6	**4.3**
Months of agricultural flooding	3.7	0.9	1.1	1.3	**11.1**

Note: Rainfall indicators are based on rainfall anomaly data derived from MSWEP long-term data series; soil moisture indicators are based on the FLDAS soil moisture anomaly data (see text). Rainfall deficient/surpluses are measured in millimeters.

3.2 HOUSEHOLD REPORTS OF EXPOSURE TO SHOCKS

As part of the PREG II surveys, data were collected from households themselves regarding the shocks they experienced in the previous 12 months. Table 3.2 shows the percentage of households that reported experiencing 23 different shocks. Also reported are the following summary indicators of shock exposure:

- the mean number of shocks experienced;
- the percentage of households that experienced at least one shock; and
- the mean of an overall shock exposure index that takes into account the total number of shocks households experienced as well as their perceived severity of impact on income and food consumption.[33]

[33] Perceived severity is measured using answers to the question, "How severe was the impact on your income and food consumption?" The four possible responses range from "None" to "Worst ever happened." The index is calculated as a weighted average of the incidence of each shock and its perceived severity as measured on the 4-point scale. That is, the incidence of each shock (0 or 1) is multiplied by its perceived severity of impact on either income (1, 2, 3, or 4) or food consumption (1, 2, 3, or 4) or both, and the resulting values are summed up across the 23 shocks. The index potentially ranges from 0 (for a household experiencing no shocks) to 184 (for a household experiencing all 23 shocks with a combined income and food perceived severity score of 8 (i.e., 8*23)).

Table 3.2. Baseline-endline comparison of household shock exposure in the previous year (self-reported)

Indicator	Baseline	Endline	
Number of shocks experienced in past 12 months (0–23)	1.9	2.6	***
Experienced at least one shock in past 12 months (% of households)	74.2	93.4	***
Index of shock exposure (0–184)	9.8	15.1	***
Climate shocks (% of households)			
Excessive rains/ flooding	40.2	16.3	***
Variable rain/drought	32.4	70.8	***
Hail/frost	0.3	0.1	
Landslides/erosion	0.6	0.4	
Crop/livestock shocks (%)			
Crop disease (e.g., rust on wheat, sorghum)	1.9	4.8	***
Crop pests (e.g., locusts, army worms, or animals eating crops)	6.2	4.6	*
Weeds (e.g., associated with striga)	1.2	2.3	**
Livestock disease	19.4	18.3	
Human disease outbreaks (e.g., from contaminated water)	4.3	4.9	
Soil degredation/loss of soil fertility/ or salination	0.6	0.5	
Conflict shocks (%)			
Theft or destruction of assets	1.7	2.2	
Theft of livestock (raids/ cattle rustling)	4.9	5.6	
Conflict over natural resources/land encroachment	1.7	2.1	
Displacement (e.g., due to oil, gas, etc.)	0.4	0.2	
Insecurity/violence (e.g., elections-related, tribal, extremism, etc.)	6.4	5.1	
Economic shocks (%)			
Interruptions or delays in safety net or humanitarian assistance	3.6	8.6	***
Increased food prices	46.9	87.1	***
Increased prices of agricultural or livestock inputs	3.7	12.9	***
Decreased prices for sale of agricultural or livestock products	3.0	2.7	
Loss of land/rental property	0.1	0.1	
Unemployment for youths (i.e., which may lead to youth migration)	7.0	8.0	
Illness or death of breadwinners, or exceptional health expense	2.4	2.9	
Other shocks (%)			
Human disease outbreaks (e.g., from contaminated water)	4.3	4.9	
Political strikes	1.4	0.1	***
Number of observations	2,394	2,394	

The summary indicators show a substantial increase in shock exposure between the baseline and endline surveys. The percentage of households experiencing at least one shock in the previous year rose from 74.2% to 93.4%. The average number of shocks experienced also rose, and the overall index of shock exposure increased by 54.1%. While one quarter of households experienced no shocks in the 12 months prior to the baseline survey, only 6.6% experienced no shocks in the 12 months prior to the endline survey.

Turning to the particular nature of shocks experienced, food price increases were the most frequently reported at the baseline and endline, and the percentage of households reporting them nearly doubled, rising from 46.9% to 87.1%. While excessive rains/flooding and variable rain/drought were the second and third most reported shocks at baseline, this changed significantly by the endline. Those reporting having experienced drought at endline (70.8%) was more than double those who reported the experience at baseline (32.4%). This trend reflects the observational data reported above of consecutive below-average rainy seasons prior to the endline survey. The third-most reported shock at endline was livestock disease (18.3%), followed closely by excessive rains/flooding (16.3%). Of note also was the significant increase in households reporting an input price shock—almost four times the percentage at baseline (12.9% versus 3.7%). While there were statistically significant changes in the percentage of households reporting crop disease and crop pest related shocks, the actual percentages of households were very low.

Among conflict shocks, the most common were thefts of livestock and insecurity/violence. The percentage of households reporting these was relatively low (5.6% and 5.1%, respectively at endline), and there was no increase over the program period.

Of note is that the percentage of households reporting problems with the delivery of humanitarian assistance more than doubled from 3.6% to 8.6%. This rise is of particular note given the IPC classification of the region (Stressed, Crisis, or Emergency) in the period prior to the endline.

Table 3.3 shows changes in households' reported perceived severity of impact of each shock. There were significant increases in the perceived impact on income and food consumption of the following shocks: livestock disease, conflict over natural resources, insecurity/violence, food and input prices, youth unemployment, and "illness or death of a breadwinner or exceptional health expense." These increases have contributed to the overall increase in the index of shock exposure shown in Table 3.2.

Table 3.3. Baseline-endline comparison of perceived severity of shocks experienced in the previous year

Indicator	Baseline	Endline	
Climate shocks			
Excessive rains/ flooding	4.8	4.7	
Variable rain/drought	5.5	5.6	
Hail/frost	^	^	
Landslides/erosion	^	^	
Crop/livestock shocks			
Crop disease (e.g., rust on wheat, sorghum)	5.6	5.4	
Crop pests (e.g., locusts, army worms, or animals eating crops)	5.8	5.4	
Weeds (e.g., associated with striga)	4.6	4.7	
Livestock disease	4.9	5.5	***
Soil degradation/loss of soil fertility/ or salination	^	^	
Conflict shocks			
Theft or destruction of assets	4.6	5.1	
Theft of livestock (raids/ cattle rustling)	6.1	6.1	
Conflict over natural resources/land encroachment	4.4	5.9	***
Displacement (e.g., due to oil, gas, etc.)	^	^	
Insecurity/violence (e.g., elections-related, tribal, extremism, etc.)	4.6	5.8	***
Economic shocks			
Interruptions or delays in safety net or humanitarian assistance	4.9	5.1	
Increased food prices	5.3	6.3	***
Increased prices of agricultural or livestock inputs	4.9	5.4	***
Decreased prices for sale of agricultural or livestock products	4.9	5.8	**
Loss of land/rental property	^	^	
Unemployment for youths (i.e., which may lead to youth migration)	5.7	6.3	***
Illness or death of breadwinners, or exceptional health expense	5.4	6.1	**
Other shocks			
Human disease outbreaks (e.g., from contaminated water)	5.1	5.3	
Political strikes	^	^	
Index of shock exposure (0-184)	9.8	15.1	***

Note: Stars indicate statistical significance of the difference between the baseline and endline at the 10%(*), 5%(**), and 1%(***) levels. Scores for the severity of shocks are reported only for households experiencing the shocks and range from 2 to 8.
^ Values not reported due to insufficient number of observations (n < 30).

3.3 QUALITATIVE FINDINGS ON HOUSEHOLD SHOCK EXPOSURE

Qualitative research findings confirm that the period prior to the endline survey was exceptional in the number and severity of shocks.

3.3.1 Drought and Flooding

When asked about drought, respondents pointed to the drought occurring at the time of the endline survey, and some said that the drought lasted as long as 4 years. Extended, multiyear drought episodes led to a shortage of water and the absence of vegetation and grasslands, as well as the loss of crops. For those communities with crop cultivation or home gardens, the drought severely curtailed their efforts. An Isiolo women's FGD stated that their community relies on the nearby river for irrigation, but they could not practice crop farming since the river was dry. PREG II programs, and other development programs, had been promoting alternatives to livestock herding, which has historically been the mainstay of the region, but these efforts were faltering during the drought. A women's FGD in Marsabit stated that they had been practicing kitchen gardens, but due to inadequate water supply they stopped planting.

With regard to flooding, respondents said that recent floods swept away crops, animals, and houses, causing many fatalities and huge economic losses. An Isiolo youth FGD stated that it was ironic that for those who managed to save a few livestock during drought, they then suffered the loss of their animals who were swept away by flash floods. A Tana River women's FGD added that the floods either submerged or swept away crops, animals, and homes. One respondent in an Isiolo women's FGD stated:

> The communities here have been living between prolonged periods of drought and instances of heavy downpours resulting in floods. The effects of climate change have been very real to the community in this area because the droughts are no longer annual, but in most cases, they are perennial.

3.3.2 Livestock

For livestock, drought has meant the loss of the rangeland grass and drinking water that they depend on, leading to increased disease and, ultimately, the death of many animals. For example, foot and mouth disease was cited in Isiolo. Respondents spoke of the numbers of animals lost by households: one household with 30 cattle was reduced to less than 10, another went from 1,000 to 500 head of livestock, and another respondent in Turkana saw his herd shrink from 250 cattle and goats to only 30 goats. Some groups cited losses of about 50% of the livestock in their communities.

Drought has also led to increased conflict and livestock theft, putting livelihoods severely at risk. Male FGD respondents in Isiolo said that:

> Due to perennial drought and also owing to intercommunal conflicts resulting in raids and loss of livestock, pastoralism has become a very expensive affair in terms of loss of lives of people and also the loss of livestock, as well it is increasingly becoming very unpopular.

In Isiolo, respondents said that the major loss of livestock for the entire community relegated them to poverty. It threatens the future of pastoralism upon which the region depended. A Garissa CG director

stated that while that county is mostly pastoralist, many people are abandoning it due to successive droughts.

3.3.3 Economic Shocks

The high cost of living was frequently cited by respondents as a serious shock. For example, a Garissa youth FGD stated that due to the decreased production of animal products like meat and milk, the cost of 1 kg of meat rose from 100 Kenyan shillings (KES) to 250 KES. In Isiolo, respondents said that due to the impassable roads during the rainy period, most shops' stocks were depleted and prices increased. In one Isiolo community, both men's and women's FGDs agreed that traders were taking advantage of the situation to increase prices, making it difficult for the poor to afford food and therefore causing surges of malnutrition cases among children under 5 years and pregnant mothers.

3.3.4 Health Shocks

Health problems were common among communities, and the various effects of COVID-19 were still fresh in the minds of respondents, though much of this was an economic shock. An Isiolo men's FGD pointed out that in addition to causing the deaths of many, especially the elderly and those with underlying conditions like asthma, diabetes, and high blood pressure, households couldn't afford a balanced diet. Hygiene levels also deteriorated with the lack of water during the drought.

3.3.5 Environmental Shocks

Environmental issues are among the shocks noted, and an Isiolo women's FGD stated that deforestation, soil erosion, and degradation of natural resources were environmental shocks that have affected agricultural productivity, water availability, and overall ecosystem health. Wildfires was a shock mentioned in four Isiolo communities and one Marsabit community. A Turkana chief mentioned that part of his function was to be prepared to deal with wildfires. Another problem is invasive plants, and while respondents did not mention this as a shock, they did bring up the invasion of the *Prosopis juriflora* tree as one of the obstacles they were facing, and the evaluation teams observed how extensive this growing problem is.

The human-nature interface provided other stresses, as environmental problems and other developments cause increased interactions. Animals such as lions and elephants are also a threat to livestock and crop farms, and this was mentioned in Isiolo and Marsabit, though the problem is not limited to these counties. Locust invasions were mentioned in Turkana and Isiolo, and women respondents in Isiolo stated that the locusts destroyed all the crops in the area, such that people and animals had nothing to eat, and they were forced to buy food to survive.

3.3.6 Conflict and Insecurity

Most communities mentioned that one of the main shocks they face is related to insecurity and conflict, both between neighboring communities and, in some cases, across counties. These were cited by respondents in all six Isiolo communities, three of four Garissa communities, three of four Marsabit communities, and two of four Turkana communities. In Garissa, respondents pointed to conflicts between Somalis and Borana on the border with Isiolo. In Isiolo, a respondent in a men's FGD stated:

> In some regions, pastoralist communities face conflicts over grazing land and water resources, sometimes leading to displacement and disruptions in their traditional

way of life. Conflicts with neighboring communities from Wajir County over pasture and water led to loss of life, and livestock were taken.

Other respondents in one Isiolo community stated that when drought ravaged their livestock, some communities mobilized their youth to go and steal livestock from other ethnic groups (they specified Samburus and Turkanas), resulting in the rise of lethal conflicts. Another FGD said that the rate of theft (i.e., cattle rustling) increased among the Samburu and the Turkana communities, and conflict arises when people seek revenge by stealing from each other. In another Isiolo community, respondents cited conflicts between the Samburu and the Borana communities over grazing areas, especially during drought. In Turkana, some fatalities occurred in border regions with Uganda and West Pokot County due to resource-based conflicts. Conflicts also led to the destruction of houses and properties and the closure of schools.

3.3.7 Differential Effects of Shocks on Women, Men, and Youth

Respondents spoke of how the combination of various shocks affected different groups of community members, some highlights of which are provided here.

Women: Women's challenges include the work overload of attending to household needs in addition to their caregiving roles, caused by the absence of men that are traveling with their livestock or other work. In some cases, the conflicts and drought also caused the death of women's partners. The stressful situations sometimes result in divorce, often caused by marital conflicts when men are unable to provide for the family. Garissa women respondents said with the absence of their husbands, they have to travel distances to fetch water and firewood, and also herd some of the livestock by themselves, thus putting them at risk of being sexually abused. Others looked for jobs close to home to sustain their families.

In Turkana, women reported burning charcoal and starting small businesses to obtain food. Marsabit respondents mentioned that collecting and selling firewood was greatly affecting the health of women, causing chest and back pains. They cited a trend of increased intimate partner violence and other forms of sexual-based gender violence. Isiolo women said that in order to take care of the livestock that are left behind, they leave their homes very early in the morning to go and cut fodder for the livestock, leaving no one behind to look after the children. A group of women entrepreneurs in Isiolo said that women faced psychological stress because they did not have enough food for their families, and they experienced poor nutrition, which was especially concerning for expectant and lactating mothers. In Marsabit, respondents cited a similar pattern of malnutrition and psychological stress for women due to their inability to feed their families. Tana River respondents said that women suffer stress when floods remove their homes and items, and they have no way to provide food for their children.

Men: Men are more likely to have to work away from home during shocks, or to migrate long distances to other counties with their livestock in search of water and grass, and they may face life-threatening disasters and compromised health situations. In Tana River, respondents pointed out that fishermen are affected when rivers dry up and they lose their livelihood. Turkana male respondents mentioned that some men are affected mentally when their livestock die. Respondents in Isiolo reported that men relocate to other towns to look for jobs to sustain their families, become involved in substance abuse due to idleness and marital conflicts, and face health consequences because of inadequate nutrition. Other Isiolo male respondents stated that some men become weak and helpless, are assaulted by their wives, and suffer in silence out of shame. Participants in one Isiolo men's group articulated that they

were formerly livestock managers but their livestock were largely gone, and furthermore they are less involved by the NGOs and they feel like a burden.

Turkana female respondents explained that many men spend long periods away from home trying to provide for their family, often suffering from the stress of worrying about their families. They added that men were highly affected by shocks as some of them were "chased out of their homes" when they could no longer meet family needs. Turkana men mentioned that when men leave home for livelihoods, some end up abandoning their families. Garissa respondents cited problems of mental health, intimate partner violence, child neglect, engagement in cattle rustling, and running away to evade the overwhelming responsibilities. Alcoholism and substance abuse, and the use of *miraa* (khat) was mentioned in Marsabit. Marsabit women said that many men seek casual labour such as digging of toilets, or as night guards, and many have lost their lives as a result of raids at the border. An Isiolo women's group stated that while men are more likely to be injured or killed by shocks (i.e., conflicts), women are more likely to suffer psychological trauma.

Youth: Youth are also likely to experience anxiety and post-traumatic stress disorder after a disaster. In Isiolo and Marsabit, respondents pointed out that because of the loss of livestock, the young have nothing to inherit or livestock to care for, and most of them end up involving themselves in illicit trade including drug trafficking and drug addiction. Similar patterns of substance abuse and theft were mentioned in Turkana, Garissa, and Tana River. Isiolo women reported that as the youth increasingly use drugs, this creates a rift between them, their parents, and society as a whole, because "nobody wants to be associated with them." Increased sexual violence was noted frequently, with a rise in teenage pregnancy, early marriage, child neglect, and incidence of children living on the street. In one Garissa community, several FGDs stated that girls were exchanging sex for sanitary pads and food—in other words, engaging in prostitution driven by poverty. Young people may drop out of school in order to earn money, or because they are unable to pay school fees. When parents move to new areas in search of pasture for the animals or other work, their children may be forced to drop out of school. School-going children are often away from their families when disasters strike and don't have the same level of support at school as they do at home. Even for those who do not drop out of school, respondents in Turkana and Tana River highlighted that students' performance is affected by these stresses and instability, which will have long-term consequences.

3.4 HOUSEHOLD COPING STRATEGIES

How did households cope with the shocks they faced? Returning to analysis of the quantitative data, Table 3.4 summarizes the strategies households used to cope with shocks and stresses in the years prior to the baseline and endline surveys. Regardless of which or how many shocks a household experienced, the most common coping strategy was to reduce household food consumption. Use of this strategy—considered one of the more negative coping strategies in terms of its long-lasting impacts (especially on children)—increased from 42.4% to 52.9% between the baseline and endline surveys. Other commonly reported strategies were sending livestock in search of pasture, selling livestock, reducing nonessential household expenses, and buying food on credit from a local merchant. With the exception of strategies involving livestock, there was a statistically significant increase in the percentage of households engaged in these coping strategies by endline.

Table 3.4. Baseline-endline comparison of coping strategies for dealing with shocks in prior year

Indicator	Baseline	Endline	
Livestock and land holdings (%)			
Send livestock in search of pasture	23.9	20.9	
Sell livestock	37.7	41.0	
Slaughter livestock	10.2	8.6	
Lease out land	0.4	0.4	
Migration (%)			
Migration of some family members	3.4	1.2	***
Migration of the whole family	10.4	4.7	***
Send household member to stay with relatives	2.3	2.2	
Coping strategies to reduce current expenses (%)			
Take children out of school	0.9	0.9	
Move to less expensive housing	1.0	1.9	*
Reduce food consumption	42.4	52.9	***
Reduce non-essential household expenses	25.4	37.8	***
Get food on credit from local merchant	26.0	36.8	***
Coping strategies to get more food or money (%)			
Take up new/additional work	9.4	14.4	***
Sell household assets	0.5	0.8	
Sell productive assets	0.1	0.2	
Borrow money from bank	0.4	0.3	
Borrow money from MFI/RuSACCO	0.8	1.7	*
Borrow moneyman from money lender	0.5	1.2	*
Take out loan from family/friends in community	0.7	1.4	
Take out loan from family/friends out community	0.4	0.6	
Receive money/food from family/friends in community	1.7	3.4	***
Receive money/food from family/friends out community	1.1	2.4	**
Send children to work for money	0.1	1.4	***
Receive emergency food aid	6.5	17.9	***
Receive emergency cash transfer	1.8	12.0	***
Participate in food-for-work/cash-for-work	0.8	1.8	*
Used own savings	8.5	16.4	***
Relied on remittances	1.6	3.5	**
Other	7.9	6.7	
Engaged in spiritual efforts	10.2	7.3	**
Did nothing	9.8	11.8	

Indicator	Baseline	Endline
Number of observations (households who experienced at least one shock)	1,833	2,254

Note: Stars indicate statistical significance of the difference between the baseline and endline at the 10%(*), 5%(**), and 1%(***) levels.

At the time of the baseline, very few households reported relying on emergency food or cash assistance, Food-for-Work programs, or family or friends for food or money, including remittances, to deal with the shocks they experienced. However, by endline there had been large and statistically significant increases in the percentage of households adopting them. Large increases were also seen in the percentage of households reporting that they used their own savings and took up new work to cope. In contrast to these increases, fewer households reported migrating as a coping strategy at endline than at baseline, perhaps due to the lower incidence of flooding, which could result in temporary displacement.

Note that there was a statistically significant increase in the percentage of households sending children to work for money, a particularly negative coping strategy.

The quantitative data show no increase in asset sales as a coping strategy. However, qualitative findings reveal how household assets are put at risk by shocks in several ways. First, the sale of household assets was mentioned by respondents in nine of the 22 communities as being a response by some people in their communities. In addition, household assets were directly lost during shocks in 10 communities, as belongings were swept away by floods or were destroyed during conflicts. Furthermore, assets are lost through credit. An Isiolo youth FGD stated that some people whose livelihood activities were disrupted after the floods and drought had taken loans with household items as the collateral—and they subsequently lost those items when they were unable to repay the loan.

Theft is a shock in itself, but it also is a common coping strategy used by people when facing shocks, causing an increase in existing practices like cattle rustling. As stated by a Marsabit women's FGD, with the loss of livestock, some *morans* (male youth) have resorted to stealing by breaking into shops and houses and taking their valuables. A Garissa women's FGD stated that the high cost of living was causing youth to commit crimes such as robbery and to engage in drug and substance abuse.

3.5 SUMMARY: SHOCK EXPOSURE AND COPING STRATEGIES

Households in the PREG II program area experienced escalating shock exposure over the program's operational period marked by repeated episodes of both drought and flooding. Droughts occurred in five out of the six rainy seasons and severe flooding in three seasons. A shock exposure index calculated using data on household reports of the incidence and severity of 23 shocks increased by 54% over the period. The most common shocks reported were drought, flooding, increased food prices, and livestock disease. Incidences of two shocks saw large jumps over the program period: drought (from 32.4% to 70.8%) and food price inflation (46.9% to 87.1%). In addition to confirming the large numbers of villages dealing with drought and food price inflation, the qualitative data point to livestock disease and losses as major downstream impacts of drought and flooding. They highlight insecurity, ethnic-based conflict between neighboring communities, and theft of livestock as major problems. Qualitative analysis of the differing effects of shocks on women, men, and youth reveal the emotional toil of the multiple shocks household were facing as well as increased marital conflict, intimate partner violence, and substance

abuse. As households struggled to deal with escalating shock exposure, they both shifted and intensified their use of coping strategies. Five of the most common coping strategies all increased over the program period: reducing food consumption, reducing nonessential household expenses, buying food on credit, taking up new work, and drawing down on savings. Reliance on humanitarian assistance and on family or friends for food or money to deal with shocks also rose precipitously. Notably, and related to livestock losses, two other common coping strategies—sending livestock in search of pasture and selling livestock—did not increase.

4 HOUSEHOLD RESILIENCE AND RESILIENCE CAPACITIES

Were households resilient to the shocks they faced over the PREG II program period? How did their resilience capacities change? This chapter examines these questions using the PREG II baseline and endline survey data.

4.1 HOUSEHOLD RESILIENCE TO SHOCKS

The operational definition of resilience for this analysis is "the ability to recover from shocks." As noted in Chapter 2, two indicators of resilience—one objective and one subjective—are employed.

The ***objective*** indicator, termed "Realized Resilience," is the change in food security between the baseline and endline surveys, where food security is measured using the inverse of the Food Insecurity Experience Scale.[34] The Realized Resilience indicator directly measures households' ability to recover, with ability indexed to a well-being outcome critical to households' basic survival. It is complemented by a dichotomous variable indicating whether or not a household is "resilient"—that is, able to recover or improve on their food security over the period.

The ***subjective*** indicator of resilience is an index of households' perceived ability to recover from the shocks they experienced in the year prior to each survey. It is constructed based on households' reports of their ability to recover from each specific shock they were exposed to, as detailed in Chapter 2.

Table 4.1 reports on the changes in food security between the baseline and endline surveys (Realized Resilience) and in households' perceived ability to recover.

The mean change in food security, at -0.60, is negative, indicating that the average household was not able to maintain its baseline level of food security or get back to it by endline. The probability density[35] of the change in food security shown in Figure 4.1 indicates wide variation in individual households' recovery, however. Sixty-four percent were resilient—able to get back to or improve upon their baseline level of food security—while the rest were not (Table 4.1).

[34] Food security measurement is described in detail in Section 5. Note that it was not possible to include another important objective indicator of resilience, stability of food security, in this study because panel data were not collected for all sample households a sufficient number of times over the program period.

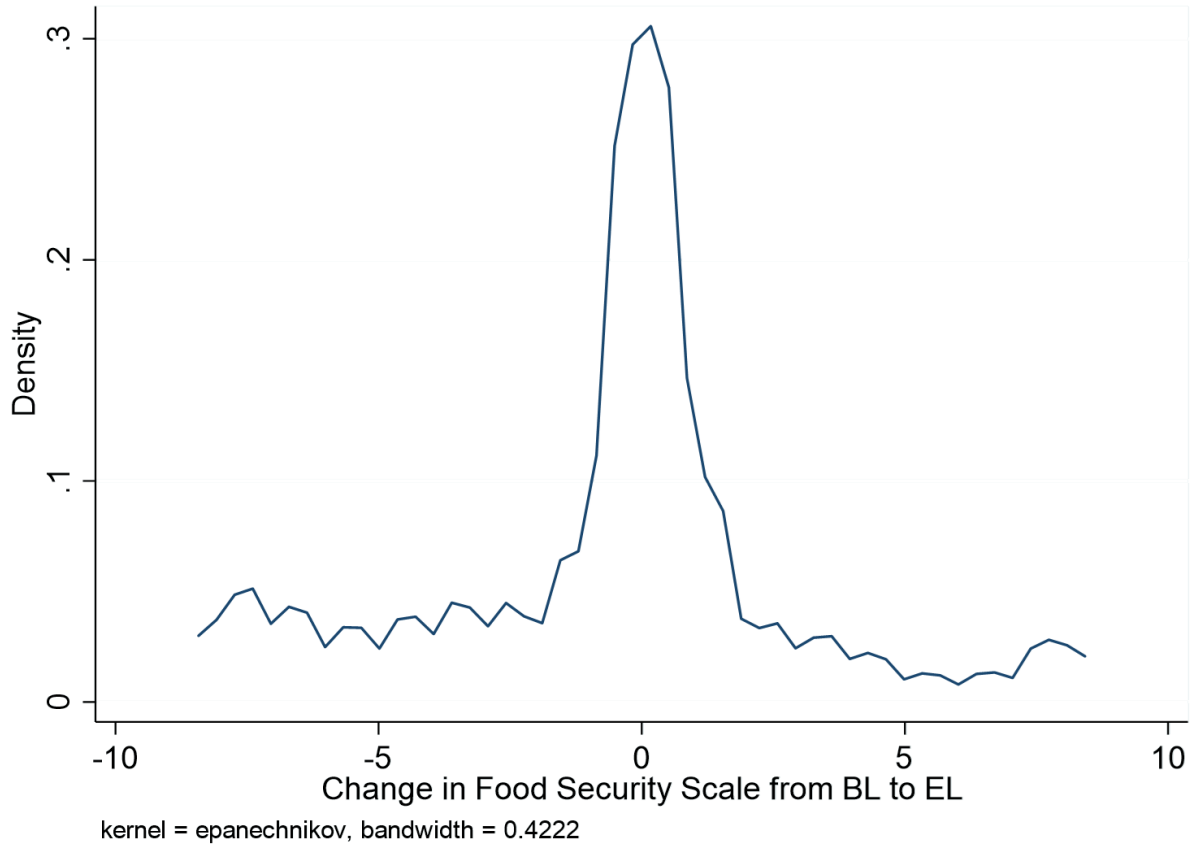
[35] A probability density function shows the probability of attaining each value of a variable in a sample. The total area under the function is equal to 1 (covering 100% of the sample).

