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RESILIENCE PROFILE - YAMBIO

2019

THIS PUBLICATION WAS PRODUCED FOR REVIEW BY THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT. IT WAS PREPARED BY MANAGEMENT SYSTEMS INTERNATIONAL, A TETRA TECH COMPANY AND THE INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE.

RESILIENCE PROFILE - YAMBIO 2019

Contracted under AID-I-668-13-00003, Task Order # 72066818F00001

KEY RESULTS

DESCRIPTIVE ANALYSIS

- For about 20-45% of the population, one or both parents live outside the household. Fathers more commonly live outside the household than mothers.

- Most households identify as Christian, predominantly Catholic or Anglican, with a small percentage of Pentecostal and minute Islamic and Adventist representation. Yambio is quite ethnically homogenous; 94% of household surveyed are Zande, with small populations of Balanda, Kakwa and other ethnic minorities.

- Our results suggest that paramount chiefs and other traditional chiefs, as well as local government have important leadership role in Yambio.

- Most households indicated that traditional leaders play a larger role than political leaders. Yambio's traditional leaders are mostly elected and viewed as very important players by the majority of surveyed households.

- Setting up peace committees was identified as the most positive government action, but most respondents indicated extreme lack of trust in political leadership. This distrust is most likely tied to the belief that politicians are characterized by greed, lack of transparency and accountability, especially related to finances and natural resources.

- Compared to other PAs, the prevalence of households affected by social risks is very high in Yambio.

- Outside the home, households reported burglaries/robberies as the most common risk. Within households, the strongly associated risks include alcohol abuse, domestic violence, child abuse and teen pregnancy are common, with particularly deleterious effects on women and children

- Households identified lack of trust as the primary bottleneck to conflict resolution, followed by dishonesty among conflicting parties, lack of seriousness and political greed. The role of political greed and external influence in Yambio is similar to that of other PAs that cited oil resource conflicts.

- Many comments cited political manipulation, particularly of youth as a lynchpin of sustaining violence. Using confusion and propaganda, "politicians made the arrow boys" and incited regional conflict to become tribal. "Conflicts are 'sold' to us," stated a local leader in Yambio. Political groups who feel they've been unfairly treated retreat to the bush and incite violence and chaos.

- Focus groups discussions reiterated the effect of conflict and violence on domestic life. Women and children face violence, sexual assault, abandonment; some are forced into marriage for financial or cultural reasons. Women face additional political violence—even from children. As one Yambian woman stated, "your own child will rape you." Many women generally feared retribution for themselves and their communities from reporting rape. Commentary expressed that young people are "too traumatized" because of constant death.

- Some comments noted an increase in formal human rights, for example "instead of lashes, they issue fines because human rights exist now." Focus groups praised "Peace Clubs" in Yambio, which provide activities such as drumming and singing songs about peace (particularly for youth), and radios shows about peace.

- Compare with the other 7 PAs, Yambio has the highest rates of literacy and household members that have been to school. Still, the discrepancy between male and female literacy and education rates is severe.

- Relative to other PAs, Yambio households have experienced "average" health care services; roughly half of households indicated healthcare services were not timely nor were families provided sufficient information. Focus group discussions highlighted general discouragement with health services, noting the long distances to hospitals, absence of drugs in pharmacies, and that doctors have given up because of low pay or no facilities.

- While multiple water sources may be available in each community, most households depend on one or two primary sources. Hand pumps, boreholes (without network) and dug wells provide the predominant water sources in Yambio; open running water serves roughly 12% of households.

- The seven PAs generally have a poor view of government services, and Yambio is no exception. Yambio's population in particular complained about poor job creation, corruption, infrastructure and price regulation

- Comparatively, Yambio's food insecurity rate of 55% is less severe than most PAs. Civil war and conflict are the main drivers of food insecurity in Yambio. Other causes including animal/insect pests modestly affected food security

- Most households responded to food insecurity by purchasing food with their own resources or relying on relatives. Gathering wild plants and animals also plays a notable role in curtailing food shortages in Yambio.

- Focus group discussions highlighted agriculture's role in food security, as well as in cultural identity, peace and dignity. Many respondents across demographics looked to farming for food security at the community and household level, yet others expressed a sense of vulnerability in agricultural survival and the need for training on extension services. Many respondents expressed a sense of collective strength in agriculture for information-sharing, coordination with external support ("NGOs say 'stay in cooperatives so we can help'") and collective-cultivation coordinated by cooperatives, CBOs or congregations.

- Most of Yambio's working population is engaged in crop production. Women and young females are more likely than males to work in catering and baking, while males dominate construction, motor vehicle mechanic work and carpentry industries and to a lesser degree, livestock production.

- Many highlighted the need for "micro-finance, small-income generation and education" to help build financial and human capital and meet strong demand for small-business. They also called for the development of vocational skills on construction, and factories that provide jobs and enable agricultural export within the region.

- Again, cooperatives emerged as an important institution for financial and community support—especially for women's and youth businesses. They also play a role in evolving gender relations.

- Comments from women's focus groups revealed the need for active participation in local business, driven by the need for income. Women stated they were good at generating money and business, and "stay long in the markets" to ensure bringing home income. They claimed that supporting women with livestock is especially helpful because women are "good at livestock," though they also expressed the risk of theft of their resources—particularly of cattle."

- The findings also underscore the ramifications of limited market access for many farmers: "Without feeder roads our crops rot." Data articulated a decline in road and market access in recent years. But most qualitative data addressed poorly-functioning markets, rather than mere limited physical market access. Producers and consumers complained of price uncertainty, limited or dishonest buyers, and in some cases low demand or supply of agricultural products.

RESILIENCE MEASUREMENT

- For Access to Basic Services, physical proximity plays a strong role, with distance to primary school and travel time to health facility playing the most prominent roles in the pillar

- The variables that contribute the most to the Adaptive Capacity pillar are those concerned with diversity of livelihood activities: the number of agricultural livelihood activities, the number of crops planted, and the number of nonagricultural livelihood activities.

- Access to remittances from South Sudan and from other countries carried equal weight in the Social Safety Nets pillar

- As expected, the latent variable resilience has a positive effect on food security, as measured by the predicted Household Dietary Diversity Score (HDDS). However, the distribution within household is rather uneven; although the net effect is positive for the household as a whole, per capita meals increase for children aged 2-5 and those over 12 years while it decreases for children aged between 6 and 12 years.

- The effects of the pillars on resilience is not linear, suggesting the existence of threshold values that must be reached before increases in the pillar values begin to affect resilience positively. The only pillar which does not affect resilience significantly is Social Safety

- Resilience elasticities with respect to pillars are positive for all pillars, and highest for Assets and Access to Basic Services—for these pillars, a one percent increase in the pillar value can be expected to increase the resilience score by respectively 0.35 percent and 0.18 percent. The corresponding change in resilience resulting from an increase in the Adaptive Capacity pillar is 0.09 percent.

- Female- and male-headed households have similar scores for the Access to Basic Services pillar, but male-headed households have higher scores for the Assets and Adaptive Capacity pillars. Female-headed households have higher values for the Social Safety Nets pillar, but this pillar makes the smallest contribution to resilience, as seen earlier.

- Female-headed households show significantly lower resilience than male-headed households; all else equal, these households have resilience scores around 7 percent lower than households headed by men.

- Improvements in governance have a significant positive effect on resilience while increase in conflict occurrence tends to reduce resilience.

BACKGROUND AND INTRODUCTION

Following four decades of civil war, South Sudan's independence in July 2011 was met with international goodwill focused on putting the country on a development trajectory that finally brings about food security, health, education, and economic growth and development. However, a resumption of civil war in 2013 hindered the country's road to economic development. The protracted conflict has created a humanitarian crisis in the country that has left tens of thousands of people dead, displaced millions more, and worsened food insecurity in the country. Livelihoods have further been battered by the effects of climate change due to more frequent and prolonged droughts and floods as well as pest infestations. Food production has been destabilized by the war, droughts, and weak national institutions and policies, and as a result in early 2017, parts of South Sudan, particularly in the north, experienced a famine that affected about half of the population. More recently, the latest integrated food security phase classification shows that in January 2018, 48 percent of South Sudan's population (5.3 million people) was estimated to be facing crisis and emergency acute food insecurity.

The effects of a long-drawn-out conflict and climate change in the face of a weak national policy system and institutions have severely affected the food security, nutrition, and well-being of South Sudan's most vulnerable. Therefore, South Sudan requires a broad coalition of support to address not only the urgent humanitarian crisis but also to help restore production systems and help communities cope, recover, and build their resilience to shocks and crises. Restoring production systems and productivity is important because growth in the agricultural sector remains the most effective driver for poverty reduction and restoring livelihoods in many African countries.

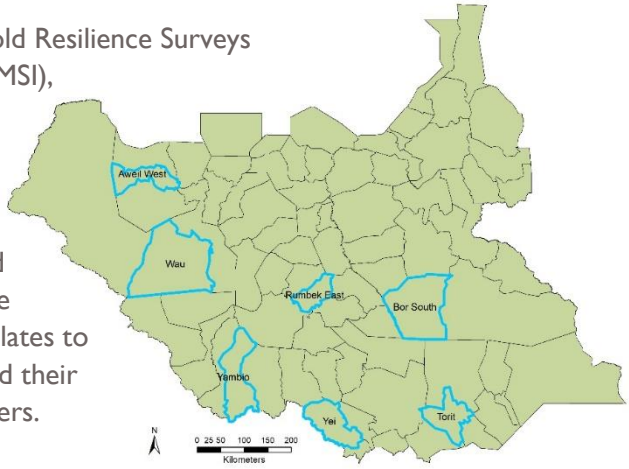
Given the multiple players involved and the weak national policy and institutional apparatus in the country, the United States Agency for International Development (USAID) in South Sudan has put together a *Partnership for Resilience and Recovery* (the Partnership, hereafter) in South Sudan that places community institutions at the center of efforts to build the resilience of livelihoods and production systems in the country. The proposed partnership is aimed at producing business models (interventions) for integrated humanitarian and development services through community-based delivery mechanisms that emphasize the productive sector as the foundation for resilience and recovery in five target regions: Torit, Wunlit Corridor, Wau, Aweil, and Yambio. The partnership provides a framework for the colocation of investments across all sectors; coordination of activities across partners; and collaboration among partners and stakeholders in defining and delivering interventions that achieve social cohesion, resilience, and recovery for long term development.