Table 4.1. Baseline-endline comparison of indicators of resilience

Indicator	Baseline to Endline	Baseline	Endline	
Realized Resilience				
Change in food security (BI to EL)	-0.602			
% of households resilient	64.5			
Perceived ability to recover				
Ability to recover index		2.2	1.7	***
Recovered from most common shocks (%)				
Drought		16.1	8.7	**
Flooding		25.1	17.3	*
Livestock disease		21.4	14.1	**
Increased food prices		15.2	4.6	***
Increased input prices		11.1	5.1	

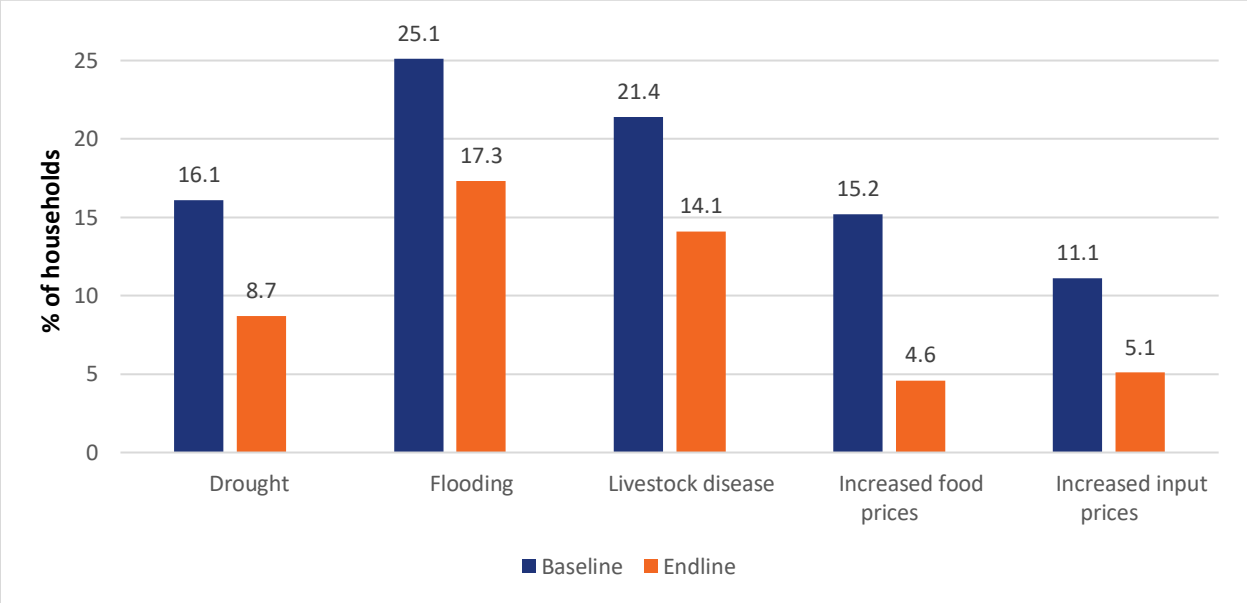
Note: Stars indicate statistical significance of the difference between the baseline and endline at the 10%(*), 5%(**), and 1%(***) levels.

Figure 4.1. Probability density of the change in food security over the program period (Realized Resilience)



Unlike the objective measure of resilience, the perceived ability to recover index allows us to look at *changes* in resilience over the program period. Apparently, the average household in the PREG II area experienced a decline in its ability to recover (lower panel, Table 4.1). The percentages that recovered from the top five shocks tell a similar story, as illustrated in Figure 4.2. The percentage dropped for all five of the shocks, with particularly large declines for drought and increased food prices, which were found in the last chapter to be the most common shocks experienced.

Figure 4.2. Baseline-endline comparison of the percent of households reporting recovery from the five most common shocks of the last 12 months



4.2 HOUSEHOLD RESILIENCE CAPACITIES

Resilience capacities are conditions, attributes, or skills that enable households and communities to achieve resilience to shocks. They are essentially the determinants of resilience. As noted in Chapter 1, they can be classified into three categories: absorptive capacity, adaptive capacity, and transformative capacity. Given their complexity, measuring these concepts requires combining multiple indicators of the underlying concepts into an overall indicator.

Figure 4.3 lays out the indicators of the three capacities that are used to measure them in this report. A description of each is given in Table 4.2. It should be noted that some components are included in more than one index (e.g., the index of asset ownership is in both the absorptive and adaptive capacity indices). The technique used to calculate the indexes and ensure comparability over time for the purposes of comparison between the baseline and endline surveys is detailed in Annex 3.

Figure 4.3. Indicators of the three dimensions of resilience capacity

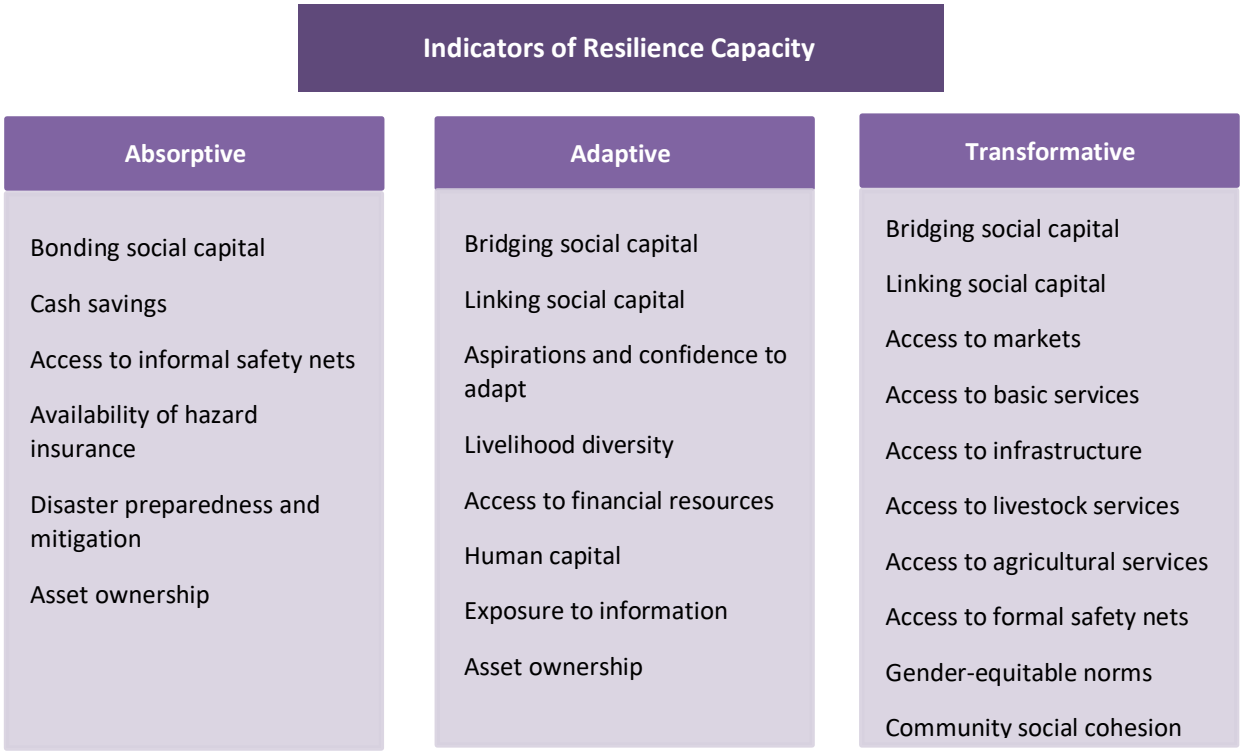


Table 4.2. Descriptions of indicators of resilience capacity

Indicator	Description
Absorptive capacity	
Bonding social capital	Bonding social capital refers to the bonds between people living in the same communities. It involves principles and norms such as trust, reciprocity, and cooperation. Factor analysis is used to generate an index (0–100 scale) based on whether or not the household would be able to give or receive assistance from relatives, non-relatives, or another group in the community.
Cash savings	Whether or not a member of the household regularly saves cash.
Access to informal safety nets	Measured as the number of community organizations providing safety nets, including a credit or microfinance group, savings group, mutual help group, religious group, mother's group, and women's group.
Availability of hazard insurance	Whether or not there is an institution available in the community where people can get insurance (e.g., weather-indexed crop insurance, livestock, health) or where people can receive assistance due to losses of livestock.

Indicator	Description
Disaster preparation and mitigation	Whether or not there have been any government or NGO programs or activities to assist with disaster planning and/or response.
Asset ownership	Asset ownership is measured as a factor analysis index (0–100 scale) based on ownership of consumer durables (out of 38), agricultural productive assets (out of 18), animals (in Tropical Livestock Units), and land.
Adaptive capacity	
Bridging social capital	Bridging social capital refers to the bonds between people living in different communities. Factor analysis is used to create an index (0–100 scale) based on whether or not the household would be able to give or receive assistance from relatives, non-relatives, or another group outside of the community.
Linking social capital	Linking social capital refers to trusted social networks between individuals and groups interacting across explicit, institutionalized, and formal boundaries in society. This type of social capital is often conceived of as a vertical link between a network and some form of authority or power in the social sphere. Factor analysis is used to create an index (0–100 scale) based on the response to four yes/no questions as to whether or not a household member knows, and could ask for the help of, a government or NGO staff member.
Aspirations/confidence to adapt	"Aspirations and confidence to adapt" is a psychosocial capacity measured by using factor analysis to combine indicators of (1) the absence of fatalism, (2) belief in individual power to enact change and (3) exposure to alternatives to the status quo to create an overall index (0-100 scale). These indicators are themselves based on multiple indicators combined into indexes using factor analysis.
Livelihood diversity	Diversity of livelihood sources allows flexibility, thereby reducing households' vulnerability in the face of shocks. It is measured as the total number of livelihood activities out of 19 a household is engaged in.
Access to financial resources	Access to financial resources measured using information on whether households live in a village where people can access credit and savings services. It is measured on a 0–2 scale in response to two yes/no questions.
Human capital	Human capital endows people with the ability to use information and other resources to cope with shocks and stressors. It is measured here using information on literacy, formal education levels, and training received, from which a factor analysis index is derived (0–100 scale).
Exposure to information	Exposure to information facilitates people's use of their human capital by providing additional information or knowledge on which to act. Exposure to information is measured using the number of positive responses by survey respondents to the question of whether at some

Indicator	Description
	time in the last year they received information on any of 19 different topics (0–19 scale).
Asset ownership	See above.
Transformative capacity	
Bridging and linking social capital	See above.
Access to markets	Access to markets is measured using an indicator of access to three types of markets: livestock, agricultural products, and agricultural inputs. It is measured on a scale of 0–3 as the number of markets available within 20 kms of the household's community.
Access to basic services	Measured using data on access to schools, health centers, veterinary services, agricultural extension services, credit institutions, savings institutions, and security services to construct a scale running from 0 to 5.
Access to infrastructure	Measured using data on access to piped water, electricity, phone services, and paved roads to construct a scale running from 0 to 4.
Access to livestock services	Measured as whether or not there is some form of functioning veterinary service (mobile vet, vet center, vet pharmacy, etc.) within 5 km of the community.
Access to agricultural services	Measured as whether or not there is a functioning agricultural extension service within 5 km of the community.
Access to formal safety nets	Measured as the number of formal safety nets available in each household's community (0–4 scale). The possible safety nets are (1) food assistance, (2) housing and other non-food items, (3) assistance due to losses of livestock, and (4) disaster response program from government or an NGO.
Gender-equitable norms	Measured as an index of the presence of five gender-neutral practices observed in households' communities derived using factor analysis (0–100 scale). The practices are (1) adult men and women sit and eat together within households; (2) adult men and women sit together in public; (3) men in the community help with childcare around the household; (4) men in the community help collect firewood for the household; and (5) men in the community help fetch water for the household.
Community social cohesion	Measured as an index derived using factor analysis (0–100 scale) of five variables: (1) percentage of households in community active in at least one group; (2) percentage of households in community participating in a group providing assistance to those in need (labor, food, or other help); (3) the mean number of activities households in a community participated in to benefit everyone in community; (4) number of community organizations (0–12); and (5) frequency of village social get-togethers.

Indicator	Description
Governance	Measured as a factor analysis index (0–100 scale) of four sub-indexes: (1) community governance system linkages with county or national government; (2) functioning conflict resolution committee; (3) households' ability to voice opinions or provide feedback about community decisions; and (4) government responsiveness.

4.2.1 Changes in Absorptive Capacity

Recall that absorptive capacity is the ability to minimize exposure to shocks and to recover quickly after a shock is experienced. As shown in Table 4.3, the index of absorptive capacity increased considerably between the baseline and endline surveys, from 21.6 to 30.4, a 41% increase. Contributing to the overall increase were increases in informal safety nets, the availability of hazard insurance, disaster preparedness and mitigation, and asset ownership. The availability of hazard insurance saw a particularly large rise, more than doubling by endline from 15.5% to 38.5% of households.

Notably, bonding social capital did not increase along with the other absorptive capacities. According to the qualitative analysis, mutual self-help may have been constrained during phases of extreme shock, as virtually all individual households were badly affected, but there is also evidence of the sharing of food assistance received among community members.

Table 4.3. Baseline-endline comparison of indicators of absorptive capacity

Indicator	Baseline	Endline	
Bonding social capital (0–100)	37.9	36.8	
Cash savings (%)	24.8	28.1	*
Informal safety nets (0–6)	1.9	2.5	***
Availability of hazard insurance (%)	15.5	38.5	***
Availability of disaster preparedness & mitigation (0–3)	0.3	1.0	***
Asset ownership (0–100)	7.0	9.1	***
Consumption asset index (0–38)	2.6	3.6	***
Productive asset index (0–18)	1.3	1.5	***
Animals owned (Tropical Livestock Units)	8.4	4.5	***
Land owned (ha)	0.22	0.43	*
Absorptive capacity (0–100)	21.6	30.4	***

Note: Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Looking more closely at asset ownership, even though there was an overall improvement, there was a statistically significant and large decline (an almost 50% reduction) in livestock ownership. As covered in Chapter 4, this trend was noted by the Kenya National Drought Management Authority (NDMA) as an impact of drought and reflected in the high percentage of households reporting the sale of livestock as a

coping strategy (41%).[36] Livestock disease and losses were also reported as common debilitating shocks by qualitative data respondents.

4.2.2 Changes in Adaptive Capacity

Adaptive capacity involves making proactive and informed choices about alternative livelihood strategies based on changing conditions. Table 4.4 shows that it increased moderately over the program period, rising from 26.3 at baseline to 42.4 at endline (a 23% increase). In addition to asset ownership, contributing to the overall increase were increases in livelihood diversity, access to financial resources, human capital, and exposure to information.

Offsetting the increase in the overall index, however, were slight declines in bridging social capital (the bonds between people living in different communities) and people's aspirations/confidence to adapt.

Following the trend for bonding social capital, there were no improvements in bridging and linking social capital over the program period. With respect to bridging social capital, qualitative data point to the challenge extended drought has placed on the bonds between communities given the unprecedented stress on arable land and water supplies and ensuing resource conflicts. An Isiolo men's focus group discussion stated that:

> Pastoralist communities face conflicts over grazing land and water resources, sometimes leading to displacement and disruptions in their traditional way of life. Conflicts with neighboring communities from Wajir County over pasture and water have led to loss of life and livestock taken. Efforts to address and mitigate such conflicts can impact pastoralist livelihoods.

Table 4.4. Baseline-endline comparison of indicators of adaptive capacity

Indicator	Baseline	Endline	
Bridging social capital (0–100)	40.8	37.0	**
Linking social capital (0–100)	5.5	5.3	
Aspirations & confidence to adapt (0–100)	52.5	50.1	***
Livelihood diversity (0–7)	1.5	1.9	***
Access to financial resources (0–2)	0.3	1.0	***
Human capital (0–100)	45.0	49.6	***
Exposure to information (0–19)	2.7	4.0	***
Asset ownership (0–100)	7.0	9.1	***
Adaptive capacity (0–100)	26.3	32.4	***

Note: Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

4.2.3 Changes in Transformative Capacity

As shown in Table 4.5, there was a substantial improvement in transformative capacity, that is, system-level capacities that enable more lasting resilience, over the program period. The index rose by 30.5%,

[36] NDMA, 2023

from 35.1 to 45.8. Contributing to this improvement (and offsetting the decline in bridging social capital) were increases in access to infrastructure and services as well as in community social cohesion. Of note is that there were no improvements in access to markets, gender-equitable norms, or governance over the period.

Table 4.5. Baseline-endline comparison of indicators of transformative capacity

Indicator	Baseline	Endline	
Bridging social capital (0–100)	40.8	37.0	**
Linking social capital (0–100)	5.5	5.3	
Access to markets (0–3)	0.8	1.1	*
Access to infrastructure (0–4)	1.3	1.6	***
Access to services (0–5)	2.6	3.6	***
Access to livestock services (%)	18.3	25.9	
Access to agricultural extension services (%)	21.6	20.0	
Formal safety nets (0–4)	0.7	0.9	*
Gender-equitable norms (0–5)	3.0	3.2	
Community social cohesion (0–100)	36.2	44.3	***
Governance (0–100)	61.5	59.1	
Transformative capacity (0–100)	35.1	45.8	***

Note: Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

4.2.4 Summary of Trends in Resilience Capacity

Figure 4.4 summarizes the trends in absorptive, adaptive, and transformative capacity over the program period. Each improved, and the overall index of resilience capacity increased from 23.9 to 32.6, a full 36%. Figure 4.5 compares the probability distribution of the index at baseline and endline for the PREG II population as a whole, clearly displaying this improvement in resilience capacity. The widening of the distribution over time possibly indicates a trend of increased inequality among the population.

Figure 4.4. Changes in absorptive, adaptive, and transformative capacities over the program period

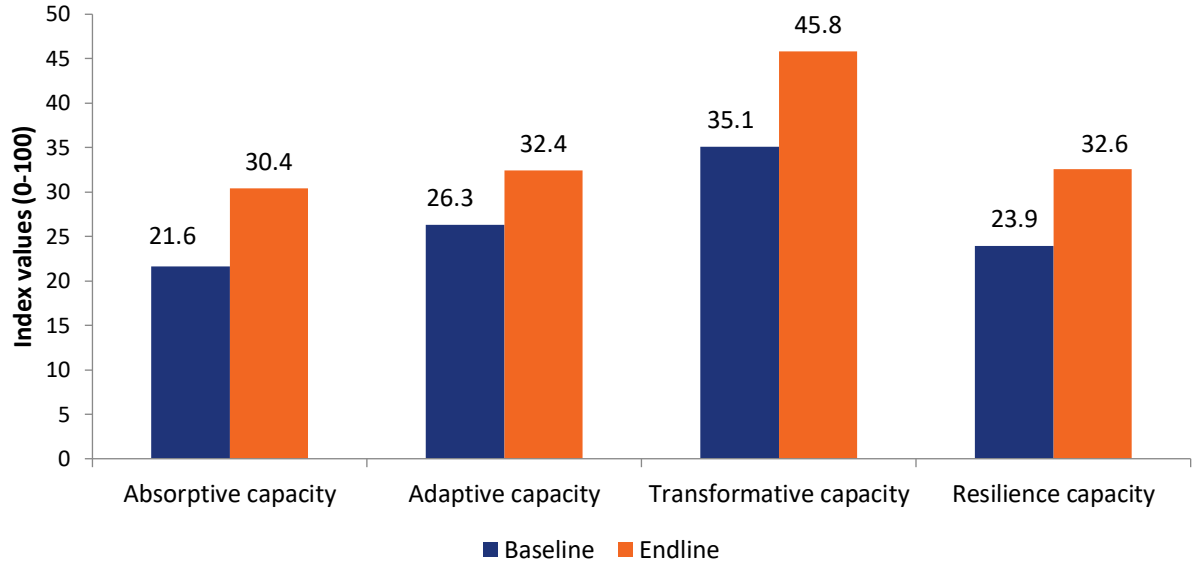
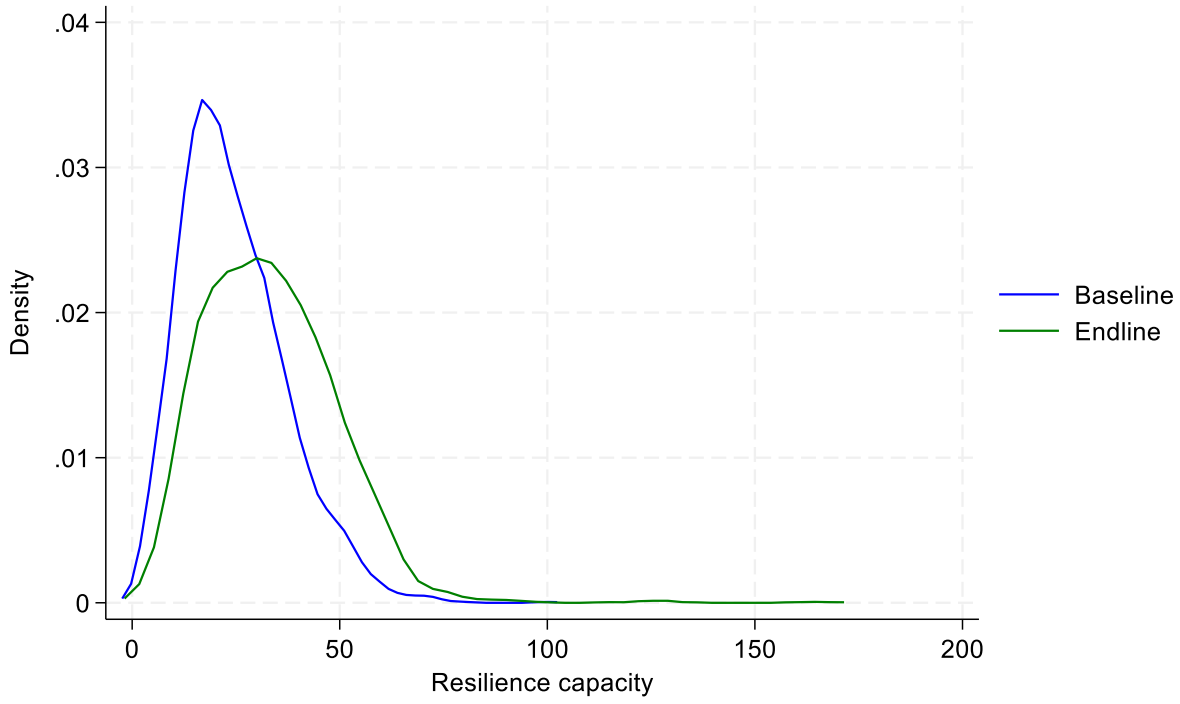


Figure 4.5. Distribution of index of overall resilience capacity, baseline vs. endline



4.3 SUMMARY: HOUSEHOLD RESILIENCE AND RESILIENCE CAPACITIES

This chapter has looked at how households fared in the face of the escalating shock exposure they experienced over the PREG II period and how their resilience capacities—the determinants of resilience—have changed. While 64% of households were resilient, that is, able to get back to or improve upon their pre-program food security, a full 36% were not. Further, the average household in the area experienced a decline in its ability to recover, with particularly large declines for the two most common shocks: drought and food price inflation. By contrast, households' resilience capacities have largely improved over the program period. The index of absorptive capacity increased by 41%, that of adaptive capacity by 23%, and that of transformative capacity by 30.5%. The PREG II area saw improvements in a wide range of important specific capacities: informal safety nets, access to hazard insurance, disaster preparedness and mitigation, asset ownership, livelihood diversity, access to financial resources, human capital, exposure to information, access to infrastructure and services, and community social cohesion. Of note is that there were no improvements in households' social capital (whether bonding, bridging, or linking) over the period. There were also no improvements in access to markets, gender-equitable norms, or governance. The overall increase in asset ownership took place despite an almost 50% decline in livestock ownership.

5 FOOD SECURITY, POVERTY, AND CHILD MALNUTRITION

As seen in Chapter 4, households experienced escalating shock exposure over the PREG II program period. This chapter examines how households and the most vulnerable within them, young children, fared by examining changes in three key well-being outcomes: food security, poverty, and child malnutrition.

5.1 FOOD SECURITY

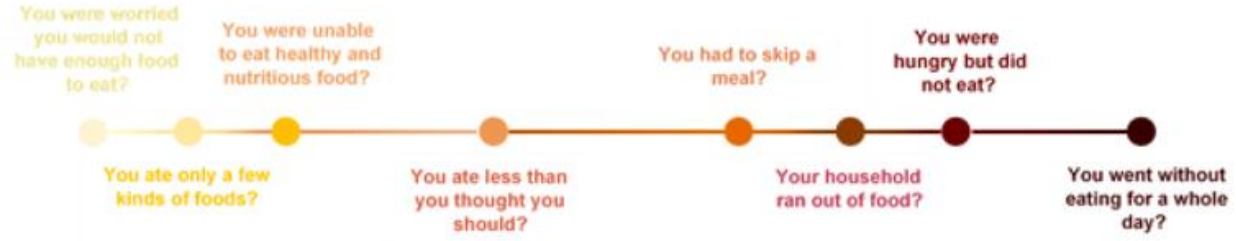
Food security—access to sufficient food to meet dietary needs for a productive and healthy life[37]—is measured in this study using the Food Insecurity Experience Scale (FIES).[38] This measure has a 12-month recall period and is based on eight questions about household access to food and responses to shortage in access to food. Answers to the questions are used to compose a scale that covers a range of severities of food insecurity. The eight questions are as follows.

During the last 12 months, was there a time when, because of lack of money or other resources:

1. You were worried you would not have enough food to eat?
2. You were unable to eat healthy and nutritious food?
3. You ate only a few kinds of foods?
4. You had to skip a meal?
5. You ate less than you thought you should?
6. Your household ran out of food?
7. You were hungry but did not eat?
8. You went without eating for a whole day

Figure 5.1 locates the questions on a severity scale.

Figure 5.1. Food Insecurity Experience Scale



Source: FAO[39]

[37] USAID, 2024
[38] The FIES was formulated by the United Nations Food and Agriculture Organization (FAO) and adopted by USAID Food For Peace in 2017. An FAO-prescribed methodology was used to compute the FIES indicator. Details about FIES calculation can be found in Ballard et al. (2013), FAO (2018a), and FAO (2018b).
[39] FAO, n.d.

The food security scale used for this study is the *inverse* of the FIES, so that the measure increases with increasing food security. The resulting food security index potentially ranges from 0 to 8.

Also derived from the FIES are two indicators of food ***in***security: moderate or severe food insecurity (experiencing at least four of the eight conditions) and severe food insecurity (experiencing at least seven of the conditions).

A final indicator of food security is the Household Dietary Diversity Score (HDDS), a count of the number of different food categories, out of 12, the household consumed food from in the 7 days prior to the survey. This measure is an indicator of dietary quality.

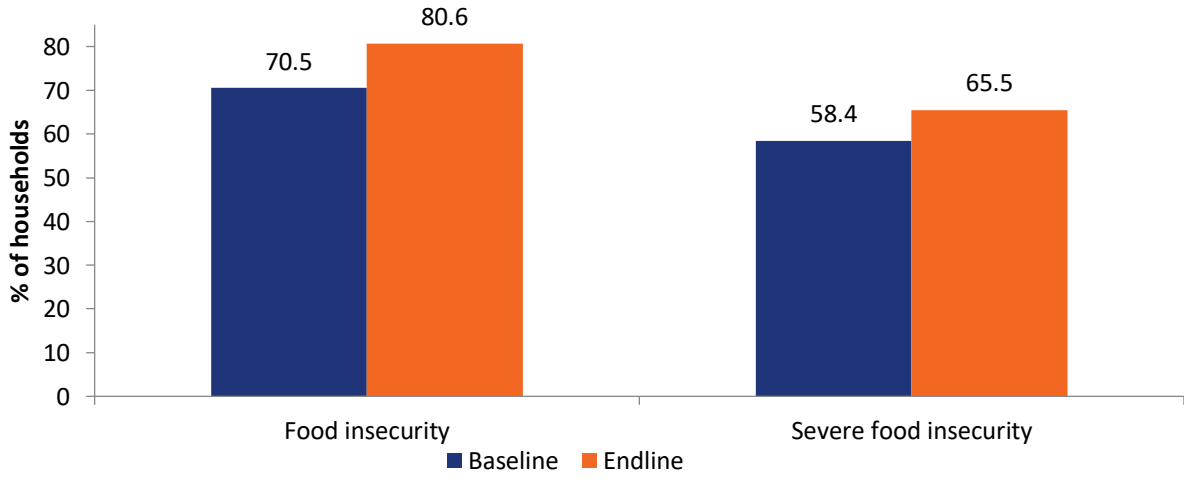
Table 5.1 reports the changes between the baseline and endline surveys in the indicators. Apart from the results for the HDDS, all show that there has been a significant decrease in food security over the PREG II period. There was a 22.2% decline in the food security scale. The prevalence of moderate or severe food insecurity rose from an already very high 70.5% at baseline to 80.6% at endline (see Figure 5.2). The prevalence of severe food insecurity rose by 7.1 percentage points. The HDDS increased only slightly, by 5.6%.