This report is an input into efforts to design interventions and investments in Yambio. It shares detailed findings from household data collection which shed light on living conditions, livelihood strategies, and household resilience in the region. The report has two major sections, which discuss findings from the descriptive analysis and from econometric analysis of resilience, respectively. Section one is divided into subsections on demographics; trust in people and institutions, including leadership, institutions and conflict; access to basic services, including education, health services, water, and other government services; and productive capacities, including food insecurity, agricultural productivity and market access. In section two, we implement the FAO's Resilience Index Measurement and Analysis-II (RIMA-II) methodology to explore the contribution of the factors discussed in section one to household resilience and food security. Section two discusses the calculation of the RIMA index and explores additional determinants of resilience. Both section one and section two end with a summary of key messages.

DESCRIPTIVE ANALYSIS

1.1. DEMOGRAPHICS

This analysis is based on the Community Household Resilience Surveys completed by Management System International (MSI), in 2018. Data was collected from the seven counties, known as Partnership Areas (PAs) in South Sudan: Yambio, Awiel West, Torit, Wau, Bor South, Yei and Rumbek East. Consultations with various stakeholders facilitated the selection of these seven communities, with the objective of profiling community resilience as it relates to conflicts, livelihoods, poverty, shocks, markets, and their distinct impacts on men, women, children and elders.



Household surveys were conducted over a period of two weeks, including travel, training and fieldwork activities. Each enumerator surveyed roughly 60 households. Enumeration Areas were selected by probability proportion according to household size. The sampling frame was based on the 2008 Population and Housing Census conducted in South Sudan, with some updated information (Lulbaale, 2018). Though sample sizes (*n*) differ for individual questions, the number of households surveyed is enough to validate the survey results as acceptable basis to guide policy design and implementation (Table 1.1). We also use qualitative MSI data gathered from focus groups discussions with farmer groups, adult females, adult males, male youth, female youth, schoolteachers, female farmers, male farmers, community-based organizations (CBOs), government peace committees, faith-based organizations (FBOs), and key informant interviews with local leaders, chiefs, executive directors, teachers and peace committees. All qualitative data in quotes comes from MSI focus groups and interviews.

Average size of the households surveyed in Yambio was 6 people (Table 1.1). Our results suggest that household in all counties face displacement and migration of family members. The absence of parent(s) in the household can hinder resilience by increasing the dependency burden on other adult caregivers, or teenage children; research indicates that the lower dependency ratio, the higher the adaptive capacity (Vincent, 2007). The MSI survey indicates that in 20-45% of the population, one or both parents live outside the household. Fathers more commonly live outside the household than mothers. Families are also less likely to know whether a father living outside the household is alive or deceased; this uncertainty was most striking in Yambio, where 5.3% of families were uncertain whether or not the father is alive. A small percentage of parents were reported as deceased while only 4.4% of households in Yambio that could confirm a deceased mother (Figure 1.3).

Most households identify as Christian, predominantly Catholic or Anglican, with a small percentage of Pentecostal and minute Islamic and Adventist respresentation (Figure 1.2). As shown in Figure 1.1, Yambio

is quite ethnically homogenous; 94% of household surveyed are Zande, with small populations of Balanda, Kakwa and other ethnic minorities.

Population distribution in Yambio suggest that there are more women than men (Figure 1.4), but the discrepancy exists exclusively among adult (age 20-50) and young adult (age 10-19) women. Among older generations (age 50 and older) and children, the distribution of men and women within households is more balanced, suggesting that the gender imbalance onset occurs as boys become adolescents or young men. Older men may be less likely to migrate or become involved in "bush" groups or conflict.

Figure 1.1

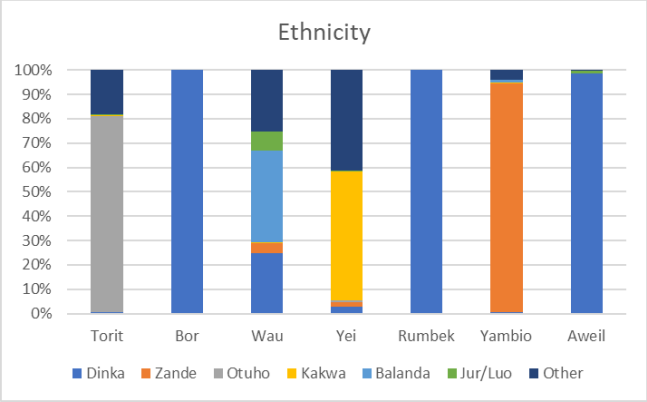


Figure 1.2

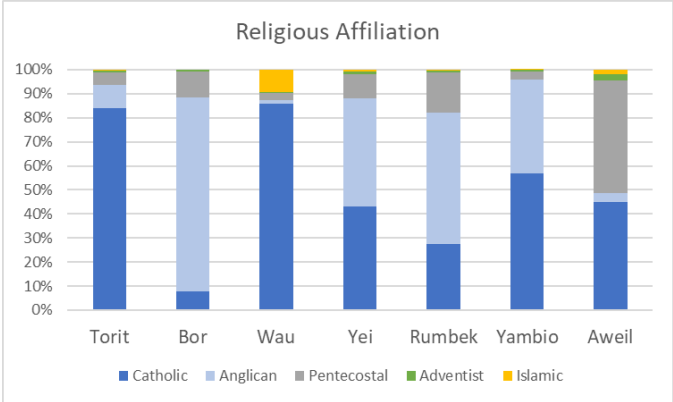
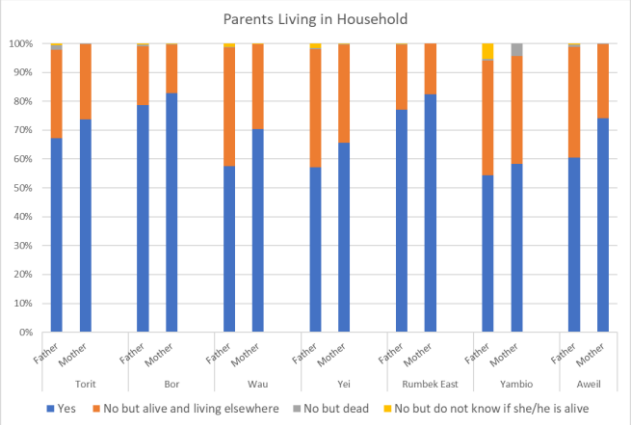