Table 5.1. Baseline-endline comparison of indicators of food security

Indicator	Baseline		Endline	
Food security scale	2.7		2.1	***
Moderate or severe food insecurity (%)	70.5		80.6	***
Severe food insecurity (%)	58.4		65.5	***
Household Dietary Diversity Score	5.4		5.7	**

Note: Stars indicate statistical significance in difference between the BL and EL at the 10%(*), 5%(**), 1%(***) levels.

Figure 5.2. Baseline-endline comparison of prevalences of food insecurity



5.2 ASSET-BASED POVERTY

Indicators of poverty capture a household's ability to meet the basic survival needs of its members, such as food, shelter, and clothing. For the baseline survey, such an indicator was derived using household expenditure survey data. Households with less than US$1.90 daily expenditures per capita were defined as poor.[40] In view of the fact that measuring per capita household expenditures is very time consuming for survey respondents and can lead to fatigue and reporting errors not only in the measurement of expenditures, but also for other important variables such as food security, the endline survey omitted the expenditure module. Instead, poverty was measured using, as its foundation, the same asset index employed to measure the "asset ownership" resilience capacity (see Chapter 4). That index is calculated using factor analysis to combine indicators of the ownership of consumption assets, agricultural productive assets, livestock, and land. For the measurement of poverty, it is divided by household size.[41]

The baseline data were used as an anchor to determine the appropriate cut-off on the asset index to identify poor and non-poor households. Specifically, the poverty rate derived from baseline expenditures data analysis corresponding to the percentage of households falling below the $1.90 poverty line was determined. Then the point along the asset-poverty index at which this rate (44.3%) falls was used as the poverty cut-off.[42]

As can be seen in Table 5.2, the percentage of households in asset-based poverty using this measure showed a 7.1 percentage-point decline between the baseline and endline, falling to 37.2%. The decline is founded on increases in the ownership of consumption and productive assets despite the steep decline seen in livestock ownership that was noted in Chapter 4.

Table 5.2. Baseline-endline comparison of indicators of poverty

Indicator	Baseline	Endline	
Asset poverty (%)	44.3	37.2	***
Consumption assets index	2.6	3.6	***
Productive assets index	1.3	1.5	***
Tropical Livestock Units	8.4	4.5	***
Land owned (ha)	0.22	0.43	*

Note: Stars indicate statistical significance between the BL and EL at the 10%(*), 5%(**), and 1%(***) levels.

[40] USAID, 2019

[41] As for *per capita* expenditures, there is a good rationale for dividing a factor-analysis-based asset index by an equivalence scale such as household size. The number of household members determines both the ability to acquire income and assets and the number of people among whom they must be shared (Howe, Hargreaves, & Huttly, 2008; Ravallion, 2016), and this can change over time. A reason given for *not* dividing a factor-analysis-based asset index by household size is that there are no recognized units associated with such an index, making it "unsuitable" for interpretation on a per capita basis (Moser & Felton, 2007). The latter consideration does not apply here since we are not analyzing the asset index itself but instead using it to measure poverty. Given that household size increased by almost 10% between baseline and endline (from 5.3 to 5.8), doing so helps to accurately detect the trend in poverty, as done in this section, and to analyze impacts on poverty in Section 7.

[42] See Sahn and Stifel (2000) and Filmer and Scott (2012) for seminal works on asset-based poverty measurement. Alkire et al. (2015) discuss such measurement in the context of multidimensional poverty measurement. For a recent example, Jolliffe and Tetteh-Baah (2024) estimate asset indices as a proxy for wealth employing a similar approach to that used here.

5.3 CHILD MALNUTRITION

Did increases in food insecurity translate into increases in child malnutrition—despite the reductions in asset-based poverty? This section looks at changes over the program period in three measures of malnutrition among children under 5: stunting, wasting, and underweight. The underlying determinants of child nutritional status are food security, caring practices for children, and quality of the health environment.

Stunting is an indicator of chronic undernutrition and is measured by comparing children's height to their age. **Wasting** is an indicator of acute malnutrition and is measured by comparing their weight to their height. **Underweight** is a combined measure of chronic and acute malnutrition; it is measured by comparing children's weight to their age. All three indicators measure the percentage of children 0–59 months who have z-scores less than two standard deviations (SD) below the median of the relevant 2006 WHO Child Growth Standard.[43] Data are presented here for moderate-to-severe (below -2SD) and severe (below -3SD) stunting, wasting, and underweight.[44]

The baseline report noted that the rates of moderate-to-severe stunting in children under 5 were slightly less than the national average of 26%.[45] As shown in the left-hand panel of Table 5.3 and in Figure 5.3, this continues to be the case at the endline. What is more important to note is that there has been a statistically significant decline in the prevalence of stunting—including severe stunting—between the baseline and the endline despite the declines in food security seen above. Given no improvements in the health environments of households,[46] this may be due to improvements in caring practices for children. As an example, the qualitative analysis found that the PREG II partner activity Nawiri had a particular focus on reducing wasting among children under 5 through promoting child caring practices.

While there were no changes in the rates of moderate or severe wasting or underweight for the PREG II population as a whole, there *were* reductions in severe stunting and wasting over the program period. Note that qualitative findings suggest that wasting may have improved in pockets of the PREG II area, for example, the Nawiri partner's operational area.[47]

[43] World Health Organization, 2006

[44] The Stata algorithm developed by Leroy (2011) was used to calculate all measures.

[45] Ndemwa et al., 2017

[46] There was no statistically significant increase in household use of clean drinking water or sanitary toilet facilities between the baseline and endline surveys.

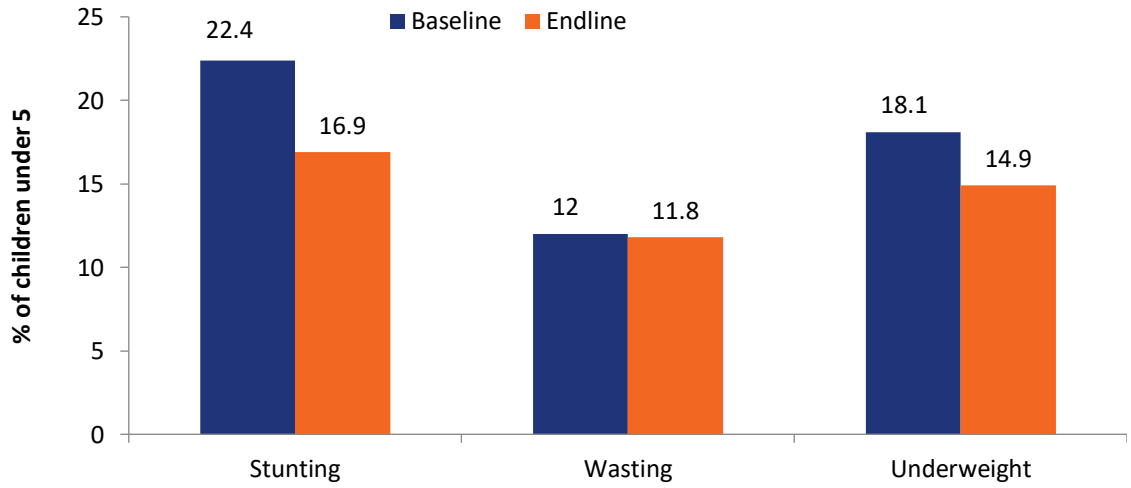
[47] From data gathered during the Nawiri midterm evaluation, clinic staff and community health promoters cited quantitative data used for registering cases of GAM, and these have dropped significantly from the time prior to the beginning of Nawiri and the late 2023 period.

Table 5.3. Baseline-endline comparison of indicators of malnutrition among children under 5

Indicator	All children under 5			Children in households with under 5s at BL & EL		
	Baseline	Endline		Baseline	Endline	
Moderate-to-severe malnutrition						
Stunting	22.4	16.9	***	31.3	40.5	**
Wasting	12.0	11.8		15.8	14.5	
Underweight	18.1	14.9	*	24.8	29.4	
Severe malnutrition						
Severe stunting	8.3	5.2	***	13.4	19.4	*
Severe wasting	2.9	1.9		4.4	4.8	
Severe underweight	3.5	2.5	***	5.5	6.7	
N	1,756	1,811		731	731	

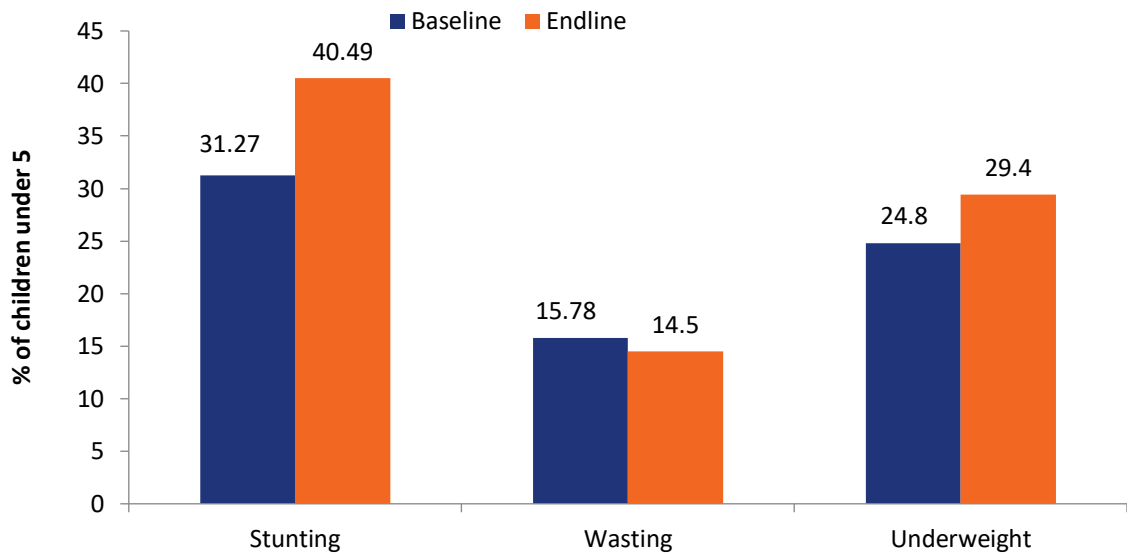
Note: Stars indicate statistical significance between the BL and EL at the 10%(*), 5%(**), and 1%(***) levels.

Figure 5.3. Baseline-endline comparison of malnutrition among children under 5 (full sample)



The right-hand panel of Table 5.3 shows the changes over time for a specific group of households: those with children under 5 at both baseline and endline. This group is singled out because it contains the households for which evaluation of the impact of PREG II on child malnutrition is conducted in Chapter 7. As illustrated in Figure 5.4, rather than declining, stunting has increased among this group of households that likely has a greater proportion of dependents to care for.

Figure 5.4. Baseline-endline comparison of malnutrition among children under 5 (children in panel households with under-5s at both baseline and endline)



5.4 SUMMARY: FOOD SECURITY, POVERTY, AND CHILD MALNUTRITION

This chapter looked at how households and the most vulnerable within them, young children, fared in the face of escalating shock exposure over the program period, examining changes in key household well-being outcomes. **Household food security** declined over the program period. The prevalence of moderate or severe food insecurity rose from an already very high 70% at baseline to 80.6% at endline. The prevalence of severe food insecurity increased by 7.1 percentage points. There was a slight increase in households' dietary diversity, an indication that dietary quality was maintained. By contrast, the prevalence of asset-based **poverty** declined from 44.3% of households at baseline to 37.2% at endline. Despite the reductions in food security, prevalence of **child malnutrition** declined over the program period, perhaps due to improvements in caring practices for children. The prevalence of stunting (chronic undernutrition) declined from 22.4% to 16.9%, a total of 5.5 percentage points. Severe stunting declined by 3.1 percentage points. There was no change in the wasting prevalence. Notably, stunting *increased* among one group of households: those with children under 5 at both baseline and endline. This group is singled out because it contains the households for which evaluation of the impact of PREG II on child malnutrition is conducted in Chapter 7.

6 ENGAGEMENT IN RESILIENCE PROGRAMMING AND ACCESS TO HUMANITARIAN ASSISTANCE

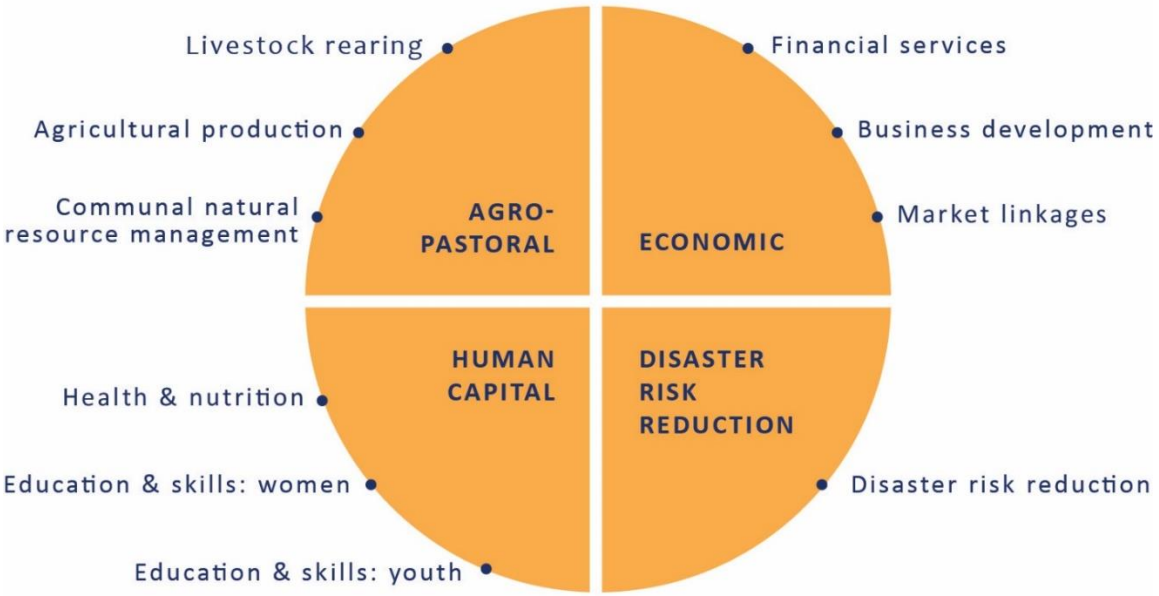
In preparation for the impact evaluation of Chapter 7, this chapter lays out how indicators of households' engagement in resilience programming and access to humanitarian assistance are measured and conducts descriptive analysis of the indicators. The indicators are used to identify the treatment and comparison groups for the impact evaluation.

6.1 EXPOSURE TO AND PARTICIPATION IN THE 10 PREG II INTERVENTION SETS

6.1.1 The Intervention Sets

As outlined in Chapter 2, for this impact evaluation, the program's interventions are divided into 10 categories. These "intervention sets" fall into four categories: Agro-pastoral, Economic, Disaster Risk Reduction, and Human Capital (see Figure 6.1).

Figure 6.1. The 10 PREG II cross-sectoral intervention sets



A description of each is as follows.

(1) Livestock Rearing

- Establishment of veterinary facilities, animal health workers, vaccination programs, livestock insurance programs, and livestock producer associations
- Assistance with food and medication for animals
- Training in livestock rearing
- New and improved water sources for animals

(2) Agricultural Production

- Establishment of services from agricultural extension agents
- Assistance with free crop seeds, farming tools, and irrigation
- Training in and promotion of the use of improved technologies and management practices: improved seeds, seedling production and transport, crop rotation, application of organic manure, improved irrigation, rainwater harvesting, and post-harvest storage

(3) CNRM

- Assistance to communities in mapping natural resource and making natural resource management plans
- Training and group formation in rangeland management
- Promotion of rotational grazing
- Tree planting programs

(4) Financial Services

- Establishment of savings and loan groups, microfinance institutions (MFIs), and mobile banking services

(5) Business Development

- Assistance launching businesses selling poultry or eggs, crops, honey, fish from ponds, and artisanal products
- Assistance with money or credit from the government or an NGO
- Establishment of business groups
- Training in business management

(6) Market Linkages

- Promotion of livestock markets
- Establishment of livestock and crop marketing associations and cooperatives
- Training in livestock market management and marketing of livestock and agricultural products
- Promotion of commercial animal feed and fodder seed sellers

(7) DRR

- Establishment of disaster plans, early warning systems, and community rescue teams
- Training in what to do if there is a disaster
- Assistance with food for animals and buying animals before they die if a disaster hits
- Assistance with conflict reduction, including establishment of conflict mitigation groups and conflict resolution training

(8) Health and Nutrition

- Establishment of and improvements in health clinics
- Establishment of community health volunteers and vaccination campaigns
- Provision of new health services: help with malnourished children, hygiene kits, supplemental feeding programs, school feeding, drinking water

- Training in family health and nutrition
- Assistance with new sources of clean drinking water and improved toilet facilities

(9) Human Capital: Women

- Skills training for women and girls, training in women's rights to make decisions in their households
- Assistance with educational scholarships, job finding, and starting new businesses
- Establishment of and assistance with money or credit for women's groups

(10) Human Capital: Youth

- Skills training for youth
- Assistance with educational scholarships, job finding, and starting new businesses
- Establishment of and assistance with money or credit for youth groups

For this study, a distinction is made between households' *exposure* to interventions and their direct *participation* in them. A household is considered to have been exposed to an intervention if it resides in a village where the intervention was implemented. A household is considered to have participated in an intervention if a household member personally took action related to the intervention.

The main source of data on exposure to and participation in interventions employed was collected from community and household survey respondents using retrospective recall with a recall period of 5 years (the length of PREG II).

Exposure to each intervention set was calculated based on multiple indicators of the presence of the interventions in the 108 sample villages at some time over the previous 5 years (measured as 0–1 dummy variables) using data collected from community survey respondents. The indicators, listed in the lefthand column of Table 6.1, were chosen based on a comprehensive inventory of the program's resilience-strengthening activities provided by PREG II staff. Overall indexes of exposure to each intervention set are calculated by adding up the total number of interventions a household was exposed to placed on a scale from 0 to 100 for comparability across the sets.

Indexes of participation in each of the 10 intervention sets are built from indicators of households' actual reported activity patterns in the previous 5 years collected from household survey respondents. The indicators are listed in the righthand column of Table 6.1.

Comparison of the exposure data collected in the community survey with the participation data collected in the household survey was undertaken for cross checking and validation.

Table 6.1. Exposure to and participation in interventions that started up in the last 5 years (Percent of households)

Intervention	Exposure	Participation
Livestock Rearing		
Veterinary facility	13.4	3.7
Animal health worker serving community	15.5	5.8
Livestock vaccination campaign	62.9	27.1
Livestock Producer Association	8.6	1.1
Assistance with free food or medications for animals	54.6	23.6
Vouchers for animal feed or veterinary supplies	43.4	4.7
Livestock insurance program	37.1	3.5
Training in at least 3 livestock rearing topics	33.6	1.9
New construction of water sources for animals	25.6	6.4
Improvements in water sources for animals	23.4	6.1
Index mean	**35.3**	**12.0**
Agricultural production		
Agricultural extension agent serving community	8.2	1.9
Assistance with free seeds for planting crops	37.1	9.2
Assistance with free farming tools	22.2	5.4
Assistance with new irrigation for their crops	12.0	2.7
Training in at least three agricultural production topics	22.3	2.9
Promotion of improved seeds	24.3	5.2
Promotion of improved seedling production and transport practices	5.1	1.0
Promotion of crop rotation	17.0	4.1
Promotion of organic manure	10.3	3.3
Promotion of improved irrigation	3.9	1.3
Promotion of rainwater harvesting	2.6	1.4
Promotion of improved post-harvest storage techniques	2.1	0.9
Index	**15.2**	**3.9**
CNRM		
Natural resource mapping	22.5	2.2
Natural resources management plan	14.6	1.5
Rangeland management training	10.9	1.1
Rangeland management group	8.2	0.5
Promotion of rotational grazing	9.5	4.6
Tree planting program	23.3	5.6
Index	**14.8**	**3.9**

Intervention	Exposure	Participation
Financial Services		
Savings and loan group	43.4	9.9
Microfinance institution (MFI)	23.9	3.4
Mobile banking service	58.8	25.4
Index	**42.1**	**12.9**
Business Development		
Support to fattening farm businesses	6.5	2.1
Support to businesses selling milk from animals	20.3	4.1
Support to businesses selling poultry or eggs	19.3	1.6
Support to businesses selling crops	11.1	2.3
Support to businesses selling honey	11.3	0.5
Support to businesses selling fish from ponds	5.8	0.3
Support to businesses selling artisanal products like beaded jewelry	3.5	0.7
Business groups	41.8	6.8
Money from the government or an NGO to help with business	43.4	8.1
Credit from the government or an NGO to help with business	24.3	3.3
Business management training	30.1	5.8
Index mean	**30.2**	**4.5**
Market Linkages		
Promotion of livestock market participation	13.9	--
Livestock marketing association	17.9	1.6
Training in livestock market management	13.1	1.2
Livestock marketing cooperative	8.4	0.5
Marketing group for selling crops at a market	7.0	1.4
Training in how to market products (livestock or agricultural products)	21.3	3.2
Promotion of commercial animal feed sellers	22.9	4.1
Promotion of commercial fodder seed sellers	39.8	5.0
Index	**20.6**	**3.4**
DRR		
Plan for what to do if there is a disaster	34.2	2.9
Early warning system	12.0	--
Training in what to do in case of a disaster	17.7	1.4
Community rescue team	9.5	0.8
Assistance with food for animals if a disaster hits	31.2	--
Assistance with buying animals before they die if a disaster hits	24.5	--
Help from government or an NGO to reduce conflict	28.6	--

Intervention	Exposure	Participation
Group in community that works to resolve conflicts	68.4	8.3
Conflict resolution training	44.7	5.5
Index	**33.8**	**3.8**
Health and Nutrition		
Health clinic	36.2	17.8
Improvements in health clinic	47.5	--
Community health volunteer	56.4	18.5
Vaccination campaign	87.9	42.6
Health service: Help for families with malnourished children	45.5	17.4
Health service: Distribution of hygiene kits	26.7	10.3
Health service: Supplemental feeding program for babies	32.5	10.2
Health service: Free food for children at school	16.6	6.5
Health service: Free drinking water	10.1	1.3
Health service: Pre-paid token for drinking water	5.1	0.4
Trainings on how to keep the family healthy	37.0	9.1
Trainings on healthy eating	37.1	9.4
Help to get new sources of clean drinking water	49.8	15.8
Help to get improved toilet facilities	12.7	3.8
Index mean	41.7	14.8
Human capital: women		
Skills training for women and girls	40.4	6.6
Training in women's rights to make decisions in their household	21.2	1.7
Assistance for women and girls: Scholarship for school	27.8	2.9
Assistance for women and girls: Finding a job	6.5	0.0
Assistance for women and girls: Starting a new business	31.4	2.8
GIRLs program	35.4	17.1
Women's group	59.8	13.7
Women's group that received assistance with money or credit	40.6	--
Index	32.9	9.0
Human capital: youth		
Skills training for youth	34.8	5.2
Assistance for youth: Scholarship for school	32.7	4.4
Assistance for youth: Finding a job	8.4	0.0
Assistance for youth: Starting a new business	18.7	1.0
Youth group	54.9	4.0
Youth group that received assistance with money or credit	24.7	--

Intervention	Exposure	Participation
Index	29.0	3.7

Note: Unless otherwise specified, indicators are the percentage of households engaged in the intervention.

Table 6.2 reports on households' exposure to and participation in each of the intervention sets. Index means (left-hand panel) capture the relative intensity of engagement across the sets. They show that both exposure and participation intensities were highest for Financial Services and Health and Nutrition interventions, followed by Livestock Rearing.

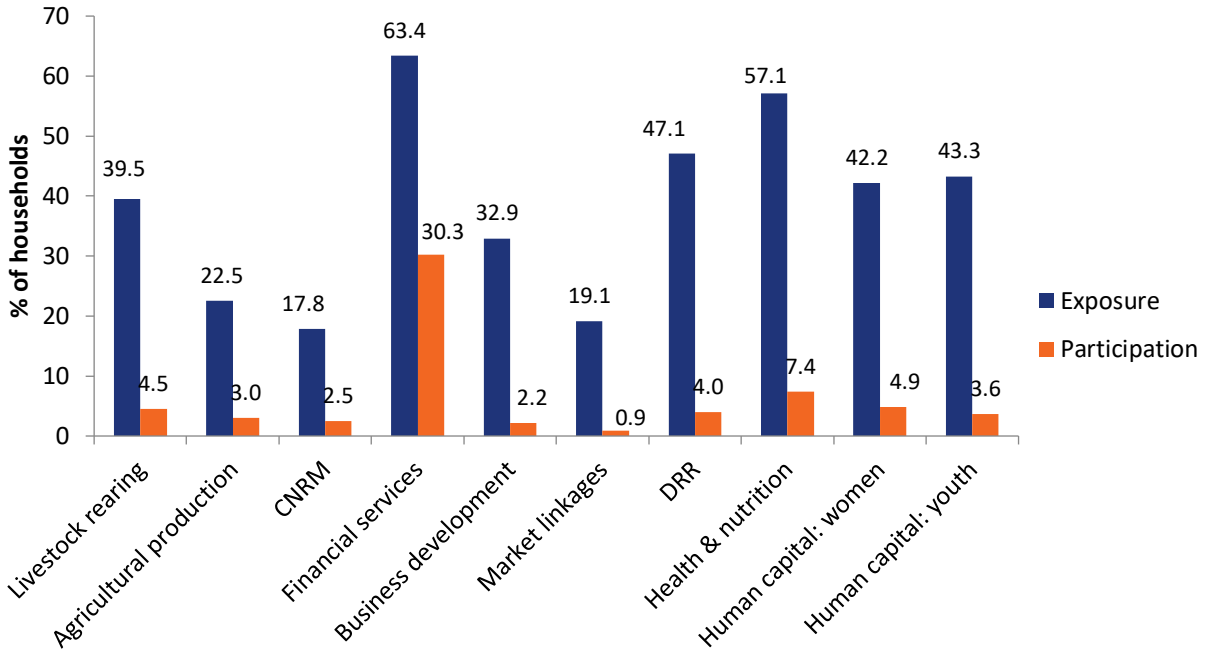
Table 6.2. Exposure to and participation in the 10 intervention sets

	Intensity of engagement (mean index value)		Percent of households	
Intervention set	**Exposure**	**Participation**	**Exposure**	**Participation**
Livestock Rearing	35.3	12.0	39.5	4.5
Agricultural Production	15.2	3.9	22.5	3.0
CNRM	14.8	3.9	17.8	2.5
Financial Services	42.1	12.9	63.4	30.3
Business Development	31.1	4.5	32.9	2.2
Market Linkages	20.6	3.4	19.1	0.9
DRR	33.8	3.8	47.1	4.0
Health and Nutrition	41.7	14.8	57.1	7.4
Human Capital: Women	32.9	9.0	42.2	4.9
Human Capital: Youth	29.0	3.7	43.3	3.6

Note: Index values are the mean number of interventions engaged in on a 0–100 point scale. The percentage of households engaged in the intervention sets represents "moderate" engagement, defined as close as possible to one third of the interventions in the set.

As shown in Figure 6.2, the percentage of households engaged in each intervention set exhibits the same pattern across interventions. This indicator gives the percent that were at least "moderately" engaged, defined as engagement in at least one third of the interventions in the set. First note that for all interventions, exposure is much higher than participation: a far greater number of households were exposed to interventions (living in a village where the intervention was implemented) than directly participated in them, and participation was very low for most. Just over 60% of households were exposed to Financial Services interventions, while roughly half of those households participated in them (that is, participated in a savings and loan group, or used the services of an MFI or mobile bank). This is the intervention set that had the highest direct participation by households. Fifty-seven percent of households were exposed to Health and Nutrition interventions, while only 7.4% participated in them. The intervention set with the lowest exposure is CNRM. That with the lowest participation (under 1% of households) is Market Linkages, an inherently systems-level intervention.

Figure 6.2. Percent of households exposed to and participating in each intervention set



6.1.2 Indicators of Engagement in the Intervention Sets Employed for the Impact Evaluation

Application of Difference-in-Differences Propensity Score Matching (DiD-PSM) (see Chapter 2) requires a dichotomous variable delineating a treatment and comparison group. It is further facilitated by having significantly more households in the potential comparison than potential treatment groups before matching so as to ensure adequate matches for treatment group households. Having at least two thirds of households in the comparison group and one third in the treatment group is a benchmark target.

For determining the impact of each of the 10 intervention sets, measures of "high" exposure to and participation in each were formulated with high exposure defined as being in the top tercile on the index. Table 6.3 gives the resulting numbers of households in the high potential treatment and comparison groups.[48] As an example, for exposure to the DRR intervention set, which contains nine interventions (see Table 6.1), the cut-off for being in the treatment group is five or more interventions. This yields a treatment group of 503 households, or 20.1% of sample households. The comparison group contains 1,891 households.

[48] These are "potential" numbers because households that are not on the "common support" will not remain in the analysis (see Section 2.4.4).

Table 6.3. Number of sample households in potential treatment and comparison groups for the impact evaluation

	Exposure				Participation			
	Treatment group	Comp-arison group	Total	% in treatment group	Treatment group	Comp-arison group	Total	% in treatment group
Engagement in the 10 intervention sets								
Livestock Rearing	482	1,912	2,394	20.1	663	1,731	2,394	27.7
Agricultural Production	587	1,807	2,394	24.5	439	1,955	2,394	18.3
CNRM	512	1,882	2,394	21.4	340	2,054	2,394	14.2
Financial Services	388	2,006	2,394	16.2	706	1,688	2,394	29.5
Business Development	555	1,839	2,394	23.2	506	1,888	2,394	21.1
Market Linkages	501	1,893	2,394	20.9	308	2,086	2,394	12.9
DRR	503	1,891	2,394	21.0	303	2,091	2,394	12.7
Health & Nutrition	680	1,714	2,394	28.4	653	1,741	2,394	27.3
Human Capital: Women	557	1,837	2,394	23.3	276	2,118	2,394	11.5
Human Capital: Youth	627	1,767	2,394	26.2	251	2,142	2,394	10.5
Overall engagement in resilience programming								
Exposure to CRP	731	1,663	2,394	30.5				
Participation in Resilience Programming					358	2,036	2,394	15.0
Exposure to high-intensity PREG II programming (village-level)	562	1,832	2,394	23.5				
Exposure to high-intensity PREG II programming (county level)	580	1,814	2,394	24.2				
Exposure to high-intensity PREG II programming (village within county)	354	2,040	2,394	14.8				

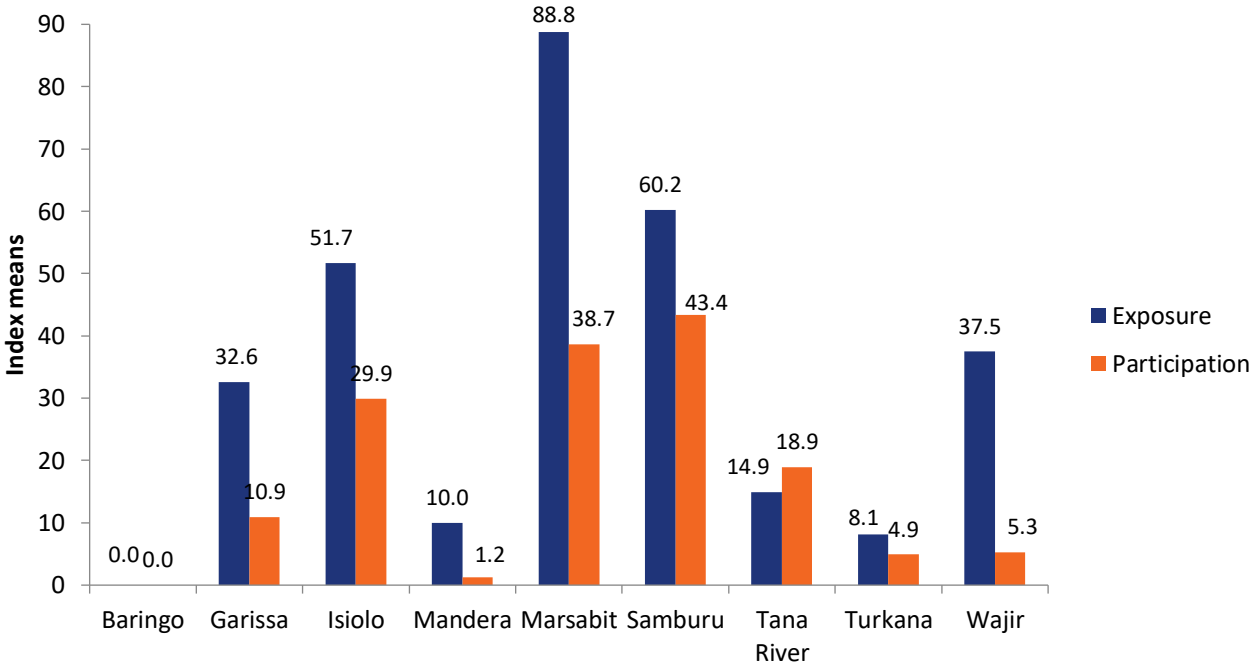
6.2 OVERALL EXPOSURE TO AND PARTICIPATION IN RESILIENCE PROGRAMMING

6.2.1 Exposure to Comprehensive Resilience Programming

An overall summary indicator of households' exposure to resilience-strengthening interventions is calculated based on the concept of Comprehensive Resilience Programming, which characterizes the PREG II comprehensive, cross-sectoral approach to strengthening resilience (see Chapter 1). Exposure to CRP is defined as having had moderate exposure to at least seven of the 10 intervention sets. This results in a potential treatment group of 731 households, or 30.5% of sample households (see bottom panel of Table 6.3).

Within the PREG II area as a whole, 25.7% of households were exposed to CRP.[49] The percentage by county is given in Figure 6.3. Exposure to CRP was highest by far in Marsabit, followed by Samburu and Isiolo. It was lowest in Baringo (no households), Turkana, Mandera, and Tana River.

Figure 6.3. Exposure to CRP and participation in cross-sectoral resilience programming, by PREG II county



6.2.2 Participation in Resilience Programming

As seen in Figure 6.2, *participation* in interventions was very low. Only four sample households participated in seven of the 10 intervention sets. Thus, a measure of participation in CRP could not be employed for the impact evaluation. Instead, a measure of households' participation in resilience programming is defined as moderate participation in at least two intervention sets. This condition was met by 15% (358) of sample households (Table 6.3). The percentage by county is given in Figure 6.3. The

[49] Sampling weights were applied to calculate this percentage as well as those in Figure 6.3.

county with the highest overall participation in resilience programming is Samburu, followed by Marsabit and Isiolo.

6.2.3 Exposure to "High-Intensity" PREG II Programming

As explained in Section 2.4.2, given the presence of other development actors in the program area, it is not known to what extent the endline survey data measure the engagement of households in interventions implemented specifically by the PREG II program.[50] A second source of data was an administrative dataset provided by program administrators on the locations of PREG II activities in the 97 sublocations in which the 108 survey villages are located. In Chapter 7, these are used to conduct an attribution analysis to provide evidence on whether impacts found can be attributed distinctively to the PREG II program.

The administrative dataset contains 5,192 entries of specific individual activities divided into 700 broader activity categories. The activities are not listed with the granularity needed to categorize them into the 10 intervention sets. Thus, three measures of "high-intensity" exposure to PREG II interventions were created. The first is based on the number of activities, out of the 700, implemented in each village. Those households residing in villages with more than seven activities are classified into the high-intensity treatment group while those with fewer are classified into the comparison group. The second measure is based on whether a household resides in a high-intensity county, defined as at least 18 implemented activities. Garissa, Isiolo, and Marsabit are the high-intensity treatment group counties while the rest are in the comparison group. The third measure is based on whether a household resides in a high-intensity village *within* a high-intensity county. The lower panel of Table 6.3 gives the numbers of households in each treatment category.

6.3 HUMANITARIAN ASSISTANCE

Humanitarian assistance was an integral part of the PREG II strategy for helping households recover from shocks. Table 6.4 reports on changes in the percentage of households with access to four types of assistance: food assistance, cash assistance, Food-for-Work (FFW), and Cash-for-Work (CFW). The data are from the baseline and endline household and community survey data.

According to the household survey data, all four types of humanitarian assistance increased in response to the escalating shock exposure households experienced over the program period. Food assistance was the most common type, and access to it increased from 17.2% of households at baseline to 27.8% by endline. The community survey data concur that access to food assistance saw a strong increase over the program period. Cash assistance, FFW, and CFW all rose even more precipitously by endline.

[50] Survey respondents were not asked to report on who implemented the interventions they were engaged in. Past experience shows a high rate of survey respondents either not knowing at all who implemented programs (reporting "Don't Know") or reporting with error.

Table 6.4. Changes in access to humanitarian assistance between the baseline and endline surveys (Percent of households)

Indicator	Baseline	Endline	
Household survey data			
Food assistance	17.2	27.8	***
Cash assistance	4.4	21.4	***
Food-for-Work	3.5	7.7	***
Cash-for-Work	3.4	12.0	***
Community survey data			
Place in village where people can receive food assistance	39.6	51.4	***

Note: Stars indicate statistical significance in difference between the baseline and endline at the 10%(*), 5%(**), and 1%(***) levels.

Table 6.5 reports on the indicators used in the evaluation of the impact of humanitarian assistance on households' resilience, resilience capacities, and well-being of Chapter 7. They rely on endline community survey data on access to assistance over the 5 previous years. Also shown are data from the PREG II administrative dataset on food assistance provided to communities.

Table 6.5. Access to humanitarian assistance over the PREG II program period

Indicator (Percentages, unless otherwise noted)	Community survey data	PREG II administrative data
Food assistance	58.6	59.3
Number of times households' community received assistance (mean)		9.1
Household resides in community receiving assistance 5+ times (percent)		22.3
Cash assistance	48.1	
Food-for-Work	24.8	
Cash-for-Work	40.6	

Note: Stars indicate statistical significance in difference between the BL and EL at the 10%(*), 5%(**), and 1%(***) levels.

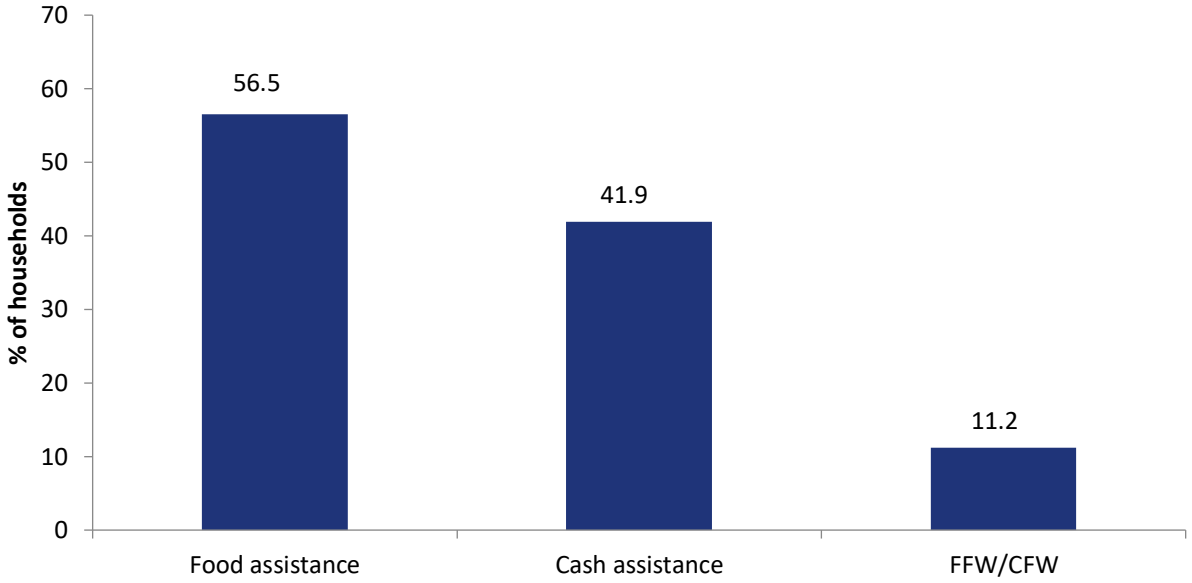
Nearly 60% of households reside in communities that received food assistance over the program period, with roughly the same percentage residing in communities that received food assistance specifically from PREG II. The average number of times communities received PREG II food assistance was 9.1, and 22.3% of households reside in communities that received it at least five times. The latter is the indicator used in evaluation of the impact of PREG II food assistance.

Just under 50% of households reside in communities that received cash assistance over the program period, 25% in communities that were offered FFW, and 41% in communities that were offered CFW.

Finally, Figure 6.4 shows the percentage of households reporting that they actually *received* assistance over the program period (in the last 5 years). The percentages for food and cash assistance are consistent with the access data in Table 6.4, indicating that when the assistance was offered in a community,

households took advantage of it. On the other hand, only 11.2% of households participated in FFW or CFW.

Figure 6.4. Percent of households receiving humanitarian assistance over the program period



6.4 SUMMARY: ENGAGEMENT IN INTERVENTIONS AND ACCESS TO HUMANITARIAN ASSISTANCE

The PREG II program's resilience interventions can be categorized into 10 groups:

- Livestock Rearing
- Agricultural Production
- CNRM
- Financial Services
- Business Development
- Market Linkages
- DRR
- Health and Nutrition
- Human Capital: Women
- Human Capital: Youth.

This chapter explained how households' exposure to and participation in each intervention set, as well as resilience interventions overall, are measured. Exposure is defined as living in a village where the intervention was implemented. Participation is defined as having taken direct actions related to the intervention. The intervention sets with the highest household prevalence of exposure were Financial Services (63.4%), Health and Nutrition (57.1%), and DRR (47.1%). Participation in interventions was far lower than exposure. It was highest for Financial Services (30.3%) and less than 10% for the other intervention sets.

The chapter laid out the specific indicators used for evaluating the impact of resilience interventions in Chapter 7 which, in addition to indicators of engagement in the 10 intervention sets, include three measures of overall engagement in the program. These are (a) exposure to Comprehensive Resilience Programming (25.7% of households), (b) participation in at least two intervention sets (15%), and (c) "high exposure" to PREG II resilience programming (23%). This latter indicator is used to determine whether measured impacts can be attributed to the PREG II program itself.

Finally, indicators of households' access to humanitarian assistance are examined, including food and cash assistance, Food-for-Work, and Cash-for-Work. Fifty-nine percent of households resided in communities with access to food assistance at some time over the program period, and it was the most widespread form of assistance. All four types increased in response to the escalating shock exposure households experienced over the program period.

7 IMPACT OF PREG II: QUANTITATIVE ANALYSIS

This chapter presents the results of the quantitative impact evaluation of the PREG II program. It investigates the following four research questions:

1. What impact did PREG II interventions have on households' resilience to shocks? Did the program's approach of sequencing, layering, and cross-sectoral integration of investments, or Comprehensive Resilience Programming, help strengthen their resilience? Which types of PREG II interventions strengthened their resilience?

2. What impact did PREG II interventions have on households' resilience capacities, including their absorptive, adaptive, and transformative capacities?

3. What impact did PREG II interventions have on key household well-being outcomes: food security, poverty, and child malnutrition?

4. Did humanitarian assistance strengthen households' resilience and resilience capacities?

To capture the overall impact of the program, Section 7.1 first investigates the impacts of exposure to CRP. It then investigates the impacts of direct participation in multiple cross-sectoral resilience interventions. Section 7.2 turns to the impact of the 10 types of resilience-strengthening interventions implemented. Sections 7.3 and 7.4 present the evidence on attribution of impacts to the PREG II and the achievement of cross-sectoral impact synergies. Finally, Section 7.5 examines the impact of humanitarian assistance.

The method employed is Difference-in-Differences Propensity Score Matching (DiD-PSM) with kernel matching. All reported DiD-PSM impact estimates are the ATT (see Chapter 2 for details).

The results of statistical tests assessing the conditions for implementing DiD-PSM and that ensure the rigor of this impact evaluation are presented in Annex 1. To address validity of the estimates, Annex 2 contains impact estimates derived using two alternative propensity-score based methods: DID-PSM Nearest Neighbor Matching and Difference-in-Differences Inverse Probability Weighting.

7.1 OVERALL IMPACT OF RESILIENCE INTERVENTIONS

7.1.1 Resilience to Shocks

Table 7.1 reports DiD-PSM estimates of the impact of exposure to CRP and participation in multiple resilience interventions of the type implemented by PREG II. As detailed in Chapter 6, estimates for exposure to CRP represent the impact of exposure to a wide range of cross-sectoral interventions (seven or more intervention sets). Participation estimates are for household participation in at least two resilience interventions. The upper panel in the table gives results for resilience itself, starting with the first indicator of resilience, Realized Resilience—the change in food security between the baseline and endline surveys.

Exposure to Comprehensive Resilience Programming

The estimate for exposure to CRP is 0.81 and statistically significant at the 1% level: ***households' exposure to resilience-building interventions spanning multiple sectors did indeed strengthen their resilience***. The Nearest Neighbor Matching and Inverse Probability Weighting estimates, at 0.77 and 1.10, are close, which indicates that the Kernel matching estimates are robust to the choice of matching algorithm (see Annex 2, Table A2.1).

Figure 7.1 below illustrates the impact of exposure to CRP on changes in households' food security and thus their "realized resilience" to the shocks they faced over the program period. Recall that food security declined substantially over the period (see Section 5.2). From the evidence presented here, the decline was *less* for households exposed to CRP (the dashed orange line) than those not (solid blue line). Households exposed to CRP experienced a 45% lower decline in food security than their unexposed counterparts.

How does this translate into the actual percentage of households resilient to shocks, that is, the percentage of households who were able to maintain or increase their food security? Figure 7.2 shows that while only 48.3% of households in the comparison group were resilient to the shocks they faced over the program period, 63.8% of those exposed to CRP were, a full 15.5 percentage-point difference. Note also that exposure to CRP had a statistically significant, positive impact on the household self-reported measure of resilience, the perceived ability to recover.

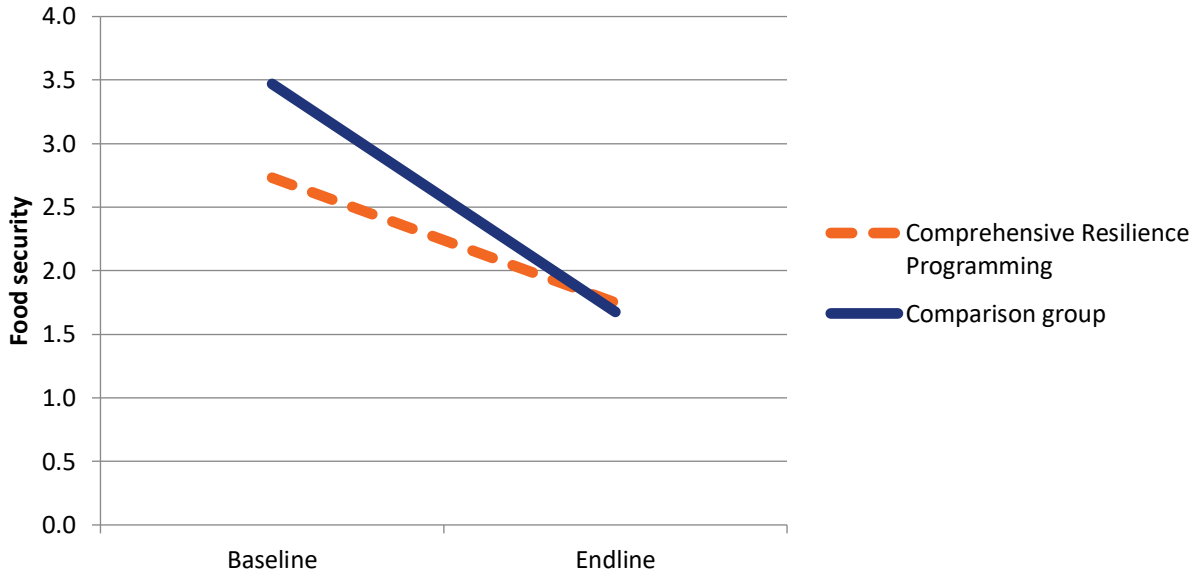
Table 7.1. Overall impact of exposure to and participation in resilience interventions on household resilience and resilience capacity

	Exposure to Comprehensive Resilience Programming		Participation in multiple resilience interventions	
Resilience				
Realized resilience (change in food security)	0.81	***	0.19	
Percent of HHs resilient to shocks	15.50	***	-0.32	
Perceived ability to recover	0.12	**	-0.04	
Resilience capacity				
Index of resilience capacity	7.80	***	9.80	***
Absorptive capacity				
Bonding social capital	9.10	***	13.5	***
Cash savings	7.60	*	19.0	***
Access to informal safety nets	1.32	***	0.47	***
Availability of hazard insurance	37.8	***	12.3	***
Disaster preparedness and mitigation	0.56	***	0.21	***
Asset ownership	-0.92		2.76	***
Index of absorptive capacity	11.2	***	9.30	***
Adaptive capacity				
Bridging social capital	4.60	*	11.4	***
Linking social capital	0.07		7.80	***
Aspirations/confidence to adapt	-2.72	*	4.0	***
Livelihood diversity	-0.01		0.42	***
Access to financial resources	0.11	**	0.14	***
Human capital	2.10		4.80	**
Exposure to information	0.46		2.10	***
Asset ownership	-0.92		2.76	***
Index of adaptive capacity	0.10		11.0	***
Transformative capacity				
Bridging social capital	4.60	*	11.4	***
Linking social capital	0.07		7.80	***
Access to markets	0.43	***	0.19	***
Access to services	0.24	***	0.18	***
Access to infrastructure	0.10	*	-0.11	*
Access to livestock services	-0.03		0.03	
Access to agricultural services	0.11	***	0.08	**
Access to formal safety nets	0.97	***	0.29	***

	Exposure to Comprehensive Resilience Programming		Participation in multiple resilience interventions	
Gender-equitable norms	11.3	***	0.92	
Community social cohesion	18.8	***	6.40	***
Governance	7.00	***	4.70	***
Index of transformative capacity	9.80	***	5.50	***
Number of observations				

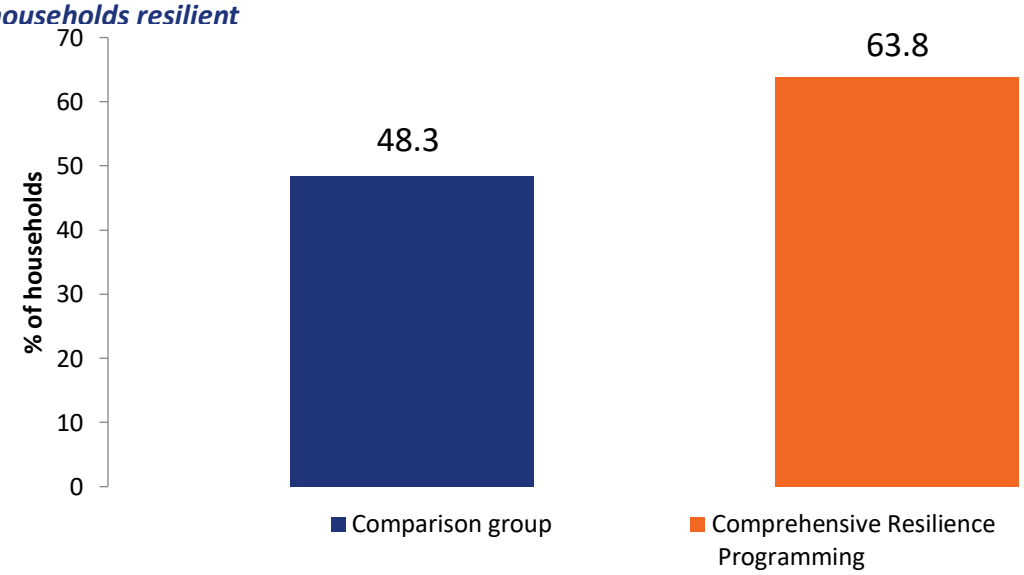
Note: DiD-PSM estimates. Values reported are the Average Treatment Effect on the Treated. Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Figure 7.1. Impact of exposure to Comprehensive Resilience Programming on Realized Resilience



Note: Realized Resilience is the change in food security between the baseline and endline surveys. The lines in this figure depict this change.

Figure 7.2. Impact of exposure to Comprehensive Resilience Programming on the percent of households resilient



Participation in Resilience Interventions

Household participation in multiple cross-sectoral resilience interventions, defined as participation in at least two of the intervention sets, does not appear to have improved households' resilience to

shocks.[51] Perhaps more intense participation is needed for a positive impact. However, as seen in the next section, it did have a positive impact on households' resilience capacities, the precursors to lasting long-run resilience.

7.1.2 Resilience Capacity

We saw in Chapter 4 that households' resilience capacities improved over the program period. The results in the lower panel of Table 7.1 show that both exposure to and participation in resilience interventions contributed to these improvements. Participation in interventions had a somewhat stronger impact. For the overall index of resilience capacity, the impact for participation in just two or more intervention sets is 25.6% higher than that for exposure to CRP (9.8 versus 7.8 on the index), that is, exposure to *seven* or more intervention sets.[52]

Absorptive capacity—***the ability to minimize exposure to shocks and recover quickly***. Both exposure and participation had positive impacts on households' absorptive capacity, with exposure having a stronger impact overall (11.2 versus 9.3 on the index). The comparative impacts are illustrated in the top panel of Figure 7.3. As can be seen, the "treatment group" line (dashed orange) is steeper than the "comparison group" line (solid blue) for both exposure and participation, and the difference in slope is greater for exposure.

However, it is only household participation in interventions that had positive impacts on *all* individual indicators of absorptive capacity: bonding social capital, cash savings, access to informal safety nets, availability of hazard insurance, disaster preparedness and mitigation (DPM), and asset ownership. The greater magnitude of impact of exposure on absorptive capacity overall is due to far stronger positive impacts on access to informal safety nets, hazard insurance, and DPM.

Adaptive capacity—***the ability to make informed choices about alternative livelihood strategies when faced with changing conditions.*** Exposure to CRP had no impact on this capacity overall, while participation had a strong, positive impact (Figure 7.3, middle panel). Exposure to CRP had a statistically significant, positive impact on only one capacity: access to financial resources. In contrast, participation in multiple resilience interventions had positive impacts on all eight of the adaptive capacities including, in addition to access to financial resources: bridging and linking social capital, aspirations, livelihood diversity, human capital, exposure to information, and asset ownership. Apparently, direct participation, rather than only exposure at the village level, is crucial for improving households' adaptive capacity in the program area.

Transformative capacity—***systems-level determinants enabling lasting resilience***. Exposure to CRP had a much stronger impact on transformative capacity than did participation (bottom panel of Figure 7.3). While both had positive impacts on a wide range of individual transformative capacities, only participation had a positive impact on bridging and linking social capital, and only exposure to CRP had a positive impact on gender-equitable norms.[53]

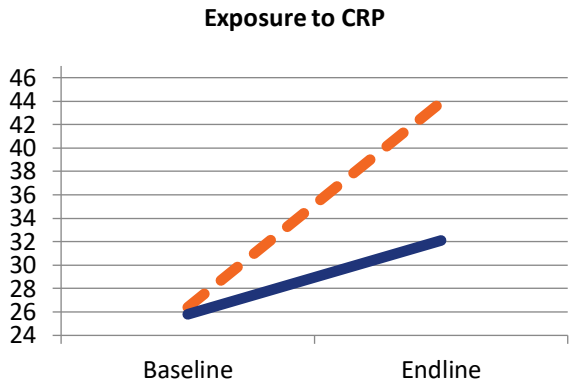
[51] The IPW estimate for Realized Resilience is similarly not statistically significant, but that for NNM is close (0.28) and statistically significant at the 5% level (Annex 3, Table A3.1)

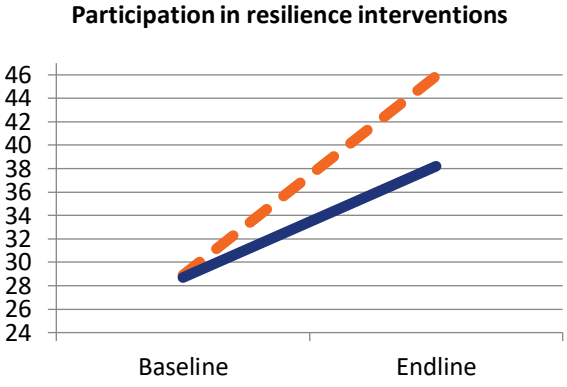
[52] NNM and IPW estimates for the resilience capacity indexes are all similar to those in Table 7.1 (Annex 3, Table A3.1).