Figure 1.3



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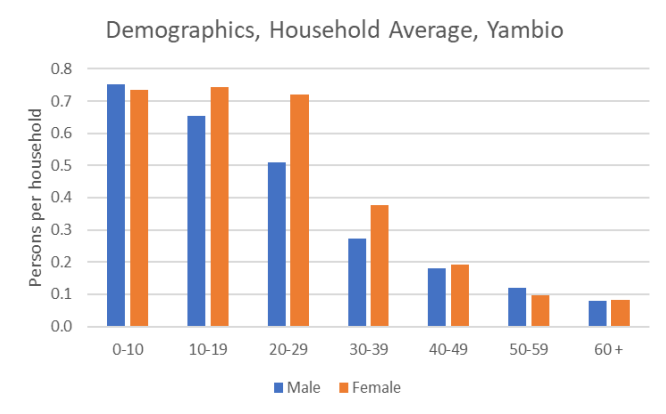


1.2. TRUST IN PEOPLE AND INSTITUTIONS

LEADERSHIP AND INSTITUTIONS

Our results suggest that paramount chiefs and other traditional chiefs, as well as local government, play the largest leadership role in Yambio. Police and Peace and Land Committees do not play a significant role, and NGOs, CBOs and FBOs play a modest role (Figure 1.7).

Most households indicated that traditional leaders play a larger role than political leaders; a slight proportion believed political leaders had more influence or did not know which played the more important role (Figure 1.5). Yambio's traditional leaders are mostly elected and viewed as very important players by the majority of surveyed households (Figures 1.6).

Figure 1.5

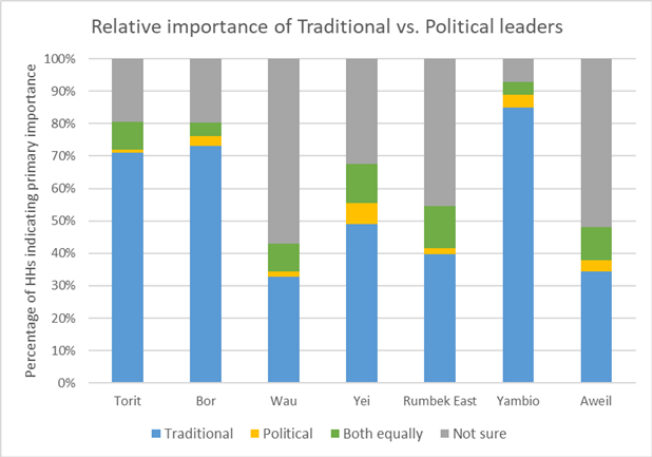
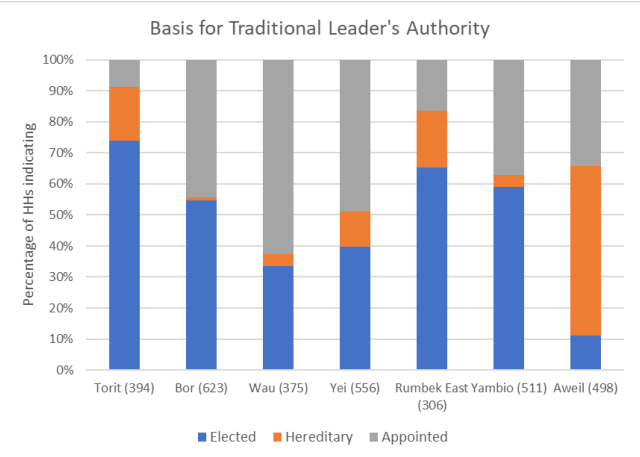


Figure 1.6



Nearly all qualitative responses from interviews and focus groups were critical of political leadership, but did not criticize traditional leaders, nor NGOs, FBOs, churches or peace committees. Employing peace committees was identified as the most positive government action, but most qualitative responses indicated extreme lack of trust in political leadership. This distrust is most likely tied to the belief that politicians are characterized by greed, lack of transparency and accountability, especially related to finances and natural resources. Most comments indicated that politicians cling to power, appoint offices based on favoritism instead of qualification or education, and use money to buy weapons and protect themselves at the cost of others. Discussions revealed anger over government silence about atrocities, lack of support for victims, government threatening civilians, the absence of law, order and constitution, and limited contact with communities—highlighting the difference between towns and "grassroots, where they apply tradition Laws of Wanth-Alel." However, peace committees in Yambio applauded the three-month holiday in which leaders could visit their communities and find out their needs, thus building trust. Others noted the lack of dissemination of peace: "the grassroots couldn't get any news about the peace and knew nothing about it."