[53] The indicator of gender-equitable norms is a measure of gender-equitable practices at the village level (see Table 4.2). The village-level measure was used in order to maintain the full sample. A full household-level analysis of women's empowerment more broadly would have required a separate sample only including households with women.

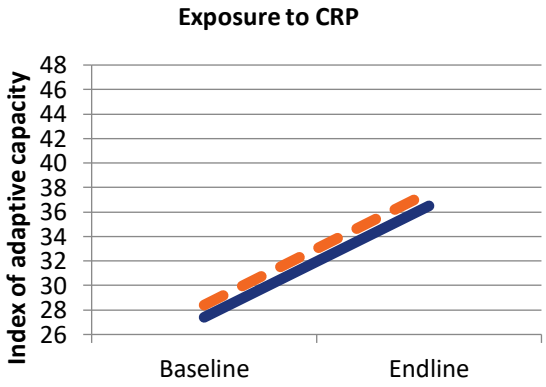
Figure 7.3. Impact of exposure to Comprehensive Resilience Programming and participation in resilience interventions on resilience capacity

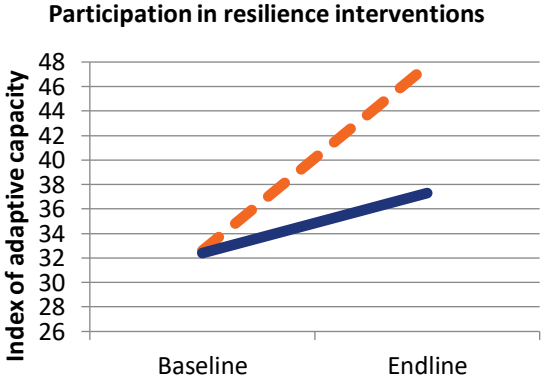
Absorptive capacity



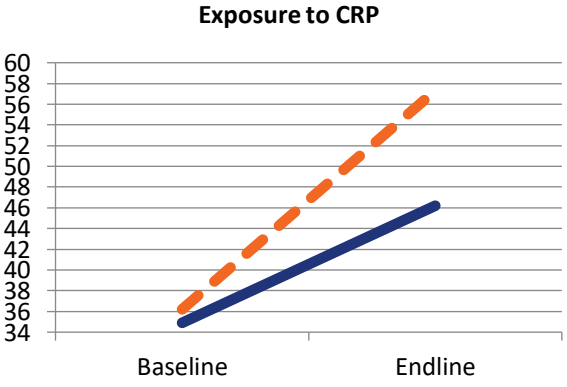


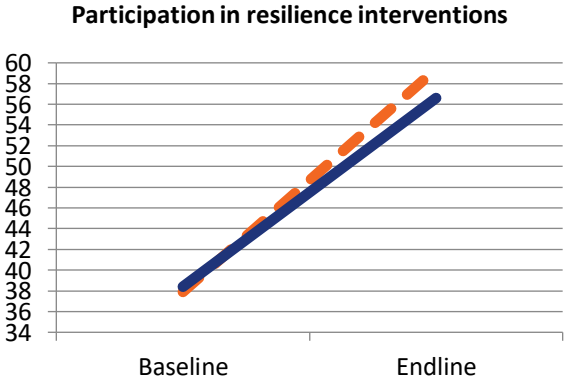
Adaptive capacity





Transformative capacity





Note: Vertical axes contain index values. The indexes potentially range from 0 to 100. For each figure, the dashed orange line represents the treatment group, while the solid blue line represents the comparison group.

7.1.3 Household Food Security, Asset-Based Poverty, and Child Malnutrition

The impact results for the well-being outcomes are in Table 7.2. They confirm that exposure to CRP had a strong, positive impact on **household food security**. It led to a 10.4 percentage-point reduction in moderate or severe food insecurity, an important achievement.[54] The result is illustrated in Figure 7.4 (left-hand graph). Moderate or severe food insecurity increased by 25.9 percentage points for the comparison group over the program period (from 60.3% to 86.2%) while it only increased by 15.5 percentage points for the CRP exposure group. The difference is the estimated impact. Exposure to CRP led to a 7.3 percentage-point reduction in severe food insecurity (see Figure 7.4, right-hand graph) and boosted household dietary diversity, the indicator of dietary quality.

While participation in resilience interventions at the low threshold with which it is measured registered no impact on food insecurity, it had a strong, positive impact on dietary diversity, almost a whole food group (0.93 groups).

In contrast to food security, exposure to CRP had no impact on **asset-based poverty,** while participation in multiple resilience interventions had a solid impact, lowering it by 7.6 percentage points.[55] It did so by increasing households' ownership of both consumption and productive assets. The result is illustrated in Figure 7.5.

Table 7.2. Overall impact of exposure to and participation in resilience interventions on household food security, asset-based poverty, and child malnutrition

	Exposure to Comprehensive Resilience Programming		Participation in multiple resilience interventions	
Food security				
Food security scale	0.81	***	0.19	
Moderate or severe food insecurity (%)	-10.4	***	-2.6	
Severe food insecurity (%)	-7.3	**	-3.8	
Household Dietary Diversity Score	0.38	**	0.93	***
Number of observations	2,394		2,394	
Poverty				
Asset poverty (%)	2.5		-7.6	**
Consumption assets index	-0.21		1.12	***
Productive assets index	0.01		0.485	***
Tropical Livestock Units	-1.12		0.377	
Land owned (ha)	-0.29		0.096	
Number of observations	2,394		2,394	
Child malnutrition (% of under-5s)				
Stunting	-16.0	**	0.66	
Wasting	-0.25		-7.7	
Underweight	-15.9	**	-3.4	
Severe stunting	-7.3	*	0.78	

[54] The NNM impact estimate is the same as reported in Table 7.2, while that for IPW is higher in (absolute) magnitude (-14.5).
[55] The NNM estimate is -9.2 and significant at the 1% level. That for IPW is -6.9 and significant at the 10% level.

	Exposure to Comprehensive Resilience Programming		Participation in multiple resilience interventions	
Severe wasting	-3.6		-3.2	
Severe underweight	-5.2	*	-2.3	
Number of observations	731		731	

Note: DiD-PSM estimates. Values reported are the Average Treatment Effect on the Treated. Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Figure 7.4. Impact of exposure to Comprehensive Resilience Programming on food insecurity

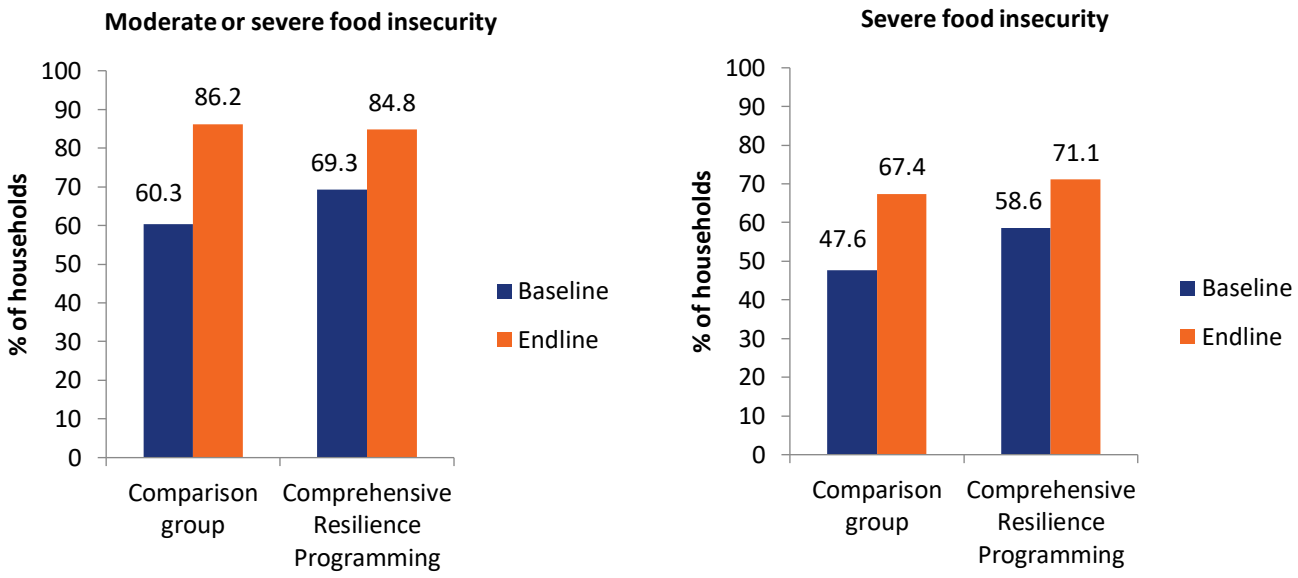
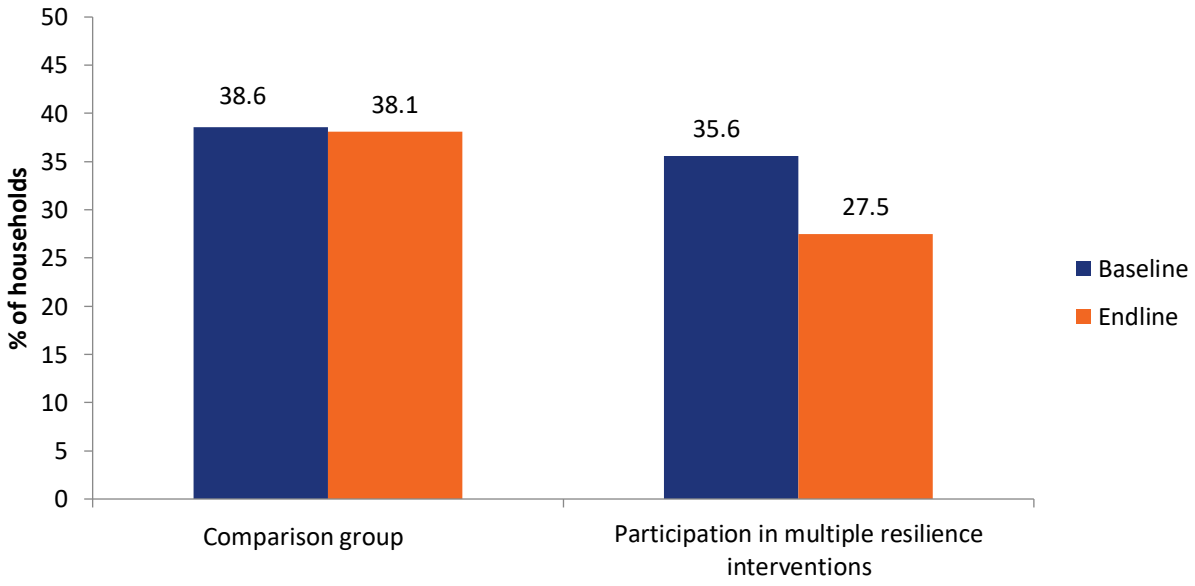
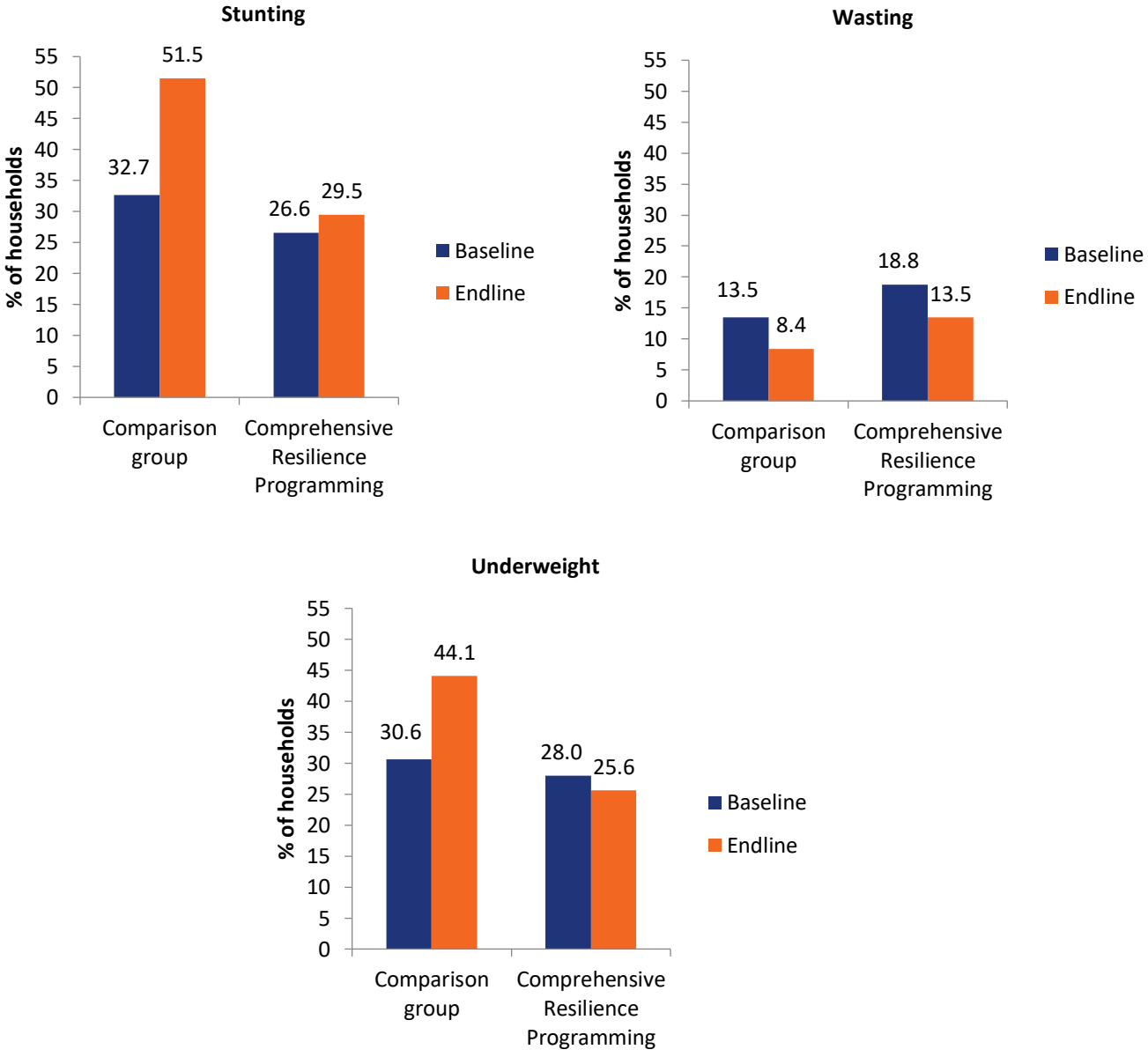


Figure 7.5. Impact of participation in multiple resilience interventions on asset-based poverty



Turning to the **child malnutrition** results, exposure to CRP led to large reductions in stunting and underweight among children under 5, 16.0 and 15.9 percentage points, respectively.[56] Recall that malnutrition increased for our impact evaluation sample of households with children under 5 at both baseline and endline (N = 731) (Section 5.3). As shown in Figure 7.6, exposure to CRP curtailed this increase. Participation in multiple interventions, at the lower threshold at which it is measured here, registered no statistically significant impact on child malnutrition.

Figure 7.6. Impact of exposure to Comprehensive Resilience Programming on child malnutrition



[56] Estimates for NNM are not statistically significant. Estimates for IPW are lower (in absolute magnitude) but confirm large impacts (Annex 3, Table A3.1).

7.2 WHAT WORKED? RELATIVE IMPACTS OF SPECIFIC TYPES OF INTERVENTIONS

7.2.1 Resilience

Table 7.3 compares the relative impacts of exposure to 10 ten intervention sets on households' resilience and resilience capacities. Table 7.4 reports the same for participation in the intervention sets. Green-shaded cells indicate a positive DiD-PSM ATT statistically significant at the 5% level; red-shaded cells indicate the same for negative ATT estimates. Unshaded cells indicate a non-significant estimate.[57]

In order to isolate the individual impacts of each intervention set, the other intervention sets are controlled for in the matching analysis. For the participation analysis, dummy variables representing "high" participation in and "high" exposure to each of the other intervention sets is included in the set of matching variables. This was not possible for the exposure analysis, as the diagnostic criteria for matching (common support and percent bias) could not be achieved. Instead, the total number of the other interventions exposed to is matched across treatment and comparison group households. Given this all-inclusive, yet more lenient manner employed to control for other intervention sets, and that only a minority of households were actually engaged in only one intervention set alone, we focus here on the bigger picture emerging from the comparative results across intervention sets rather than the specific results, such as magnitudes of ATT estimates, for each intervention. Note that it was not possible to generate estimates for exposure to the Business Development intervention set as the conditions for DiD-PSM were not met.

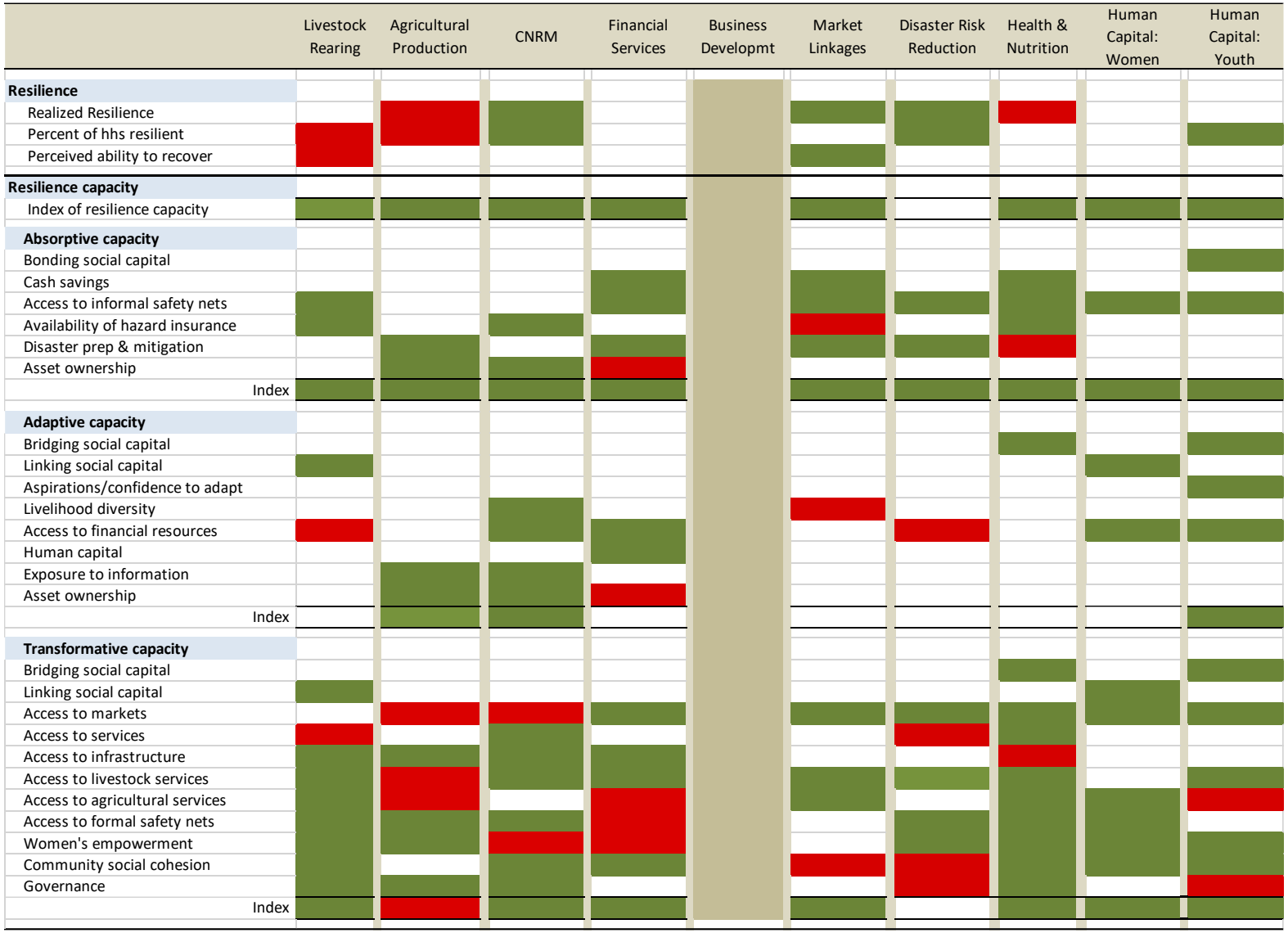
Five intervention sets appear to have had the most positive impact on households' ability to recover from shocks over the program period, whether through exposure to the interventions or direct household participation:

- CNRM
- Financial Services
- Market Linkages
- DRR
- Youth Human Capital

A negative ATT for Realized Resilience is registered in the case of two intervention sets, when implemented on their own: livestock rearing and agricultural production. While more research is needed, these results could be due to targeting toward less resilient households in response to shock events that took place after the start of the program. Note that while the negative impact estimate for the health and nutrition intervention set is not corroborated by the other measures of resilience, these interventions may have also been subject to post-baseline targeting bias.

[57] Matching diagnostics are given in Annex 2.

Table 7.3. Impact of exposure to the 10 intervention sets on resilience and resilience capacity: summary



Note: Green-shaded cells indicate a positive impact significant at the 5% level; Red-shaded cells indicate a negative impact significant at the 5% level. Results are not reported for "Business Development" interventions because the Propensity Score Matching diagnostic criteria were not met.

Table 7.4. Impact of participation in the 10 intervention sets on resilience and resilience capacity: summary

	Livestock Rearing	Agricultural Production	CNRM	Financial Services	Business Developmt	Market Linkages	Disaster Risk Reduction	Health & Nutrition	Human Capital: Women	Human Capital: Youth
Resilience										
Realized Resilience										
Percent of hhs resilient										
Perceived ability to recover										
Resilience capacity										
Index of resilience capacity										
Absorptive capacity										
Bonding social capital										
Cash savings										
Access to informal safety nets										
Availability of hazard insurance										
Disaster prep & mitigation										
Asset ownership										
Index										
Adaptive capacity										
Bridging social capital										
Linking social capital										
Aspirations/confidence to adapt										
Livelihood diversity										
Access to financial resources										
Human capital										
Exposure to information										
Asset ownership										
Index										
Transformative capacity										
Bridging social capital										
Linking social capital										
Access to markets										
Access to services										
Access to infrastructure										
Access to livestock services										
Access to agricultural services										
Access to formal safety nets										
Women's empowerment										
Community social cohesion										
Governance										
Index										

Note: Green-shaded cells indicate a positive impact significant at the 5% level; Red-shaded cells indicate a negative impact significant at the 5% level.

7.2.2 Resilience Capacities

All of the intervention sets had a positive impact on resilience capacity overall, whether via exposure, direct household participation, or both. Table 7.5 summarizes the number of resilience capacities, out of the full 22, for which positive and negative ATTs were estimated. The difference gives an indication of the relative strength of impact of the intervention sets.

The intervention sets that appear to have had the most positive impacts overall on households' resilience capacities, whether through exposure or direct participation, are women's human capital, health and nutrition, CNRM, and DRR.

Table 7.5. Summary of relative impacts of the 10 intervention sets on household resilience capacities

	Livestock Rearing	Agricultural Production	CNRM	Financial Services	Busi-ness Devt.	Market Linkages	DRR	Health & Nutrition	Human Capital: Women	Human Capital: Youth
Exposure										
Positive ATT	10	7	11	9		6	6	12	8	9
Negative ATT	2	3	2	4		3	4	2	0	2
Difference	8	4	9	5		3	2	10	8	7
Participation										
Positive ATT	3	4	6	7	7	5	11	5	9	6
Negative ATT	1	1	0	0	0	1	0	0	0	1
Difference	2	3	6	7	7	4	11	5	9	5

Note: ATT = Average Treatment Effect on the Treated. Results are not reported for Business Development interventions because the PSM diagnostic criteria were not met.

However, all of the intervention sets had some positive impacts and thus contributed to the improvements in resilience capacities seen in Chapter 4.

Exposure to the DRR interventions did not have a strong positive impact on resilience capacities. However, direct *participation* in these interventions had the strongest impact among all of the intervention sets, improving households' absorptive, adaptive, and transformative capacities and a broad range of resilience capacities (11 out of the 22).

7.2.3 Food Security, Poverty, and Child Malnutrition

Table 7.6 compares the relative impacts of exposure to the 10 intervention sets (top panel), as well as of participation in them (bottom panel), on food security, asset-based poverty, and child malnutrition. To aid in interpretation, table cells with yellow circles indicate a positive impact on well-being.

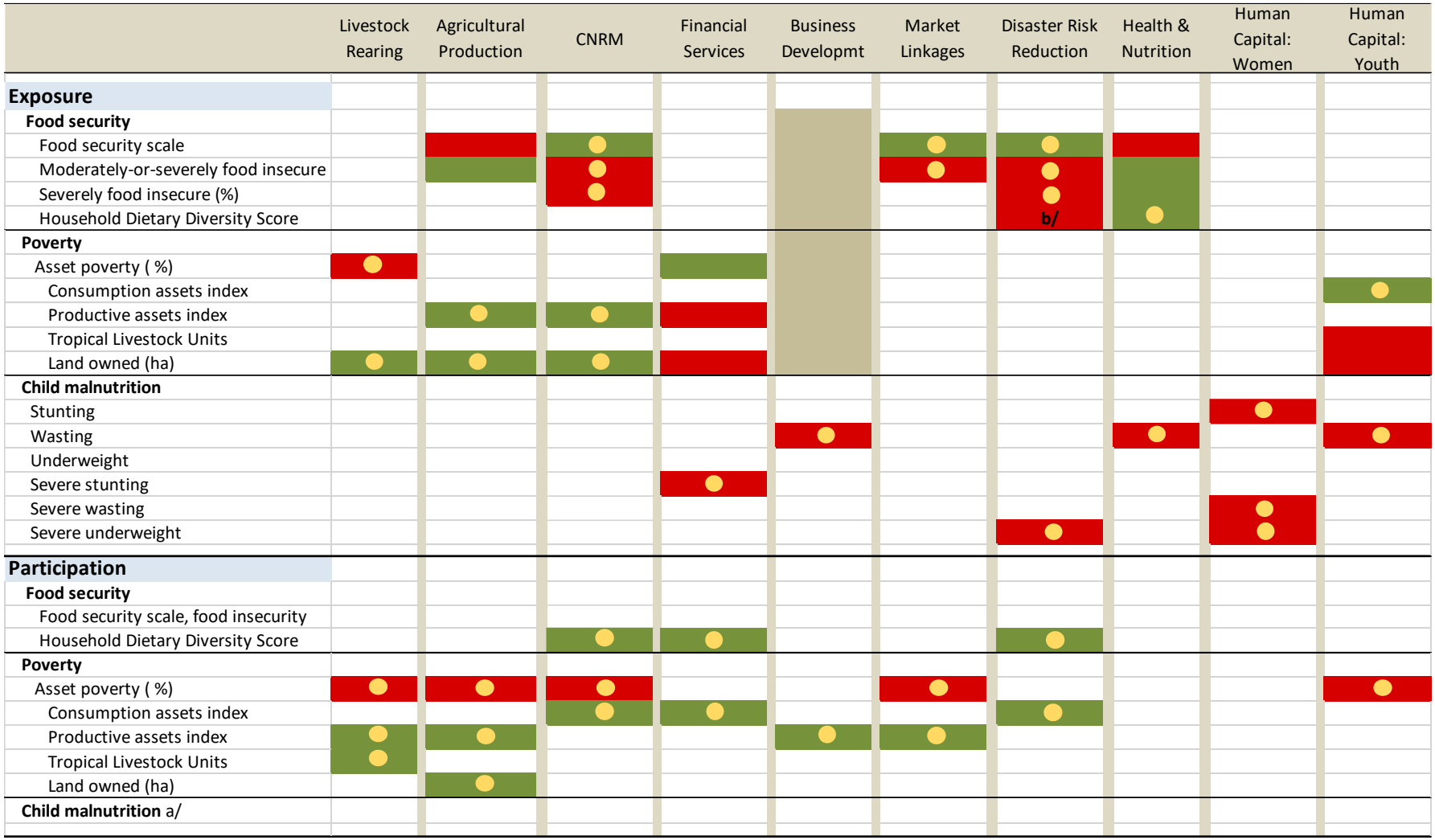
Food security. The results indicate a positive impact of CNRM, market linkages, and DRR interventions on household food security. This is evident in positive and statistically significant impacts on food security and negative impacts (reductions brought about) in moderate or severe food *in*security. Negative impact estimates for exposure to agricultural production and health and nutrition interventions may again be a result of targeting decisions made after the baseline toward villages with crisis levels of food insecurity. The results indicate positive impacts on dietary diversity of exposure to

health and nutrition interventions and for participation in CNRM, financial services, and DRR interventions. The negative registered result for exposure to DRR interventions disappears when two food groups are removed from the HDDS: (a) sugar/honey and (b) condiments, alcohol, and coffee/tea. Thus, it does not apply when only nutritious foods are considered.

Poverty. Both exposure to and participation in livestock rearing interventions reduced asset-based poverty in the program area. Participation in four additional intervention sets also helped lower asset-based poverty: agricultural production, CNRM, market linkages, and youth human capital. Participation in three other intervention sets helped boost asset ownership, which is an indication that they did help improve households' ability to obtain needed items: financial services, business development, and DRR. The results indicate that financial services interventions *increased* asset-based poverty by lowering ownership of productive assets and land. This finding may be because households employing credit and savings gained from the interventions shifted out of agricultural production, divesting from productive assets and land in the process. No negative impact on the ownership of consumption assets was found.

Child malnutrition. Exposure to (but not participation in) a variety of intervention sets helped to reduce child malnutrition in the program area: financial services, business development, DRR, health and nutrition, and human capital for both women and youth. Women's human capital interventions stand out as having mitigated multiple forms of malnutrition stunting, severe wasting, and severe underweight.

Table 7.6. Impact of exposure to and participation in the 10 intervention sets on food security, poverty, and child malnutrition



Note: Green-shaded cells indicate a positive estimate significant at the 5% level; Red-shaded cells indicate a similar negative estimate. ***Yellow dots denote a positive impact on well-being.*** *Results are not reported for Business Development interventions because the Propensity Score Matching diagnostic criteria were not met.*
a/ No statistically significant impacts. b/ The negative, significant estimate becomes insignificant when non-nutritious food groups are excluded (see text).

7.3 EVIDENCE ON ATTRIBUTION OF IMPACTS TO THE PREG II PROGRAM

Can the positive results for the overall impact of resilience interventions seen in Section 7.1 be attributed, specifically, to the PREG II program? As noted in the last section (6.2.3), it is not known to what extent the endline survey data measure the engagement of households in interventions implemented specifically by PREG II. However, the PREG II administrative dataset described there can be used to provide evidence on such attribution. DiD-PSM impact estimates are calculated for three sets of treatment groups:

1. Households residing in "high-intensity" PREG II villages. These households may benefit from local exposure to interventions within their own village.
2. Households residing in the three high-intensity PREG II counties (Garissa, Isiolo, and Marsabit). These households may benefit from systems-level interventions applied throughout broader geographical areas, such as livestock market interventions and support of Ward Development Planning Committees (WDPCs).
3. Households residing in a high-intensity village within one of these counties. These households may benefit from both local exposure and systems-level interventions applied more broadly.

Table 7.7 contains the results. They confirm that PREG II resilience programming had a positive impact on households' resilience to shocks and resilience capacities, and helped reduce food insecurity, asset-based poverty, and child malnutrition.[58]

Resilience. All three treatment scenarios show strong, positive impacts on Realized Resilience and the percentage of households resilient to shocks. The perceived ability to recover measure is positive and significant for the county-level treatment variable. These results are consistent with those for exposure to CRP found in Table 7.1.

Resilience capacity. Across the treatment scenarios, impacts of PREG II programming are positive and statistically significant for all three dimensions of resilience capacity: absorptive, adaptive, and transformative capacity. These results confirm the positive impacts of exposure to resilience interventions on absorptive and transformative capacity seen in the CRP exposure analysis. They further provide evidence that exposure to resilience interventions had positive impacts on households' adaptive capacity as well, which was not seen in the CRP exposure results.

Food security. Across the treatment scenarios the results mirror those found in the CRP analysis and confirm that PREG II interventions lowered food insecurity in the program area. The first scenario confirms positive impacts on dietary quality (HDDS) for households residing in villages with high-intensity PREG II programming.

Poverty. Results for the second and third scenarios confirm that PREG II resilience interventions helped reduce asset-based poverty for households living in high-intensity programming villages, with households also living in high-intensity counties benefiting even more. These households would have

[58] Results for the two alternative estimation methods for stunting, wasting, and underweight prevalences are reported in Annex 3, Table A3.2. They confirm the estimates in Table 7.7 for the indicators of resilience (IPW estimates are substantially higher in magnitude), food security, and asset-based poverty. In the case of resilience capacity, results differ somewhat depending on the estimation method. In the case of child malnutrition, all estimates are statistically insignificant except for the NNM estimate for wasting, which is positive and statistically significant. This finding is not validated by the other methods.

gained from direct local exposure to interventions at the same time as broader systems-level interventions. The reductions in asset-based poverty are manifested mainly through increased ownership of consumption assets.

Table 7.7. Attribution to PREG II: Impact of exposure to high-intensity PREG II programming

Impact of residing in a PREG II …	High-intensity village		High-intensity county		High-intensity village in a high-intensity county	
Resilience						
Realized Resilience (change in food security)	0.75	***	1.59	***	1.29	***
Percent of HHs resilient to shocks	8.00	***	16.7	***	15.3	***
Perceived ability to recover	0.02		0.18	***	0.10	
Resilience capacity						
Absorptive capacity	1.75	**	2.52	***	4.30	***
Adaptive capacity	1.15		2.63	***	3.20	**
Transformative capacity	3.3	***	8.6	***	11.4	***
Resilience capacity	1.90	**	3.6	***	5.2	***
Food security						
Food security scale	0.75	***	1.59	***	1.29	***
Moderate or severe food insecurity (%)	-9.30	***	-19.0	***	-14.4	***
Severe food insecurity (%)	-12.10	***	-29.3	***	-26.0	***
Household Dietary Diversity Score	0.69	***	0.06		0.27	
Poverty						
Asset poverty (%)	-1.43		-8.58	**	-10.96	**
Consumption assets index	0.44	**	0.49	**	0.88	***
Productive assets index	-0.07		0.08		0.10	
Tropical Livestock Units	-0.59		1.73	***	-1.10	
Land owned (ha)	-0.02		-0.23	**	-0.09	
Child malnutrition						
Stunting	1.91		-5.01		a/	
Wasting	6.85		3.64			
Underweight	1.90		-6.40			
Severe stunting	2.30		-3.77			
Severe wasting	-5.80	**	0.08			
Severe underweight	-1.10		-3.61			

Note: DiD-PSM estimates. Values reported are the Average Treatment Effect on the Treated. Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.
a/ The number of observations in the treatment group is insufficient for generating accurate estimates (<100).

Child malnutrition. PREG II resilience programming contributed to reductions in severe wasting in the program area for households residing in high-intensity programming villages. The results regarding

exposure to CRP in Table 7.2 were far more positive for this well-being outcome. The latter could indicate that Comprehensive Resilience Programming, with exposure to many *cross-sectoral* interventions, is needed for reducing malnutrition. It could also indicate that household exposure to interventions other than PREG II interventions have helped reduce child malnutrition.

Some interesting patterns emerge when looking across the three PREG II high-intensity treatment scenarios. In the case of resilience and food security, impacts are stronger for households living in high-intensity counties than those who only live in a high-intensity village. In the case of resilience capacities and asset-based poverty, we find the same but an additional advantage if they live in a high-intensity village *within* a high-intensity county. These results indicate that the systems-level interventions implemented in broader geographical areas of the PREG II area had positive impacts on households' resilience, resilience capacities, and well-being beyond those conferred by interventions implemented at the local level.

7.4 EVIDENCE ON CROSS-SECTORAL IMPACT SYNERGIES

We've found above that household exposure to Comprehensive Resilience Programming had widespread positive impacts. Is this simply because of an abundance of interventions or because of the synergies generated by simultaneous implementation of *cross-sectoral* interventions?

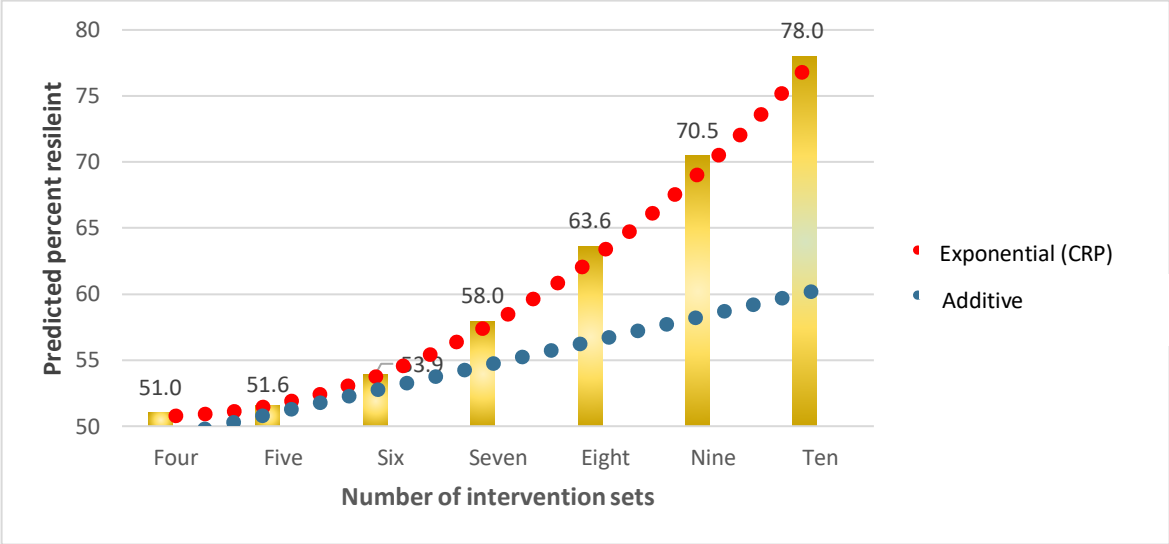
Here, we investigate whether cross-sectoral impact synergies are at play by testing for non-linearities in the relationship between the number of intervention sets households were exposed to and the percentage of households resilient to shocks. To do so, we run a weighted probit regression, where the weights are from the DiD-PSM analysis for exposure to CRP, which ensures that the comparison and treatment groups are well matched.[59] The dependent variable is whether or not each household is resilient to shocks. The main independent variables are the number of intervention sets each household was exposed to over the program period in addition to that number squared, which introduces the potential non-linearity. A statistically significant and positive coefficient on the squared term indicates the presence of synergies from combining multiple interventions. The other independent variables are the matching variables controlled for in the DiD-PSM.

The squared number of intervention sets term in the probit regression is indeed positive and statistically significant, at the 1% level. The results are illustrated in Figure 7.7. The orange-dotted line shows the exponential increase in the percentage of households resilient as the number of interventions increases.[60] As can be seen, the addition of each new intervention set increases that percentage more than proportionally. The solid blue line shows what the additive effect of increasing the number of intervention sets would be if there were no impact synergies.

[59] The DiD-PSM analysis differs only slightly from that reported on in Table 7.1 in that the number of months of drought and flooding over the program period derived from rainfall and soil moisture data are not included. All other shock exposure variables listed in Table 2.3 are included.

[60] These percentages are predicted as estimated marginal effects of increasing the number of interventions by one at each number of interventions. To do so, the "margins" command in Stata is employed. All marginal effects are statistically significant at the 1% level.

Figure 7.7. Synergistic impacts of Comprehensive Resilience Programming: Percent of households resilient as number of cross-sectoral intervention sets increases



Apparently, exposure to CRP had such success in strengthening households' resilience partly because of the synergistic effects of simultaneous implementation of cross-sectoral interventions in the same geographical locations.

7.5 IMPACT OF HUMANITARIAN ASSISTANCE

Our final investigation of impacts centers on that of the humanitarian assistance provided by PREG II and other development actors in the program area. We saw in the last section that humanitarian assistance increased over the program period in response to escalating shock exposure. What difference did it make?

Table 7.8 shows impact estimates for four categories of humanitarian assistance: emergency food assistance, emergency cash assistance, Food-for-Work (FFW), and Cash-for-Work (CFW).[61] The primary goal of emergency food and cash assistance is to protect lives during crisis situations. FFW and CFW are expected to have longer-term impacts, supporting households' livelihoods and building up infrastructure in communities.

All four types of assistance show a positive impact on households' resilience to shocks and food security, with particularly strong impacts on severe food insecurity. Consistent with the expected longer-term goals of FFW and CFW, these are the only two types of assistance with positive impacts on households' resilience capacities. While CFW had a positive impact on all three dimensions of resilience capacity, FFW only had positive impacts on households' adaptive and transformative capacities.

[61] The impact estimates for the alternative methods are reported in Annex 3, Table A3.3. Emergency food and cash assistance and FFW largely confirm those in Table 7.8 in terms of direction of impact (positive or negative) and statistical significance. CFW estimates are consistent across methods for the resilience capacity indexes, but there are some differences for the other measures.

None of the forms of assistance had an impact on asset-based poverty, but CFW appears to have improved households' ownership of consumption assets. CFW is also the only type of assistance that helped reduce child malnutrition, by reducing severe stunting.

Table 7.8. Impact of access to humanitarian assistance on resilience, resilience capacity, and household well-being outcomes

	Food Assistance		Cash Assistance		Food-for-Work		Cash-for-Work	
Resilience								
Realized resilience (change in food security)	1.48	***	1.55	***	0.95	***	0.52	***
Percent of hhs resilient to shocks	11.6	***	11.0	***	10.4	***	5.1	
Perceived ability to recover	0.30	***	0.25	***	0.02		-0.06	
Resilience capacity								
Absorptive capacity	-0.53		-1.61		1.28		4.11	***
Adaptive capacity	-1.20		-3.70		2.86	***	5.00	***
Transformative capacity	-1.10		-1.07		5.00	***	3.40	***
Resilience capacity	-0.85		-2.40		2.44	***	4.50	***
Food security								
Food security scale	1.48	***	1.55	***	0.95	***	0.52	***
Moderate or severe food insecurity (%)	-15.9	***	-19.5	***	-10.50	***	-4.00	
Severe food insecurity (%)	-23.9	***	-21.7	***	-17.90	***	-14.80	***
Household Dietary Diversity Score	-0.25		-0.38		0.09		-0.34	
Poverty								
Asset poverty (%)	-2.80		-3.50		0.79		-2.70	
Consumption assets index	-0.23		-0.35		-0.06		0.42	***
Productive assets index	0.94		0.04		0.10		0.14	
Tropical Livestock Units	-0.72		0.50		0.31		0.05	
Land owned (ha)	0.18		0.34		0.11		0.15	
Child malnutrition (%)								
Stunting	0.34		-6.20		-3.50		-6.20	
Wasting	2.90		9.60		11.40		3.10	
Underweight	7.80		6.90		-3.30		-9.80	*
Severe stunting	-2.40		-3.40		3.00		-8.40	**
Severe wasting	3.80		5.40		2.40		-0.50	
Severe underweight	-0.30		-0.97		1.00		-3.30	

Note: DiD-PSM estimates. Values reported are the ATT. Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

7.6 SUMMARY: IMPACT OF PREG II RESILIENCE INTERVENTIONS AND HUMANITARIAN ASSISTANCE

This section presented the results of the quantitative impact evaluation of the PREG II program. It finds that the program had widespread positive impacts on households' resilience and resilience capacities while also helping to reduce food insecurity, asset-based poverty, and child malnutrition.

The impact evaluation found that household exposure to resilience-building interventions spanning multiple sectors, that is Comprehensive Resilience Programming (CRP), did indeed strengthen their resilience. Exposure to CRP (residing in a village where at least seven of 10 resilience intervention sets were implemented) raised the percentage of households resilient to the shocks they experienced over the program period by 15.5 percentage points. It also had strong, positive impacts on their absorptive and transformative resilience capacities, which are essential foundations for sustainable resilience. In terms of well-being outcomes, exposure to CRP led to a 10.4 percentage-point reduction in moderate or severe food insecurity and strong reductions in the prevalences of stunting and underweight among children under 5—16.0 and 15.9 percentage points, respectively. Evidence is presented that exposure to CRP had such success because of the synergistic effects of simultaneous implementation of cross-sectoral interventions in the same geographic locations.

The evaluation found that direct participation by households in interventions (taking direct actions related to at least two of the intervention sets) as opposed to indirect exposure, was critical for inducing positive change in some outcomes. Participation in resilience interventions had positive impacts on households' adaptive capacity—the ability to minimize exposure to shocks and recover quickly. Participation in just two intervention sets also led to a 7.6 percentage-point reduction in asset-based poverty, while exposure to seven of the intervention sets had no impact.

The PREG II administrative data introduced in Section 6 were used to determine whether the above impacts could be attributed to PREG II itself. They were used to construct broad measures of programming intensity at village and county levels. The analysis of these data confirm that exposure to PREG II resilience interventions had positive impacts on households' resilience to shocks, all three dimensions of resilience capacity (absorptive, adaptive, and transformative capacity), and helped reduce food insecurity, asset-based poverty, and child malnutrition.

What worked? Examination of the relative impacts of the 10 PREG II intervention sets, whether through exposure or participation, finds that different intervention sets had positive impacts on different outcomes, as follows:

- **Resilience:** CNRM, Financial Services, Market Linkages, DRR, Youth Human Capital
- **Resilience capacities:** CNRM, DRR, Health and Nutrition, Women's Human Capital
- **Food security:** CNRM, Financial Services, Market Linkages, DRR, Health and Nutrition
- **Asset-based poverty:** Livestock Rearing, Agricultural Production, CNRM, Market Linkages, and Youth Human Capital
- **Child malnutrition:** Financial Services, Business Development, DRR, Women's Human Capital, Youth Human Capital.

Among these, those with positive impacts on the most outcomes are DRR, CNRM, Financial Services, Market Linkages and Youth Human Capital. Note that a full evaluation of the impacts of Business Development interventions could not be undertaken due to DiD-PSM implementation limitations.

Finally, the evaluation finds that the humanitarian assistance provided to households over the course of the PREG II program had far-ranging, positive impacts. All four types of assistance (emergency food aid, emergency cash aid, FFW, and CFW) had positive impacts on households' resilience to shocks and food security. Consistent with the longer-term livelihood goals of FFW and CFW, only these types of assistance had positive impacts on resilience capacities. CFW also helped reduce severe stunting.

8 QUALITATIVE ANALYSIS OF THE IMPACT OF PREG II ON GOVERNANCE CAPACITIES AND PRACTICES

The PREG II qualitative survey involved KIIs with numerous CG directors, including sub-county and ward officials, community leaders, and FGDs with groups of women, men, and youth. This section addresses Research Question #5 in terms of:

- The evolution of governance to understand how PREG II built on that foundation
- The approach taken by PREG II in its implementation through coordination and partnerships
- The capacity strengthening with CGs and impacts on policies
- The impacts on community governance
- Examples of linkages and services in selected sectors and functional areas

8.1 CONTEXT OF CHANGING GOVERNANCE (DEVOLUTION)

With the 2010 Constitution, many aspects of Kenyan government services were devolved to CGs, though the process of building up systems and policies has been gradual,[62] and respondents generally spoke of what the process of devolution had meant to them. Qualitative survey questions prompted them to talk about general trends within government, as well as the influences of PREG II and other development programs. This was done to get a sense of overall change since respondents (particularly community members) often do not know the reasons for a change in services. Thus, for example, a Turkana WDPC chairperson stated a very common view that the CG has also brought many services close to people, which has improved accessibility. Some of those services reflect the support of development partners rather than the CG, but community members may not be aware of the source of—or how—these changes occurred.

Awareness of challenges in the relationship between national and county governments requires some navigation by PREG to support CGs to develop the capacity to undertake certain work and develop policies while also coordinating with national entities. In disaster relief coordination at the national level, senior PREG officials networked with the NDMA. Meanwhile, at the county level, PREG officials worked with NDMA officers along with CG officers to coordinate effectively on issues such as the distribution of cash transfers in numerous counties and the implementation of a locust response in Isiolo. Security remains a national mandate, and this required close coordination by PREG II with county commissioners and chiefs. PREG staff participated in regular county fora held by county commissioners.

New CG officers: At the local level, more functions are now being handled by the CG officials, such as ward administrators and village administrators. The division of functions among community actors is not always clear, with numerous overlaps, such that what actually happens in any given community may depend to some extent on individual interpretation and initiative of the individuals involved. Village administrators were mentioned and also interviewed in Turkana, whereas in other counties, they were infrequently mentioned. One village administrator expressed frustration that PREG II staff were entering the village without passing through his office and stated that he would not allow this to continue. This may create a challenging balancing act for PREG II, to maintain independence to work with a range of participants while also maintaining a good working relationship with key actors. In addition to village

[62] USAID. (2019). *Devolution in Kenya fact sheet*. https://2017-2020.usaid.gov/documents/1860/devolution-kenya

administrators, another position mentioned was that of "area manager" in other counties, though this position is apparently under discussion for full adoption in county policies.

Chiefs: Chiefs have long been the formal fixture of local governance and are still often seen as traditional focal points involved in practically all developments. Overall, PREG generally did a good job of consulting carefully with them. One Isiolo chief stated that he acts as an integral link between the state and his community, helping ensure school retention, aiding partners in development activities, handling domestic and civil disputes including social and gender-based violence, peacebuilding, fighting against female genital mutilation and drug and substance abuse, issuing national ID cards, and fighting against child malnutrition. Where village administrators were present, they somewhat overlapped in their responsibilities. A chief in Garissa mentioned that he solves cases like land conflicts, which highlights one of the realms of national government, although land allocation has also become a county mandate. He also said that an NGO (not PREG, in this case) experienced problems with a market project that he would otherwise have been able to help solve if they had included him in the activities.

Elders: Other community elders have important roles in projects, particularly mentioned in connection with rangeland management and inter-community relations, which PREG programs worked closely with. Some villages mentioned a "village chairman," and one Garissa chairman mentioned his role in mobilizing the community for development activities. Religious leaders play important roles in a range of development topics, such as a Tana River imam who chairs a peace committee and works with police to ensure security. A key question with all of these community actors is how much representativeness they permit, given the historical dominance of males.

General impression of government services: It has been historically difficult for governments to provide reliable services in the ASALs, and this will take time to improve. A Turkana natural resources committee felt that county and sub-county officials do not have time for dealing with the village other than when there are emergencies or other issues that need their immediate attention. Some respondents felt positive about the change in governance relations and government services, though much work remained to be done. Government officials recognize that need. An Isiolo CG director pointed out that a number of governing bodies have been established (e.g., the Members of County Assembly (MCA), ward and village administrators) to collaborate with chiefs to make sure law and order are upheld. Still, he said, issues remain, including lack of participation by community members (including women and youth) in governance, financial constraints limiting resource distribution, and lack of community involvement in decision-making processes. Some respondents did not consider the CG to be doing as well as the previous national government, and an Isiolo school headteacher described the situation as "no government."

8.2 PREG II STRATEGY OF PARTNERSHIP WITH GOVERNMENT AND COMMUNITIES

PREG II involves a strong partnership with government in its planning and implementation. PREG II invites government officials to help shape its plans and activities and, in turn, makes specific contributions to government plans, policies, and capacities. The latter is addressed in this section.

Generally, PREG II has more extensive coordination with the government than most NGO-managed development programs, and the work with CGs, in particular, is highly relevant to the context of devolution and addressing the needs of the marginalized ASALs region. A Garissa CG director

commented on the use of sequencing, layering, and integration (SLI) of interventions and how this allows for complementarity among partners. Partners and CGs support each other during implementation, and tasks carried out by PREG II are ultimately "handed over" to the CG directorate to continue after the end of the activity. A Turkana County agriculture director said that he participates in all PREG II agriculture activities, which are co-designed, co-developed, and co-monitored. Similar statements were made by officials at county and sub-county levels. During an FGD with the Isiolo CG directors, respondents emphasized their sense of ownership of all dimensions of the PREG II initiative. In Tana River, interviewed CG directors were not familiar with PREG II, reflecting the lower level of intensity of PREG activities in this county.

The feedback from county leaders about PREG II is generally very positive, and PREG's work nationally with the NDMA was also particularly appreciated. A sense of identification and ownership of PREG was revealed in a comment by a Garissa CG director, who implied that the work of PREG II could be continued in the future and used as a platform for participation by others, even though they had not yet engaged other donors to participate.

Other aspects of PREG's approach to partnerships and coordination mentioned by respondents can be summarized as follows:

- Alignment with government policies and plans (some of which PREG helped formulate), including the County Integrated Development Plans (CIDPs), and use of training guides in health, agriculture, and gender.
- Use of certain sectoral guidelines, materials, and local institutions (e.g., community health promoters, Water User Associations, rangeland management groups), to facilitate learning with government and other participating organizations and strengthen local and national capabilities.[63]
- Active participation in coordination platforms and technical/sectoral working groups, such as social protection, gender, cash transfers, and multi-sector platforms for nutrition, to help ensure harmonization of approaches.
- Close collaboration of government officers in implementing PREG work plans (e.g., sharing draft plans to discuss and build consensus).
- Utilizing existing government staff (including sub-county health systems staff and agriculture trainers) as opposed to hiring new staff for the program's duration, which helps build local capacities and increases sustainability. However, implementation can be challenging if staff are not motivated to take on additional work.
- Close coordination at local levels with chiefs, village administrators, and ward and sub-county officials, which helps reinforce coordination with national and county governments.
- Combined training (e.g., climate smart agriculture/resilient design in Turkana).
- Co-funding (e.g., gasoline and staff support to irrigation and *Prosopis* clearing while CG provides machinery); support for nutrition outreach services and Standardized Monitoring for Assessment of Relief and Transition (SMART) surveys.[64]
- Integration with and strengthening of CG monitoring and evaluation (M&E) is an improvement over past programs. Examples of this are the use of government systems of registers for anchor groups that PREG integrates with (though the alignment always needs review, particularly in the case of WASH).

[63] Community health promoter is the term that has been adopted nationally with the new 2023 policy.
[64] Ministry of Health Division of Family Wellness, Nutrition & Dietetics. (n.d.).

- Close contacts with different departments of CGs, ensured through PREG II government focal points and actively supported by PREG II technical staff.

Issues: Several issues were highlighted regarding PREG's partnership approach. Several CG respondents mentioned that contact/communication with PREG has been inconsistent over time. In part, this may have occurred when program planning and implementation shifted from the county to sub-county level (i.e., as part of the devolution process). Additionally, a lack of information sharing within different levels of CG appears to be occurring. For example, a senior nurse in one county understood that they would continue to be "kept in the loop" by PREG II. According to her, however, this did not happen. Information sharing—among and between partners—is an important element for successful partnerships, particularly those with multiple partners and multi-sectoral activities. Complementarity and coordination are necessary for effective implementation of activities that are sequenced, layered, and integrated to provide maximal benefit to participants.

Another issue concerns allowances given to government officers (e.g., to attend meetings). According to one respondent, not all partners adhere to the government's guidelines, which has led to complaints. As with external incentives generally, the motivation for continuing to engage with and participate in program planning meetings and other activities often disappears once the incentives—which are program-specific—end. Other CG officials noted that for the partnership to be continued after a program ends and to work effectively, the CG needed to make up the difference by allocating sufficient resources to continue the work.

National government collaborations: Though much of PREG's focus targeted capacity strengthening at the county level, there was also engagement with national technical working groups. An important collaboration opportunity for PREG II at the national level involved the Kimormor One Health program, which reaches out to remote communities with integrated health services for people, animals, and the environment. As part of the health program's quarterly outreach, community members were able to obtain birth and civil registrations and enroll in the National Health Insurance Fund. Several respondents noted that this is especially important for women without national identification documents and persons who are differently abled.

Community orientation: The community-oriented focus of PREG II reflects both a basic approach to program management and a key area for capacity strengthening. The community engagement strategy is fundamental to the sustainability of all PREG's interventions. A Samburu WASH official stated that Nawiri interventions are sustainable because the community is engaged with and included in all stages of program implementation, resulting in a feeling of ownership.

PREG generally did an effective job of forming anchor groups and partners at the village level through community meetings convened by village administrators and chiefs and often planned in conjunction with sub-county CG staff. A strongly participatory approach characterized PREG's work with youth and women's groups, water user committees, livestock associations, rangeland management groups and numerous others. Another notable aspect of community engagement was the series of community-wide dialogues/conversations and action plans carried out by Nawiri that pointed the way toward more systematic village-level consultations. The impact of PREG's partnership and capacity-strengthening interventions spans from the household to the county level. As a Turkana WDPC chairman stated: "The cause of the change is the community's changed mindset towards development which is attributed to capacity building from the County and partners."