Figure 1.7

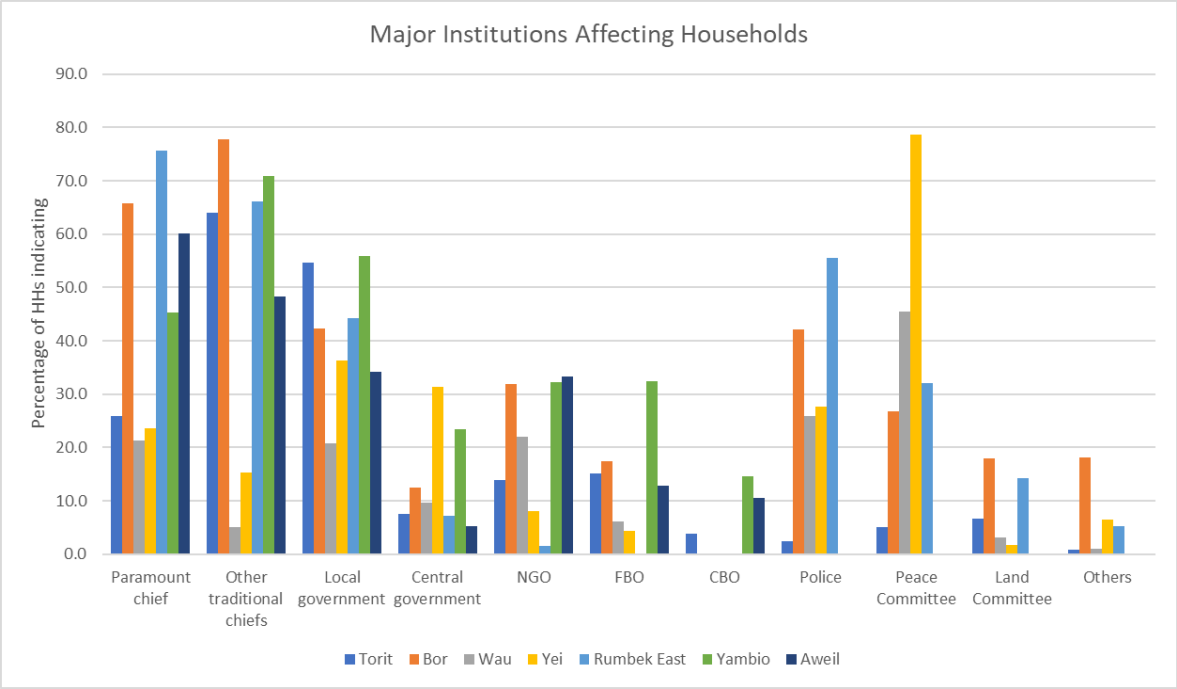
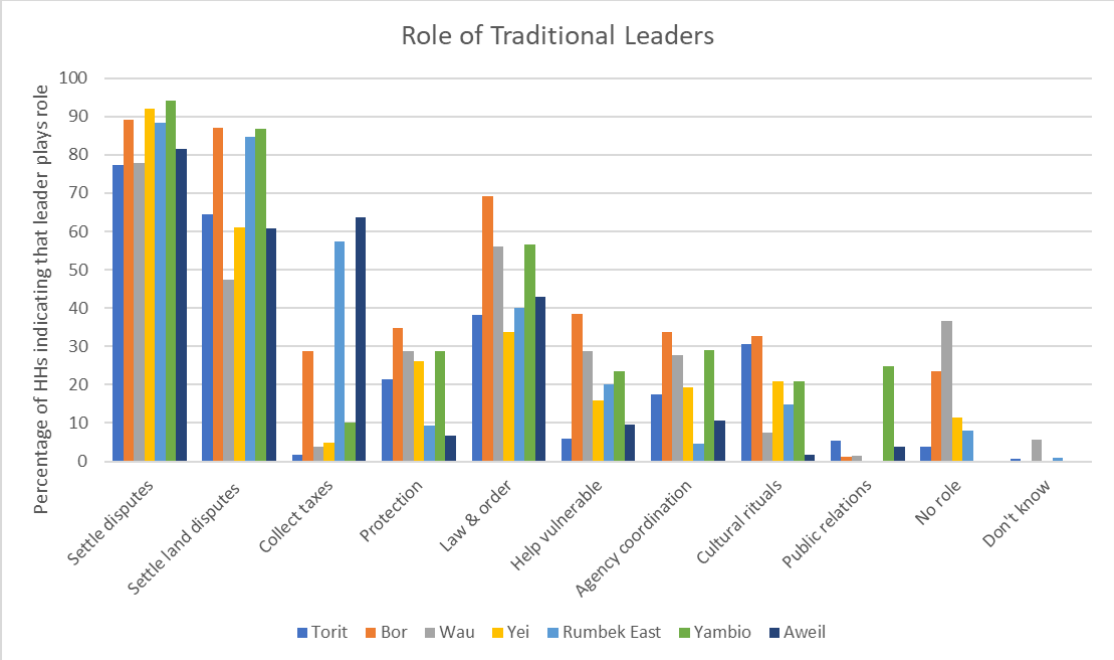
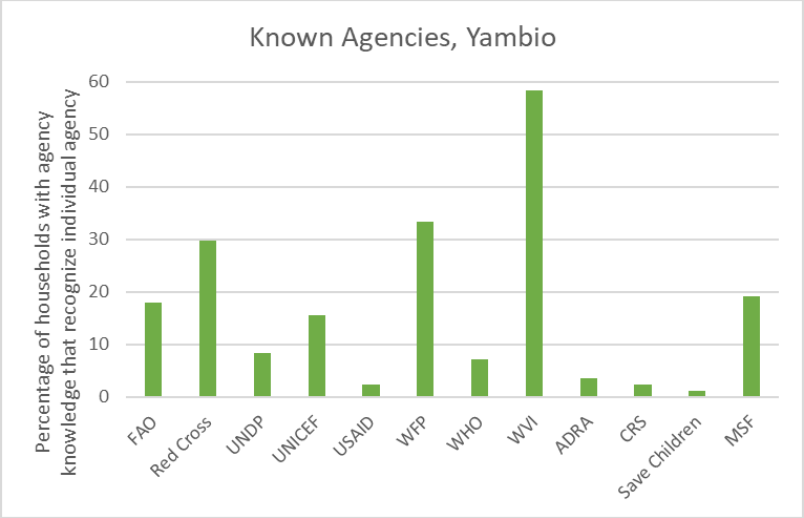


Figure 1.8



Only a small proportion (17%) of households in Yambio are familiar with the humanitarian, development and service agencies in their region, yet over 30% of households stated that NGOs and FBOs affect their household (Figure 1.7); the discrepancy may indicate data error or poor job by the agencies to properly introduce themselves. *World Vision International (WVI), World Food Programme (WFP)* and *Red Cross* are the most familiar among aware households. Figure 1.9 indicates the agencies familiar to households that know of at least one agency, bearing in mind that aware households are the minority in all counties.

Figure 1.9



CONFLICT AND RESOLUTION

Figure 1.10 and 1.11 indicate the pervasive social risks and threats of violence, both domestically and outside the home, facing Yambio and other PAs. Compared to other PAs, the prevalence of households affected by social risks is high in Yambio.

Outside the home, households reported burglaries/robberies as the most common risk. Within households, the strongly associated risks include alcohol abuse, domestic violence, child abuse and teen pregnancy are common, with particularly deleterious effects on women and children. Over 40% of households indicated rape was a prevalent social risk.

Figure 1.10. Predominant Social Risks, by Country and Risk Type

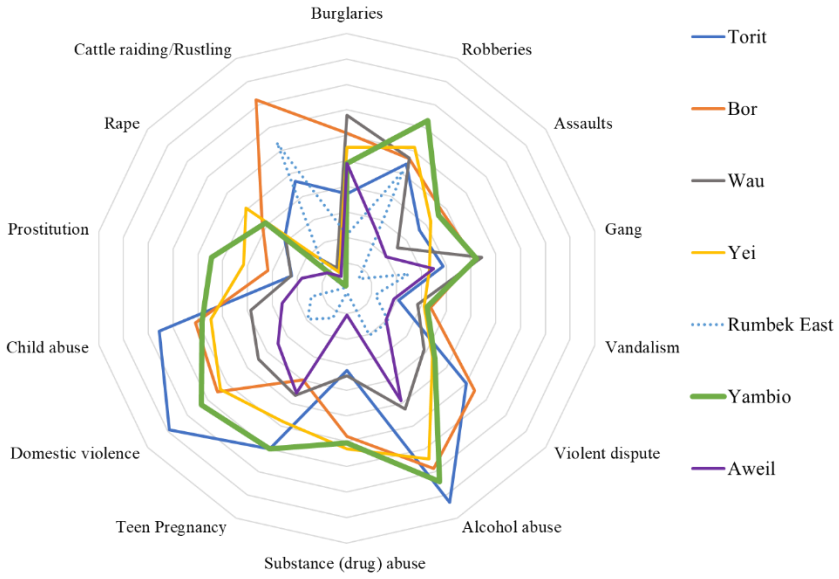