8.3 IMPACTS OF PREG II IN STRENGTHENING GOVERNMENT CAPACITIES

Part of the qualitative review involving governance was to analyze the extent to which PREG is building on its partnership with governments, and especially with CGs, to strengthen their capacities generally and specifically their ability to sustainably carry on after PREG ends. PREG II reinforcement of governance mechanisms—such as the CIDP, the multi-sector platforms for nutrition, and technical working groups—helps reinforce the leadership role of government and enhances overall government performance. Just as government directors have played a major role in shaping PREG II plans, PREG II staff have also participated actively in developing the CIDPs, Annual Development Plans (ADPs), and related mechanisms. For example, a Samburu County director reported that Nawiri has been instrumental in the WASH Forum, where it has served as the forum secretariat. He said that during this period, the sector has made tremendous strides in water governance and community water infrastructure development.

Promoting SLI in government: A central focus of PREG's governance-strengthening interventions was promoting collaboration among CG departments. While the coordination of development actors is not new, it was through the PREG initiative that SLI was promoted as an operational strategy for CGs. WFP had worked to establish county technical working groups in Marsabit, Wajr, Baringo, and Turkana, which had a significant influence in those counties. However, changing government bureaucracies often takes time, given the entrenched structures and tendencies of governments. For example, an Isiolo CG director stated that Nawiri had created awareness of the cross-cutting, interdepartmental nature of interventions required to address malnutrition. An analysis of the overlapping roles of the agriculture and health departments led to a new rationalization of roles, which has contributed to smoother working relationships between the two departments. She acknowledged that SLI is yet to be fully realized partly because of competition over budget allocations and stated: "The project coordinating unit should continue emphasizing SLI until there is behavior change among the leadership in the departments and staff within these departments."

Capacity assessments: Capacity strengthening typically involves training and providing technical assistance to government departments to improve their ability and effectiveness in fulfilling their functions. Generally, government officials learn new skills and practices and then play a role in training community members, often in conjunction with partner staff (e.g., Nawiri staff). Under PREG II, Nawiri conducted Participatory Institutional Capacity Assessments (PICA) to identify areas of learning, which were used to inform training and other plans, and WFP conducted capacity assessments—at both national and county levels—of logistics to support emergency preparedness.

Collaborative learning: The PREG II collaborative learning approach promotes both learning exchanges between government officials and program staff and experiential learning from direct participation in program planning and implementation. A respondent in Isiolo noted that PREG's collaborative learning approach results in the use of complementary skills being leveraged for the benefit of communities. Where government has the required technical expertise, it takes the lead. On the other hand, PREG II—or partner—staff take the lead where they have the better skills or knowledge. For example, Village Savings and Loan Associations and cutting-edge agroecology crop cultivation are two areas where PREG II staff are better suited to provide training. Nonetheless, many trainings were done by CGs, which contributes greatly to longer-term sustainability.

Promoting government strategies: In addition to joint planning and training, the program's support to government agencies in developing and strengthening their policies, strategies, and technical procedures lends a sense of trust and legitimacy in the eyes of communities, which in turn, adds to longer-term sustainability of such government efforts. Examples of PREG II approaches include WFP's work with the national government in developing the Enhanced Single Registry as a shared database of vulnerable populations for use in emergency responses, with some progress at county levels. Additionally, female FGD participants in Turkana indicated that the CG, in close collaboration with development partners (e.g., Livestock Market Systems, or LMS), supports their community with veterinary services. A CG respondent in Isiolo said:

> Pointers towards sustainability include the fact that they have involved the department in the planning and investing in the activities. The project overlays the existing government approach in extension, including lead farmers, village-based advisers, and farmer field schools. Strengthening these local delivery mechanisms contributes to sustainability. Types of demonstration plots promoted by the Government are baby demos at individual farm level, mother demos at the village level, and super demos at the community level, managed by a technical officer.

Finances: Other aspects of CG capacity-strengthening interventions involved core operations, such as finances. In many ways, PREG II funded activities that supplement government budgets, and directors state that this makes it possible for government to provide more services. This was a key outcome of the synchronization of operating plans between PREG II programs and CGs. For example, CG staff in Turkana were available for clearing *Prosopis* spp., but PREG II program funds and equipment were needed to help them pay for fuel and per diems to the government's drivers. In another case, significant infrastructure was developed, such as the market facilities built through a partnership between LMS and the CG. Members of a women's FGD in Turkana pointed out that PREG II programs reinforced health facilities with essential drugs, supplementary feeding programs, and support to outreach initiatives. These types of funding arrangements allow PREG II programs to target investments precisely, monitor expenditures closely, and detect impacts quickly. This has also led to better advocacy for CG support to nutrition; a CG director in Isiolo pointed out that PREG II programs have built the capacity of the department to track resource allocations and lobby the county assembly for more resources.

M&E: Strengthening M&E systems within CGs, such as the nationally mandated County Integrated Monitoring and Evaluation System electronic platform (e-CIMES) has improved the transparency and effectiveness of CG services. Efforts were underway in PREG II programs to strengthen community actors such as CHPs, community disease reporters (CDRs), and savings association field agents to carry out effective data gathering. Strengthening M&E capacities has meant supporting the sub-county and ward levels, where there is often no equipment such as computers.

Policy formulation: These aspects of capacity strengthening are mutually reinforcing with the efforts by PREG II programs to support CGs in formulating and adopting policies for strengthening resilience. There are dozens of policies that PREG II programs have played strong support roles in formulating, including CIDPs. This is a remarkable accomplishment given that most development and advocacy programs often focus on only a few policies or targeted policies, which may or may not ever come to fruition. It may be that there was a window of opportunity for supporting policy development in the relatively new CGs. For example, WFP was well-positioned due to its efforts beginning in 2018 to establish policies and legislation targeting different components of the enabling environment for food and nutrition security,

including strengthening the capacity of county officials to develop their own social protection, gender, and inclusion policies.

Community leaders were aware—and appreciative—of Nawiri's role in facilitating policy development within the CG, according to an assistant chief in Turkana. In contrast, a CG director in Turkana felt that PREG II programs needed to support more policies, and a gender officer in Samburu had requested support for the finalization of the stalled gender policy. The LMS activity, in conjunction with the efforts of various organizations, provided support for the development of gender and livestock policies (among others) in Marsabit. In some sectors, there was a need to consolidate programmatic advances by embedding these in a supporting policy, which was the case with animal health and the functioning of community disease reporters.

Policy impacts: Assessing the impact of policies developed or strengthened through the PREG II initiative on program outcomes is difficult at best and not possible at this time. However, PREG II helped advocate for major allocations for nutrition, agriculture, and health in CIDPs. According to a CG director in Samburu, PREG II and other partners had supported the preparation of rangeland, climate change, and tree planting policies, though they had yet to be adopted at the county assembly level. He pointed out that these policies would be incorporated into the CIDP and ultimately serve as guiding principles for PREG II.

Policy learning: Advocacy for and development of policies is only part of the process in strengthening government capacities. Policies must be adopted (i.e., pass through the legislative process) and then resources allocated through the budgeting process before they can be implemented. This process is not typically well documented. For example, there were no written reports on this subject available at the time of reporting. However, a CG director in Turkana emphasized the importance of the advocacy process in this way:

> The government has issues with the allocation of resources. What needs to be done is build the capacity of the government to gradually and slowly take up those interventions through advocacy to the executive. There is a need for conducting consistent advocacy meetings with the executive to help them understand why the interventions for both short- and long-term goals are key in sustainably reducing malnutrition in the county and enable them to make budget allocations for those interventions.

A Samburu health official highlighted WFP's advocacy work that brought together key decision-makers in forums regarding the county's nutrition efforts and WFP's program. Such efforts were seen by respondents as increasing the likelihood of the government continuing PREG-supported work after the program has ended.

8.4 IMPACTS ON WARD AND VILLAGE INSTITUTIONAL DEVELOPMENT

Governance is not just the realm of formal governments at the national and county levels. Governance—learning, participation, decision-making, and accountability—at the village and ward levels

is also of critical importance and often includes informal governance structures. *Institutions* include both formal and informal organizations and entities, including governmental, nonprofit, and private entities, as well as community-based committees such as elected development committees or other groups that are legally registered. Informal governance structures at the village level also include local leaders, such as chiefs and village elders. The views of a youth leader in Isiolo, whose response is summarized in the box below, help illustrate the impact of PREG over the course of devolution.

Question: Have there been any changes in governance or relations between communities and institutions? Have there been changes in service delivery?

Answer: The respondent argued that the relationship between the community and government institutions is fine, and she attributed this to active participation in meetings by the community during program implementation by different actors. She felt that the CG has carried out some development programs in the area, such as road infrastructure, electricity connections and health facilities, but more needs to be done. She cited one enhancement in governance: Nyumba Kumi ("Ten Households"), a national government initiative where members act as a link between the village and the administration. Ward and village administrators are the link between the CG and the community, established through the enactment of the Isiolo County Village Bill of 2016. Most of the notable changes were attributed to civic education and public participation by the community, as well as the promulgation of the new constitution in 2010 and the inception of the devolved system of government. She predicted that in the future, education will be taken more seriously, and more people will shift from indigenous livestock keeping to improved grade livestock because of cattle rustling and droughts, as well as diversification effects on crop farming. She had awareness of Nawiri and WFP programs, along with Action Aid, Vétérinaires Sans Frontières, the UN Food and Agriculture Organization, and Mercy Corps.

Key Intervention – Ward Planning Committees: There was some diversity of opinion among counties and villages about the main institutions found at the local level. However, a particularly important focus of PREG II was support for the Ward Planning Committee, or Ward Development Planning Committees (WDPC), which is the term now used in some counties.[65] A collection of approximately 8-15 villages, wards are the lowest administrative level for CG operations. Ward Planning Committees were originally promoted by the LMS activity during PREG I. The committee's responsibility for producing Ward Development Plans was seen as a means of increasing village- and ward-level participation in CG planning and financing.[66] Excellent guidance for forming WDPCs was produced although it has been inconsistently implemented. Nonetheless, numerous PREG counties have adopted WDPCs, and the Isiolo CG recently shared takeaways from an LMS event on forming and training committees.[67]

Supporting and strengthening local participation in governance is clearly beneficial. During the PREG survey, some respondents stated that there has been an increased quantity and quality of governance structures since devolution and the community has more input into the planning and execution of programs. A female youth group in Isiolo was able to identify and speak positively about a youth

[65] The WDPC name is used in the report according to the usage by some PREG II programs, and because it combines the ideas of development and planning.
[66] Mercy Corps (2019) A Ward Development Planning Process Toolkit: Communities Acting Together
[67] County Government of Isiolo. (2024, February 29).

representative on the WDPC. Still, some respondents felt that programs are not always implemented in accordance with the community's priorities and that the community lacks a mechanism for providing feedback or voicing complaints without fear of possible negative consequences.

Planning and development: The intent of WDPCs was to prepare Ward Development Plans and channel feedback and requests from the wards to the County Assembly for consideration during their annual budgeting. At the current time, some respondents stated that their WDP inputs have influenced budget allocations within the County Assembly and there have been isolated reports back to the wards from this process. However, there does not seem to be systematic reporting or documentation of "success stories" in terms of how this process should function. In response to 15 ward plans for grazing management, LMS reported that CG and other partners had contributed US$185,000 in addition to USAID support. An WDPC key informant in Isiolo stated that he was not sure whether local systems were strengthened through the preparation of the WDP, but that the exercise was valuable in itself. In addition to this short-term planning function, there is increasing recognition that these committees could provide some degree of ongoing participation in coordinating development initiatives, which may be why the name seems to be shifting to include the word "development." Part of the value of WDPCs is in helping to coordinate different actors and inputs, although this is still somewhat nascent. Aside from the focus on WDPCs, PREG II programs provided extensive training in disaster risk management. For example, WFP had helped establish disaster risk management coordination structures in Marsabit. One method that was applied at the local level and appreciated by numerous respondents was Participatory Rangeland Management.

Challenges: While there have been important improvements in ward governance as a result of PREG II, more progress is needed. Respondents in some villages indicated that there was no ward planning committee in their area. Reports from Garissa were that the WDPC was not meeting or interacting with the community. In Isiolo, a respondent asserted that participants were only those closely associated with the chief and therefore *community* participation was limited. According to interviews in several villages in Turkana, Isiolo, and Marsabit, there is diversity in how WDPCs operate and how inclusive they are, even though the original LMS guidelines included a process for engaging wide community participation. For example, at least one representative from different groups (e.g., women, youth, people with disabilities) should be selected. However, it was not clear how these individuals should be chosen or how they would interact with others from these groups. As explained in one Turkana village, the village administrator calls on village elders from every village, along with other leaders such as leaders from the Nyumba Kumi association (a national government -promoted grassroots security organization), to be part of the WDPC. In Marsabit, a ward administrator explained that they would generally have one representative from each village for regular meetings and then hold a large meeting that was open to anyone from the ward. Although such large meetings tend to involve hundreds of participants, they do not yet provide optimal conditions for full and clearheaded engagement by a range of community members. Although experiences vary, PREG implementing partners have pointed to several examples of systematic and extensive participation in WDPCs.

Variety of local institutions: One of the challenges that PREG II programs face is how to deal with existing local institutions (a perennial dilemma for NGOs). One solution was the "hybrid committee" innovation of combining several ward-level committees, perhaps intending them to be temporary, until a WDPC is formed. In Turkana and Marsabit, Ward Climate Change Committees were promoted. However, one respondent in Turkana felt there was a lack of clarity regarding the respective roles and relationships between this committee and the hybrid committee introduced by Nawiri.

Ward environmental/disaster management: Strengthening local institutions appeared to have great potential. Over the past year, PREG II programs provided important support to the preparation of Ward Development Plans and training for WDPC members and others on topics such as rangeland and drought management and adaptation to shocks and stresses. Given the quantitative findings on the linkages of disaster preparedness to resilience, this work should be beneficial.

Village-level governance: Although the ward level is important for risk planning, engagement with government officials, and reaching larger populations, the village is the main level at which people maintain most of their relationships and discuss development issues. At the time of the survey, PREG II programs were still exploring the best approaches for promoting inclusive participation at the village level and for providing linkages to the WDPC, CG, and other institutions. A FGD with young women in Samburu confirmed the importance of village-wide participation in development activities:

> Nowadays, we have been taught the importance of unity because no one can help themselves alone. So, when we come together, for example, GIRL-H connects with the producer group, and others connect through mother-to-mother. When we unite, we become one entity, helping the whole community because those groups support each other. In the past, you used to live your life individually with your own problems, just you and your family. But now, at least, we have found that unity.

8.5 IMPACTS IN SECTORS/FUNCTIONAL AREAS

PREG II worked with numerous community groups to formulate and strengthen their functioning and with CGs to create and strengthen opportunities for more effective government performance. Some examples and issues are cited below.

Agriculture: CG agriculture staff have become involved in training events facilitated by PREG II programs. CG materials and methods were used in many cases, which helped reinforce their role with community members. Work on irrigation schemes required more complex arrangements involving co-funding and timeframes with national irrigation authorities as well. Community members in one Turkana village were uncertain of how these inputs were coming together.

Livestock: Although the ASALs region is still reeling from the impacts of drought and devastating loss of livestock, PREG II interventions with livestock associations, markets, food farms, and animal health have resulted in some improvements. Other programs (Red Cross, FAO) were involved in destocking during the drought, and the question of whether and how to restock still remains unanswered. PREG II interventions with Community Disease Reporters show promise in that these community members are trained to identify and report animal diseases and conditions and liaise with CG veterinarians and animal health officers. This effectively creates opportunities for CG officials to maintain closer connections to villages, support services like vaccinations, and intervene more quickly in cases of disease outbreaks. Similar innovations with agrovets showed promise in disseminating certified agriculture and livestock products and information. Alternative animal livelihoods were promoted in partnership with CG and other international and local partners, including support by LMS for beekeeping in Turkana.

Financial inclusion and business development: While CGs help provide market facilities and some food processing centers, PREG II programs have greatly increased the number of producers engaged in

marketing livestock and other products; in some cases, linkages were made with larger regional and national markets. The savings associations and business grants encouraged retailers to provide products locally, often through linkages with county-level wholesalers.

Youth employment: Youth were very enthusiastic about technical and vocational training. PREG II programs worked with CG vocational training centers to set up training opportunities, providing financing and preparation that would otherwise make access to such training difficult for village youth. Northern Rangelands Trust (NRT), LMS, and Nawiri were innovating various ways to reach youth, including arranging for the training to be delivered at the community level, and linking them to employment opportunities with businesses. Vocational training was also promoted in CG budgets, and the Garissa CG aligned its budget with LMS enterprise development training.

Water supply: The planning of water projects as part of PREG II is done through joint planning with CG water department officials, who have become more involved at the community level. However, there is uncertainty about their ability to provide follow-up support after projects have finished. The current management approach involves Water User Associations, although these associations have mixed success in terms of longer-term sustainability. USAID's Sustainable, Transformational and Accessible Water Interventions (STAWI) activity is expected to provide insights into how best to structure such services.

Health: There is a long tradition of community health volunteers in Kenya, and the accumulation of national learning culminated in the adoption of a national policy that recognizes Community Health Promoters (CHP) and provides for monthly stipends to be jointly funded by national and county governments. PREG II programs were instrumental in training CHPs and their counterparts in the CG Community Health Services. A very extensive linkage was being developed between communities and CGs in health services, probably the strongest example in the PREG II area.

Rangeland management: A number of respondents spoke about the effectiveness of activities by PREG II and partners (e.g., LMS, NRT, Nawiri, International Livestock Research Institute) to strengthen collaboration among elders, committees and local governments for rangeland use planning, with a major focus on conservation of grazing lands for use during the dry season. This has required planning and engagement with villagers and dialogues with different levels of government officials in neighboring communities, counties, and countries. NRT was active in protecting rangeland and wild animals from poachers, although there were reports of misunderstandings with some community members who perceived a loss of control over lands. Still, conservation activities were combined with a variety of community supports for youth and women in terms of livelihoods and water supply, which helped communities see the linkage between household needs and resource management. Meanwhile, LMS worked closely with forestry departments in Wajir and Turkana on the gazettement of rangelands as protected areas and discouraging deforestation.

Peace and conflict: Numerous individuals and community organizations participated in activities and efforts to strengthen peace and reduce conflict, which officially falls under the mandate of chiefs and police forces. Peace committees, groups of elders, rangeland management groups, Nyumba Kumi committees, and sometimes religious and other leaders all played a role and were purportedly having some positive effects. PREG II activities also worked strategically to reinforce and systematize these efforts, often bridging between neighboring communities. A well-publicized case involved a collaboration between NRT and Nawiri to sort out water access in villages on the border between Isiolo

and Meru. Community respondents had seen violence in the past and were appreciative of efforts by government and partners to resolve conflicts.

8.6 SUMMARY: IMPACT OF PREG II ON GOVERNANCE CAPACITIES AND PRACTICES

PREG II has a tighter and more broad-based integration with County Governments (CGs) than most NGO programs, as well as linkages with agencies such as the NDMA and other national technical working groups and training institutions. It has a two-way relationship with CGs, involving open participation and a strong sense of ownership by CG officials in directing PREG II designs and plans, while PREG II influences CIDPs, ADPs, policies, and various CG technical platforms. A particularly beneficial area of impact has been the numerous CG policies that were co-developed and/or adopted with PREG II support. As such, CG capacity to play a more effective coordination role with all development partners has improved dramatically. Additionally, staff capacity for better service provision to communities has been strengthened. At the community level, PREG II support for the WDPC proposed by the LMS project was critical, and it has progressively become embedded in county policies.

Still, maintaining consistency with different government officers and levels has been challenging, particularly as the program moved from preliminary consultation and planning to implementation. PREG II and future resilience programs would benefit from better documentation of policy development and clearer demonstration of the positive impacts of program activities on communities and households. The WDPC is very good on paper and there are numerous signs of advancement over the approximately 5 years since its introduction, but implementation has been inconsistent. A key challenge is to ensure consistent participation and engagement at the village level so that ward-level plans are more representative and impactful.

9 IMPLICATIONS FOR PROGRAMMING

Despite escalating shock exposure in its operational area, the PREG II program was successful in reaching its goal of enhancing households' resilience to shocks. It also improved a wide range of resilience capacities, which will help ensure continued resilience to ongoing and future shocks. The ultimate goal of enhancing households' resilience is to maintain their wealth and well-being; the analysis showed that the PREG II approach was successful in moderating increases in food insecurity and child malnutrition and in reducing asset-based poverty. What can we learn from the experience of PREG II to enhance the effectiveness of future resilience-strengthening programs in the ASALs?

We've seen that households' exposure to Comprehensive Resilience Programming had wide-ranging, positive impacts on many aspects of households' resilience and resilience capacities and helped moderate increases in food insecurity and child malnutrition. These impacts were achieved at least partly from the synergies engendered by implementing cross-sectoral interventions in the same geographic locations. However, only one quarter of the population was exposed to this powerful type of programming. The approach is having a transformational impact in the minority of communities it directly reached, but it is apparently not having spillover effects to the rest of the population. More widespread impacts across the program area can be achieved by scaling up. A strategic approach for PREG II would be to consider its interventions as demonstration activities to be scaled up by CGs, the Kenya National Drought Mitigation Authority, the private sector, and other Kenya-based actors in the future.

The analysis found that direct participation, as opposed to indirect exposure, by households in interventions had stronger impacts on some important outcomes. Further, participation was critical for inducing *any* positive impact on households' adaptive capacities and reducing asset-based poverty. Yet such direct participatory action on the part of households was very low for most interventions, with the only exception being the financial services interventions. In the ASALs setting, future programs should encourage the direct participation of households in interventions to enhance program impacts in general, but especially to strengthen households' adaptive capacities and reduce asset-based poverty.

Out of the 10 types of interventions evaluated here, those that appear to have had the greatest impact in terms of number of outcomes improved are:

- Disaster Risk Reduction (DRR)
- Communal Natural Resources Management (CNRM)
- Financial services
- Market Linkages, and
- Youth Human Capital.

These interventions should continue to be the focus of future resilience programming. Their positive impacts could be due to the inherent effectiveness of the types of interventions implemented and/or effectiveness in administering them. Other intervention sets evaluated here—Livestock Rearing, Agricultural Production, Health and Nutrition, and Women's Human Capital—also had some positive impacts. However, more thought should be given to how their impacts could be enhanced. As noted above, data limitations prevented a full analysis of the impacts of the Business Development interventions.

The evaluation found evidence that systems-level interventions implemented in broader geographical areas (e.g., livestock market interventions) had positive impacts on households' resilience and well-being beyond those conferred by interventions implemented at the local level. Such a combination of systems-level and local-level interventions is an important feature of resilience-enhancing programming and should be replicated in the future for optimal impacts.

Resilience interventions had positive impacts on four important resilience capacities, yet no improvements were found in these capacities population-wide over the program period: social capital (bonding, bridging, and linking); access to markets; gender-inequitable norms; and governance. To bring about more widespread improvements in these outcomes, interventions already focused on them could be scaled up and/or new programming more specifically focused on them explored. In the case of social capital, greater focus is warranted on facilitating the formation of within-village and cross-village groups (e.g., VSLAs, CNRM groups, farmer groups) to enhance social cohesion. To best do so, efforts should be made to identify which implementing partners have been most successful in building social capital through group formation so these best practices can be shared. Linking social capital can be improved through strengthening communication and relationships between villages and government/NGO entities.

With respect to access to markets, only 19% of households were exposed to the market linkages interventions. These interventions would need to be scaled up to bring about more widespread, positive change in households' market access. In the case of gender-equitable norms, more attention could be paid to interventions specifically focused on inducing positive change in norms that are detrimental to women. The qualitative analysis points to some ways that governance programming could be improved to bring about broader-based impacts: maintaining better consistency in relationships with government officers, documenting benefits of policies to households and communities, and engaging more consistently at the village level to enhance the effectiveness of ward-level plans.

Consistent with the principles of humanitarian-development-peace coherence that programming be integrated and shock-responsive, the analysis found that humanitarian assistance increased as shock exposure escalated over the program's implementation period. Nearly 60% of households lived in villages that received food assistance, a contribution that was critical to villages dealing with droughts, floods, and food price inflation. Also, PREG II efforts to work with local CGs in service delivery were well received and enabled the county social protection program to help households deal with escalating shock exposure.

The impact evaluation found that all four types of humanitarian assistance administered—emergency food and cash assistance, Food-for-Work (FFW), and Cash-for-Work (CFW)—served their immediate role in helping households maintain their food security. FFW and CFW played longer-term roles in helping to strengthen households' resilience *capacities*, and CFW reduced severe stunting. The lesson learned is that shock-responsive, integrated programming in collaboration with government entities is essential to resilience programming in the ASALs. Further, FFW and CFW are effective modalities in this setting for strengthening households' resilience capacities, the underlying determinants of resilience.

Finally, as indicated by the qualitative analysis of the impact of PREG II on governance capacities and practices, strengthening the capacities of local and county governments is important for the continuation of resilience building after PREG II programming ends.

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ANNEX 1. DIFFERENCE-IN-DIFFERENCES PROPENSITY SCORE MATCHING DIAGNOSTICS

This annex presents the results of Common Support and balancing tests for the treatment variables of the quantitative impact evaluation analysis of Section 7. The method employed is difference-in-differences propensity score matching (DiD-PSM) with kernel matching.

Test statistics diagnosing whether the Common Support and balancing conditions are met are for the treatment variables covering the whole PREG II population given in Table A1.1. Those for the child malnutrition analysis are in Table A1.2. The Common Support condition is that at least 80 percent of sample households are on the common support. The balancing condition is that the Mean Percent Bias (MPB) across all matching variables be less than or equal to 10 and the percent bias for individual matching variables be <= 25. In the rare cases where this latter condition is not met, the mean of the matching variables for the treatment and comparison groups are reported in the far-right column of the table. Figures A1.1 to A1.3 show the propensity score distributions of treated and comparison households for key treatment cases, which illustrates Common Support. Figures A1.4 to A1.6 illlustrate the extent of balance after matching for the same treatment cases.

Table A1.1 Difference-in-differences Propensity Score Matching Diagnostics (Kernel matching)

	Common support		Standardized percent bias		Remaining unbalanced matching variables a/
	# treated hhds	% on common support	Mean	Median	
Exposure to Comprehensive Resilience					
	731	97.1	8.0	6.8	Months of agricultural drought (BL-EL) (4.3 vs 5.0)
Participation in PREG interventions (at least two)					
	358	99.7	1.7	1.6	None.
Exposure to the ten intervention sets					
Livestock rearing	482	85.1	9.1	7.7	Shock exposure index (10.4 v 13.0)
Agricultural production	587	92.5	6.2	4.5	None.
CMRM	512	86.1	9.7	5.6	Livestock loss assistance (18.4 v 9.2)
Financial services	388	95.9	9.5	8.4	Months of meteorological flooding (8.0 v 9.4) Absorptive capacity (26.7 v 30.1)
Business development	555	66.0	26.1	22.0	18 variables
Market linkages	501	86.2	5.0	4.1	None.
DRR	503	83.9	6.1	3.9	Access to emergency food assistance (54.7 v 38.0) Food assistance services (45.3 v 29.1)
Health and Nutrition	680	84.7	9.9	7.7	Number of govt/NGO programs (1.22 v 0.74) Security services (61.1 v 86.4) Number of other non-HN intvn sets (3.4 v 2.8) Months agricultural drought (11.1 vs 10.1)
Human capital: Women	557	83.5	7.6	6.0	Women's empowerment (61.4 v 70.7)
Human capital: Youth	627	91.9	7.0	6.3	None.
Participation in the ten intervention sets					
Livestock rearing	663	95.6	3.2	2.7	None.
Agricultural production	439	90.2	3.7	3.2	None.
CMRM	340	90.9	4.4	3.6	None.
Financial services	706	95.0	2.3	1.8	None.
Business development	506	99.8	5.2	4.6	None.
Market linkages	308	98.7	3.7	3.0	None.
DRR	303	99.3	2.1	1.8	None.
Health and Nutrition	653	95.1	2.4	2.1	None.
Human capital: Women	276	98.6	7.4	7.2	None.
Human capital: Youth	251	97.6	3.1	2.5	None.

a/ Remaining imbalances lists variables with bias greater than 25. Values are treatment vs. control group.

The total number of households in each analysis before matching is 2,394.

Table A1.1 (cont.) Difference-in-Differences Propensity Score Matching Diagnostics (Kernel matching)

	Common support		Standardized percent bias		Remaining unbalanced matching variables a/
	# treated hhds	% on common support	Mean	Median	
High exposure to PREG II interventions					
Residence in a …					
High-intensity village	562	95	5.3	3.9	None.
High-intensity county	580	100	6.6	6.3	None.
Both	354	95	4.9	3.5	None.
Access to humanitarian assistance					
Food assistance	1449	94.1	6.3	4.8	Number of NGOs in last 5 years (at BL): 1.9 vs. 2.3
Cash assistance	1206	99	9.6	7.8	Number of programs at BL (1.4 vs. 1.9) Informal Safety Nets (2.0 vs. 1.6)
Food-for-work	620	92.7	6.1	4.1	Number of NGOs in last 5 years (at BL): 3.2 vs. 2.7
Cash-for-work	1124	88.97	7.7	5.9	None.

a/ Remaining imbalances lists variables with bias greater than 25. Values are treatment vs. comparison group.

The total number of households in each analysis before matching is 2,394.

Table A1.2 Difference-in-Differences Propensity Score Matching Diagnostics (Kernel matching) for analysis of impacts on child malnutrition

	Common support		Standardized percent bias		Remaining unbalanced matching variables a/
	# treated hhds	% on common support	Mean	Median	
Exposure to Comprehensive Resilience					
	238	87.0	8.2	6.0	Access to emergency food assist: 47.8 vs 36.0 Access to emergency cash assist: 25.1 vs 13.9
Participation in PREG interventions (at least two)					
	136	94.9	5.1	4.6	None.
Exposure to the ten intervention sets					
Livestock rearing	148	96	5.4	4.7	None.
Agricultural production	169	97	4.0	4.1	None.
CMRM	177	96.6	7.6	6.8	None.
Financial services	84	94.1	7.4	5.8	Female household head: 24.1 vs 36.2
Business development	180	93.9	3.9	3.3	None.
Market linkages	148	97.3	7.8	5.2	None.
DRR	157	98.1	5.4	4.0	None.
Health and Nutrition	242	86	4.8	4.3	None.
Human capital: Women	173	92.5	8.1	4.0	Food security scale: 1.6 vs. 2.5
Human capital: Youth	191	96.3	4.3	4.1	None.
Participation in the ten intervention sets					
Livestock rearing	222	97.3	4.8	4.3	None.
Agricultural production	146	96.6	4.1	4.3	None.
CMRM	120	94.2	3.9	3.3	None.
Financial services	236	96.2	3.6	3.0	None.
Business development	209	92.8	9.5	7.6	Number mnths agricultural drought: 4.5 vs 5.0 Village has electricity: 31.4 vs 46.6
Market linkages	108	92.6	3.4	3.4	None.
DRR	83	97.6	3.4	3.2	None.
Health and Nutrition	259	97.7	3.6	2.7	None.
Human capital: Women	111	99.1	4.7	4.2	None.
Human capital: Youth	75	89.3	4.5	3.1	None.

a/ Remaining imbalances lists variables with bias greater than 25. Values are treatment vs. control group.

The total number of households in each analysis before matching is 731.

Table A1.2 (cont.) Difference-in-difference Propensity Score Matching Diagnostics (Kernel matching) for analysis of impacts on child malnutrition

	Common support		Standardized percent bias		Remaining unbalanced matching variables a/
	# treated hhds	% on common support	Mean	Median	
High exposure to PREG II interventions					
Residence in a …					
High-intensity village	134	99	4.7	5.3	None.
High-intensity county	160	97	5.9	5.4	None.
Both	89	100	4.5	3.5	None.
Access to humanitarian assistance					
Food assistance	470	87.7	8.7	5.8	Female household head: 40.0 vs 54.5 Emergency food assist: 33.5 vs 19.0
Cash assistance	381	93.4	9.9	6.7	Human disease shock in last year: 4.2 vs 9.4 Livestock ownership: 7.3 vs 12.7
Food-for-work	191	84.3	7.3	5.4	None.
Cash-for-work	354	87.6	6.5	6.1	Emergency cash assist: 19.0 vs 9.3

a/ Remaining imbalances lists variables with bias greater than 25. Values are treatment vs. comparison group.

The total number of households in each analysis before matching is 731.

Figure A1.1 Common support for exposure to Comprehensive Resilience Programming: Propensity score distributions of treated and comparison households

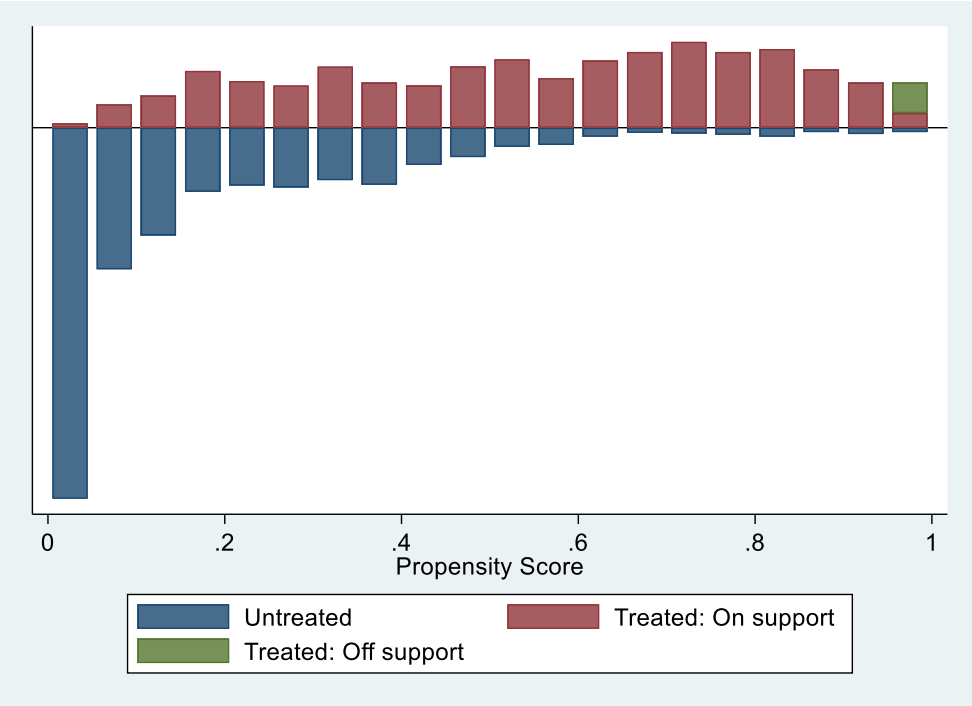


Figure A1.2 Common support for participation in multiple resilience interventions: Propensity score distributions of treated and comparison households

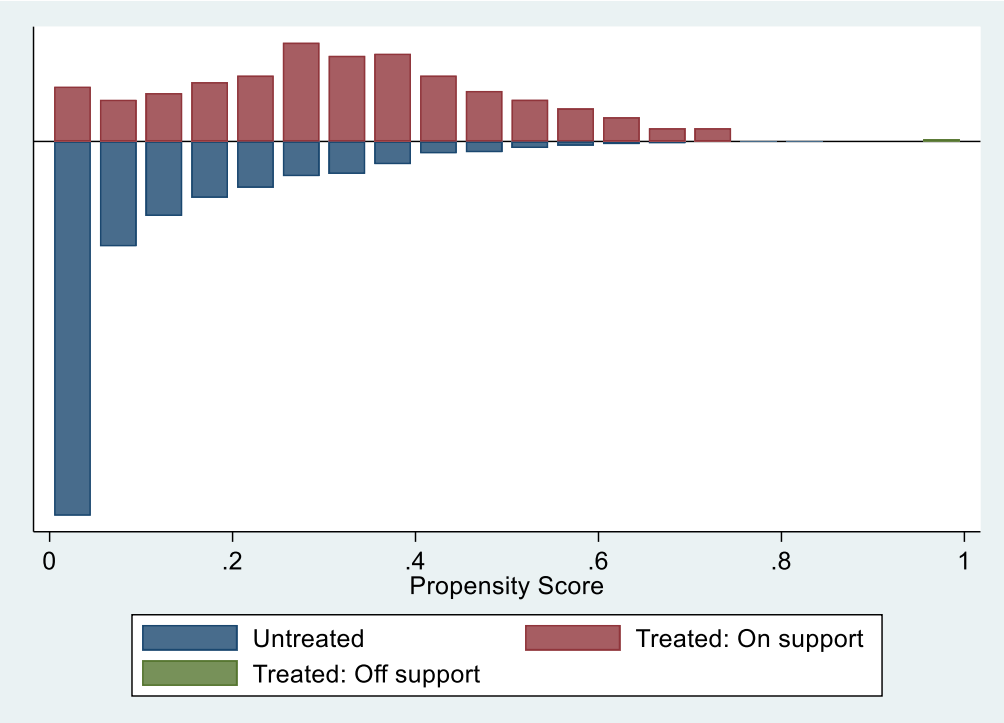
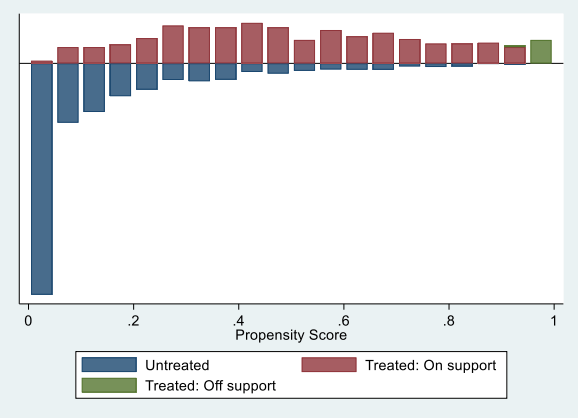
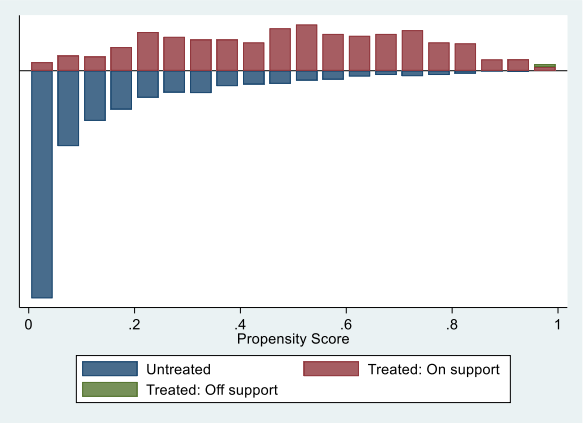


Figure A1.3 Common support for exposure to high-Intensity PREG II programming

High-intensity village



High-intensity county



High-intensity village in a high-intensity county

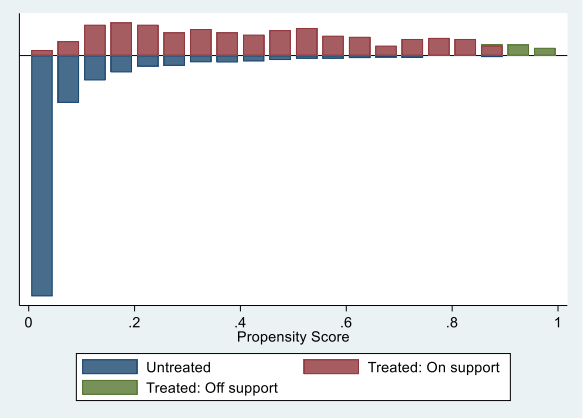


Figure A1.4 Balance for exposure to Comprehensive Resilience Programming: Standardized percent bias across the matching variables

Figure A1.5 Balance for participation in multiple resilience interventions: Standardized percent bias across the matching variables

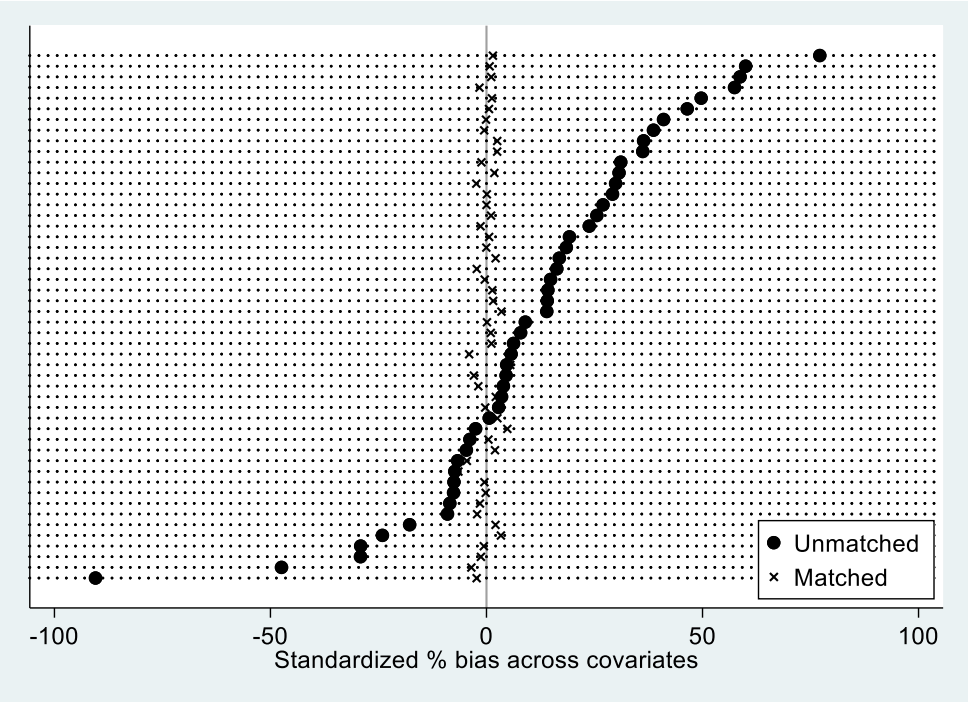
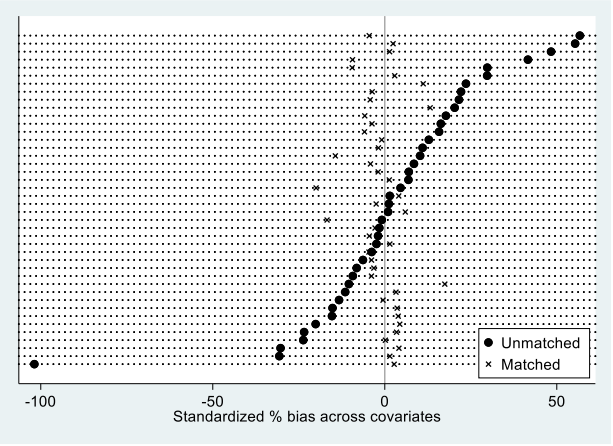
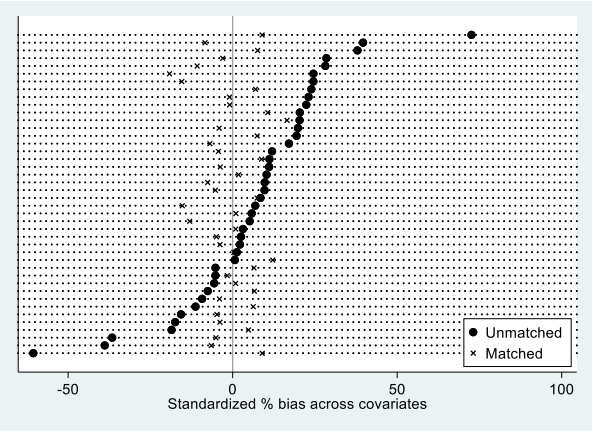


Figure A1.6 Balance for exposure to high-Intensity PREG II programming: Standardized percent bias across the matching variables

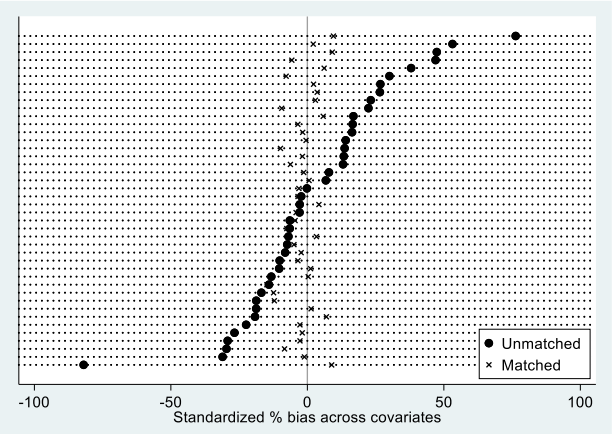
High-intensity village



High-intensity county



High-intensity village in a high-intensity county



ANNEX 2. IMPACT ESTIMATES FROM ALTERNATIVE PROPENSITY SCORE -BASED METHODS

This annex compares the impact estimates derived using Difference-in-Differences Propensity Score Matching (Kernel matching) with those derived using two alternative propensity score -based methods:
(1) Nearest Neighbor Matching with Difference-in-Differences; and
(2) Inverse Probability Weighting.
(see Section 2.4 for details)

Table A2.1 Impact of exposure to Comprehensive Resilience Programming and participation in multiple interventions on key outcomes: Comparison of results from alternative estimation methods

	Exposure to Comprehensive Resilience Programming						Participation in multiple resilience interventions					
	DID-PSM Kernel matching		DID-PSM Nearest Neighbor Matching (1:5)		Inverse Probability Weighting		DID-PSM Kernel matching		DID-PSM Nearest Neighbor Matching (1:5)		Inverse Probability Weighting	
Resilience												
Realized resilience	0.81	***	0.77	***	1.1	**	0.19		0.28	**	0.225	
Percent of hhs resilient to shocks	15.5	***	14.6	***	12.9	**	-0.32		-0.4		0.64	
Perceived ability to recover	0.12	**	0.1	*	0.02		-0.04		-0.01		-0.05	
Resilience capacity												
Absorptive capacity	11.2	***	11.1	***	11.6	***	9.3	***	9.0	***	9.23	***
Adaptive capacity	0.1	*	0.3		0.5		11.0	***	10.4	***	11.2	***
Transformative capacity	9.80	***	9.81	***	8.1	***	5.50	***	4.5	***	5.43	***
Well-being outcomes												
Food security	0.81	***	0.77	***	1.10	**	0.19		0.28	**	0.23	
Moderate-to-severe food insecurity	-10.4	***	-10.3	***	-14.5	**	-2.6		-3.6		-2.3	
Household Dietary Diversity Score	0.4	**	0.4	**	0.49	*	0.9	***	0.9	***	1.0	***
Asset Poverty	2.50		2.20		-10.50		-7.60	**	-9.20	***	-6.90	*
Stunting	-16.0	**	-16.0	*	-12.2	**	0.66		2.4		2.7	
Wasting	-0.25		-0.25		-2.77		-7.7		-7.2		-8.8	*
Underweight	-15.9	**	-19.1		-13.2	**	-3.4		-1.9		-1.6	

Note: DID-PSM refers to "Difference-in-Differences Propensity Score Matching". Values reported are the Average Treatment Affect on the Treated (ATT).
Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Table A2.2. Impact of exposure to high-intensity PREG II programming (village-level) on key outcomes: Comparison of results from alternative estimation methods

	DID-PSM Kernel matching		DID-PSM Nearest Neighbor Matching (1:5)		Inverse Probability Weighting	
Resilience						
Realized resilience	0.75	***	0.86	***	1.25	***
Percent of hhs resilient to shocks	8.0	***	8.5	***	13.7	***
Perceived ability to recover	0.02		0.08		0.16	*
Resilience capacity						
Absorptive capacity	1.8	**	1.52		0.01	
Adaptive capacity	1.2		1.3		0.7	
Transformative capacity	3.30	***	2.23	**	2.32	
Well-being outcomes						
Food security	0.75	***	0.86	***	1.25	***
Moderate-to-severe food insecurity	-9.3	***	-11.6	***	-16.1	***
Household Dietary Diversity Score	0.7	***	0.5	***	0.63	***
Asset Poverty	-1.43		-0.68		-1.65	
Stunting	1.9		0.8		1.99	
Wasting	6.9		10.3	**	5.8	
Underweight	1.9		4.2		3.4	

Note: DID-PSM refers to "Difference-in-Differences Propensity Score Matching". Values reported are the Average Treatment Affect on the Treated (ATT).
Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Table A2.3 Impact of access to humanitarian assistance on key outcomes: Comparison of results from alternative estimation methods

	Emergency Food Assistance			Emergency Cash Assistance		
	DID-PSM Kernel matching	DID-PSM Nearest Neighbor Matching (1:5)	Inverse Probability Weighting	DID-PSM Kernel matching	DID-PSM Nearest Neighbor Matching (1:5)	Inverse Probability Weighting
Resilience						
Realized resilience	1.48 ***	1.61 ***	2.21 ***	1.55 ***	1.61 ***	2.21 ***
Percent of hhs resilient to shocks	11.6 ***	10.8 ***	20.1 ***	11.00 ***	10.8 ***	20.10 ***
Perceived ability to recover	0.30 ***	0.26 **	0.3 **	0.25 ***	0.26 **	0.3 **
Resilience capacity						
Absorptive capacity	-0.5	0.08	0.37	-1.6	0.1	0.37
Adaptive capacity	-1.2	-1.2	-2.1	-3.7	-1.2	-2.1
Transformative capacity	-1.10	-0.79	0.15	-1.07	-0.79	0.15
Well-being outcomes						
Food security	1.48 ***	1.61 ***	2.21 ***	1.55 ***	1.61 ***	2.21 ***
Moderate-to-severe food insecurity	-15.9 ***	-16.3 ***	-22.9 ***	-19.5 ***	-16.3 ***	-22.9 ***
Household Dietary Diversity Score	-0.3	-0.1	-0.18	-0.4	-0.1	-0.2
Asset Poverty	-2.80	-2.42	-5.50	-3.50	-2.40	-5.50
Stunting	0.3	3.6	1.4	-6.2	-5.6	-2.1
Wasting	2.9	2.1	0.32	9.6	9.2	30.2
Underweight	7.8	6.8	4.9	6.9	7.7	0.74

Note: DID-PSM refers to "Difference-in-Differences Propensity Score Matching". Values reported are the Average Treatment Affect on the Treated (ATT).
Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

Table A2.3 (cont.) Impact of access to humanitarian assistance on key outcomes: Comparison of results from alternative estimation methods

	Food-for-Work			Cash-for-Work		
	DID-PSM Kernel matching	DID-PSM Nearest Neighbor Matching (1:5)	Inverse Probability Weighting	DID-PSM Kernel matching	DID-PSM Nearest Neighbor Matching (1:5)	Inverse Probability Weighting
Resilience						
Realized resilience	0.95 ***	0.64 ***	0.70 ***	0.52 ***	0.13	0.23
Percent of hhs resilient to shocks	10.40 ***	6.00 **	6.50	5.10	-3.90 *	0.95
Perceived ability to recover	0.02	-0.10	-0.10	-0.06	-0.16 ***	-0.09
Resilience capacity						
Absorptive capacity	1.28	2.32 **	1.15	4.11 ***	5.30 ***	5.00 ***
Adaptive capacity	2.86 ***	4.62 ***	3.20 ***	5.00 ***	6.60 ***	5.90 ***
Transformative capacity	5.00 ***	6.60 ***	5.40 ***	3.40 ***	4.70 ***	5.40 ***
Well-being outcomes						
Food security	0.95 ***	0.64 ***	0.70 ***	0.52 ***	0.13	0.23
Moderate-to-severe food insecurity	-10.50 ***	-6.10 *	-7.50 **	-4.00	0.70	-0.09
Household Dietary Diversity Score	0.09	0.07	-0.08	-0.34	-0.73 ***	-0.37 **
Asset Poverty	0.79	-3.00	-2.50	-2.70	0.87	-2.40
Stunting	-3.50	-5.6	-2.1	-6.2	-7.4	-10.6
Wasting	11.40	9.2	30.2	3.1	3.9	8.3
Underweight	-3.30	7.7	0.74	-9.8 *	-12.2	-15 *

Note: DID-PSM refers to "Difference-in-Differences Propensity Score Matching". Values reported are the Average Treatment Affect on the Treated (ATT).
Stars indicate statistical significance at the 10%(*), 5%(**), and 1%(***) levels.

ANNEX 3. TANGO METHOD FOR CALCULATING AND UPDATING RESILIENCE CAPACITY INDEXES

This annex lays out TANGO's method for calculating resilience capacity indexes that are comparable over time, in this example across a baseline and endline survey. The most important property of such an index is that it represents the concept being measured as closely as possible. To achieve this, the analyst should always start by identifying a comprehensive set of valid indicators. The indicators, referred to here as "index components", should be correlated with each other and the final index in the expected direction (based on theoretical priors).

In overview, the TANGO method employs factor analysis applied to baseline household data to calculate index weights. These weights are then used to calculate both baseline and endline resilience capacity indexes, as detailed in the following five steps.

Step 1. Calculate index weights and baseline index values

The weights used for calculating both baseline and endline index values, denoted w_i, one for each index component, are computed using factor analysis (the default "principal factors" option) and baseline data.[68]

The factor analysis may yield multiple "factors". Which should be used for the index calculation? The reported loadings for each factor correspond to the signs (positive or negative) of the weights used for constructing the final index. The final factor for constructing the baseline and endline indexes is chosen based on consistency with the meaning of the concept being measured. For example, if the underlying index components should all be positively correlated with the concept, then the weights should all be positive.[69] If the components have been chosen well from the start, the selected factor is typically the first factor, the one contributing the most to the components' overall variance.

The baseline index itself is calculated directly in Stata using the "predict" command (assuming the default "regression" option). Stata automatically standardizes the values of the index components to have mean=1 and standard deviation=0 as part of the calculation.

Given five index components Z_1_bl, Z_2_bl, Z_3_bl, Z_4_bl and Z_5_bl, the Stata code for conducting the factor analysis to calculate the baseline index (denoted Y_bl) is:

```
factor Z_1_bl - Z_5_bl

predict Y_bl
```

The code for saving the index weights for later use (to calculate the endline index) is

```
matrix(W)=r(scoef)

            forvalues x=1/5 {scalar w`x'_=W[`x',1]
```

[68] Other options are to use the endline data or a combination of both baseline and endline data. These would only be considered if the index weights differ substantially when baseline versus endline data are employed.

[69] For examples of this approach to interpreting factor analysis output see https://www.stata.com/manuals13/mvfactor.pdf and https://www.stata.com/manuals13/mvfactorpostestimation.pdf.

```
gen w`x'=w`x'_}

collapse w*
```

Step 2. Conduct KMO test

Next, the Kaiser–Meyer–Olkin (KMO) test of whether the index components have enough in common to warrant a factor analysis is conducted using the following command:[70]

```
estat kmo
```

Step 3. Calculate means and standard deviations of baseline index components

The index components for the endline must be standardized manually using baseline means and standard deviations before calculating the updated endline index value. The following are the Stata commands for doing so:

```
forvalues x = 1/5 { egen m_Z_`x'_bl=mean(Z_`x'_bl) }

forvalues x = 1/5 { egen sd_Z_`x'_bl=sd(Z_`x'_bl) }
```

Step 4. Calculate standardized values of endline index components[71]

Standardized endline values of the index components are calculated in Stata using the means and SD's calculated in Step 3 as follows.

```
forvalues x = 1/5 { gen Z_`x'_el_std = (Z_`x'_el-m_Z_`x'_bl)/sd_Z_`x'_bl }
```

Step 5. Calculate endline index value

Finally, the endline index values are calculated using (1) the index weights calculated in Step 1; and (2) the standardized endline index components calculated in Step 4, as follows:

```
gen Y_el = Z_1_el_std* w_1 +

                Z_2_el_std* w_2 +

  Z_3_el_std* w_3 +

  Z_4_el_std* w_4 +

  Z_5_el_std* w_5.
```

Note on index re-scaling

Indexes are often re-scaled for ease of interpretation and presentation. For example, an index may be re-scaled to run from 0 to 100 using the following commands:

```
egen max = max(index_old)
```

[70] KMO values less than 0.5 are considered to be "unacceptable". (see https://www.stata.com/manuals13/mvfactorpostestimation.pdf).

[71] The procedures for updating indexes follows that in "Measuring equity with nationally representative wealth quintiles", PSI 2014 (http://www.psi.org/wp-content/uploads/2014/10/Wealth-Quintile-Guide.pdf).

egen min = min(index_old)

gen index_new= (index_old-min)*100/(max-min).

After rescaling the baseline index, in order to ensure comparability, it is very important to also rescale the endline index using the *same maximum and minimum values used for the baseline* re-scaling.