Figure 1.11

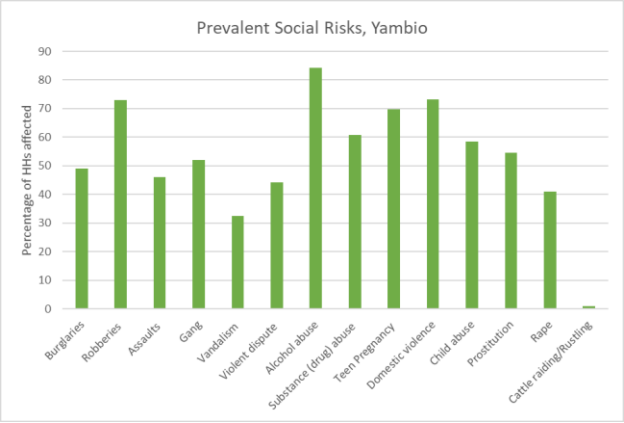


Figure 1.12

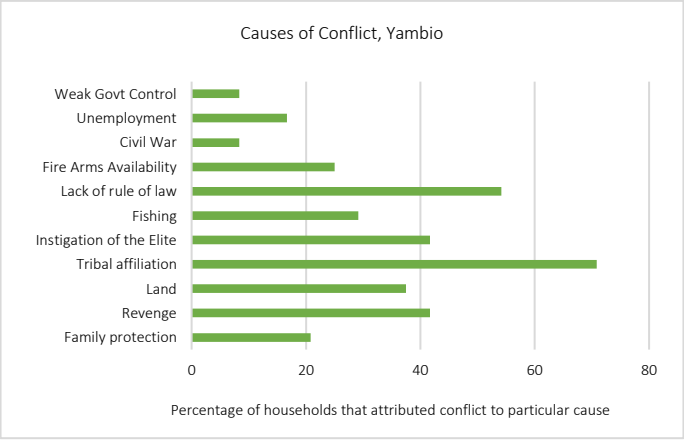
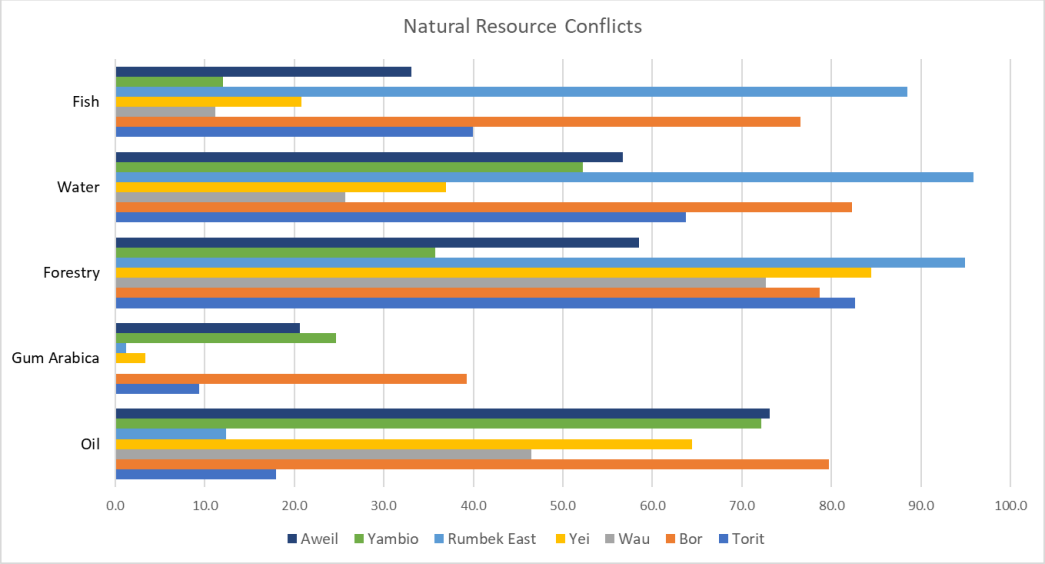
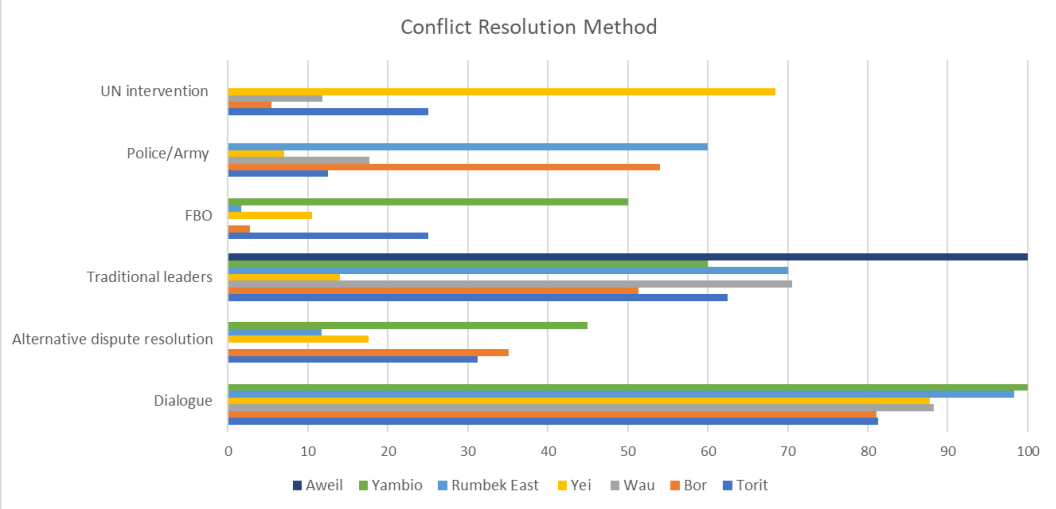


Figure 1.13



A select number of surveyed households identified primarily tribal affiliation and lack of rule of law (Figure 1.12) as the main causes behind local conflict. Overall, households cited various causes, including conflicts over natural resources, especially oil and water (Figure 1.13) Most surveyed households believe dialogue remains the primary method to resolve disputes, followed by intervention from traditional leaders. Households identified lack of trust as the primary bottleneck to conflict resolution, followed by dishonesty among conflicting parties, lack of seriousness and political greed. The role of political greed and external influence in Yambio (Figure 1.17) is similar to that of other PAs that cited oil resource conflicts (Figure 1.13).

Figure 1.14



Responses from focus groups and interviews echo the threats from domestic and gender-based violence, resource-based conflicts, tribalism and fire arms availability. Qualitative data largely corroborates the survey data but offers further nuance, particularly regarding gender-related threats, the role of propaganda and youth, and the various ways that livestock play into conflicts.

One peace committee key informant indicated that conflict comes when "the youth of South Sudan see that they have no jobs. They take up arms and go to the bush and do any bad things by a panga, axes, knife or guns." Tribal communities are recruited into conflict events, such that revenge spreads from singular victimized households to entire communities. Many comments cited political manipulation, particularly of youth as a lynchpin of sustaining violence. Using confusion and propaganda, "politicians made the arrow boys" and incited regional conflict to become tribal. "Conflicts are 'sold' to us," stated a local leader in Yambio. Political groups who feel they've been unfairly treated retreat to the bush and incite violence and chaos.

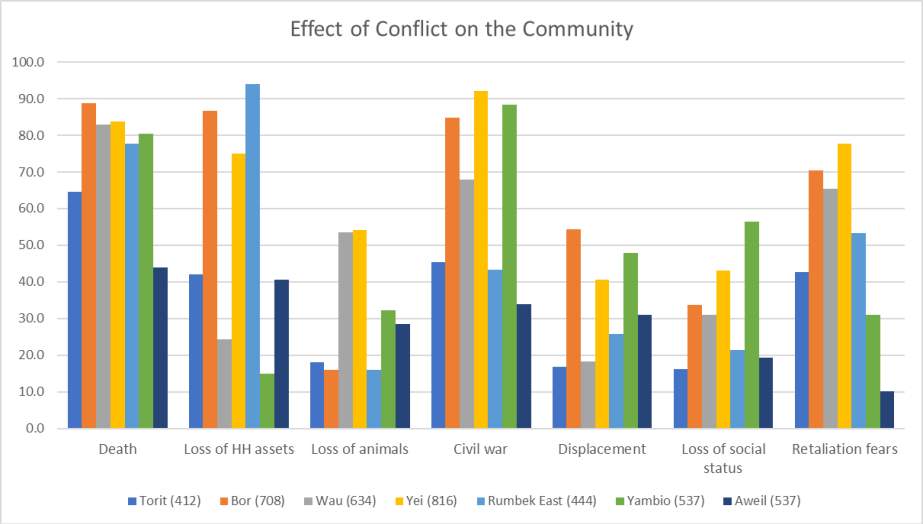
Respondents reported resource conflicts over timber, oil ("fighting at oil locations") and suspicion about external oil interest and other countries using South Sudan. Comments connected land and water to competition from migrating livestock, which may destroy agricultural crops or contaminate drinking water. They stated that the government has banned grazing in select areas due to conflict violence. Land resource conflicts arise between tribes, sometimes leading to cycles of conflict/revenge, but also due to the land policy and community confusion about what it means to own land. Cattle conflicts relate to communal natural resources as well as theft, including cattle-raiding for marriage purpose.

Focus groups discussions reiterated the effect of conflict and violence on domestic life. Women and children face violence, sexual assault, abandonment; some are forced into marriage for financial or cultural reasons. Women face additional political violence—even from children. As one Yambian woman stated, "your own child will rape you." Many women generally feared retribution for themselves and their communities from reporting rape. Commentary expressed that young people are "too traumatized" because of constant death.

Focus groups and interviews further illuminated the types of conflict resolution that resonate with communities. Across various groups (male, female and youth) people emphasized the need for understanding and forgiveness—including of child/youth soldiers, instead of revenge. Comments about traditional and paramount chiefs corroborated the survey responses, highlighting local and traditional leaders' role in gathering people to listen, solve conflict and ensure united communities. Discussions reflected the positive role of FBOs, NGOs and peace processes through the church. Both men and women articulated the benefits of gender-based training for building familial trust and equality.

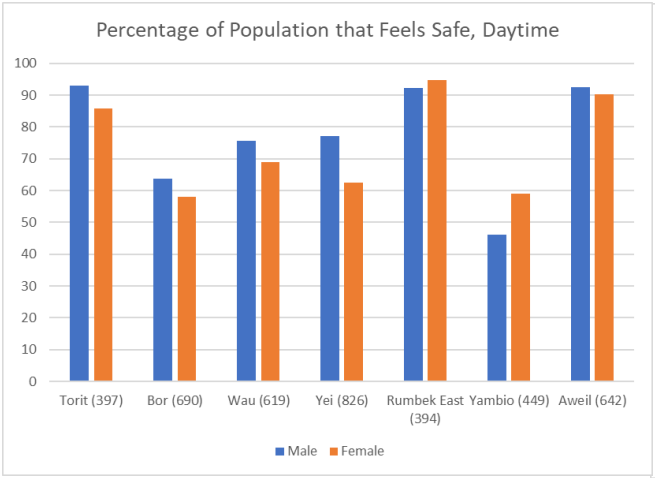
Some comments noted an increase in formal human rights, for example "instead of lashes, they issue fines because human rights exist now." Focus groups praised "Peace Clubs" in Yambio, which provide activities such as drumming and singing songs about peace (particularly for youth), and radios shows about peace. Youth, teachers and FBOs all praised the role of Peace Clubs, cultural dances, youth educational drama for the community, and sports (including NGO-provided "sports kits") for promoting peace and bringing joy and meaning to young people's lives. Some felt the government should be supporting these kinds of peace club activities, especially considering the impact on youth.

Figure 1.15



Most of households identified civil war and death as the primary effects in their community (Figure 1.15). While a majority of men and women feel safe during the day in their communities, far fewer feel safe at night (Figure 1.16). Qualitative data also echoed the felt sense of fear and trauma's hold on communities. Though the psychological trauma and mental health disorders that stem from conflict, violence and social risks are difficult to quantify, they will likely play a major role in household and community resilience (Michalopoulos et al., 2015).

Figure 1.16



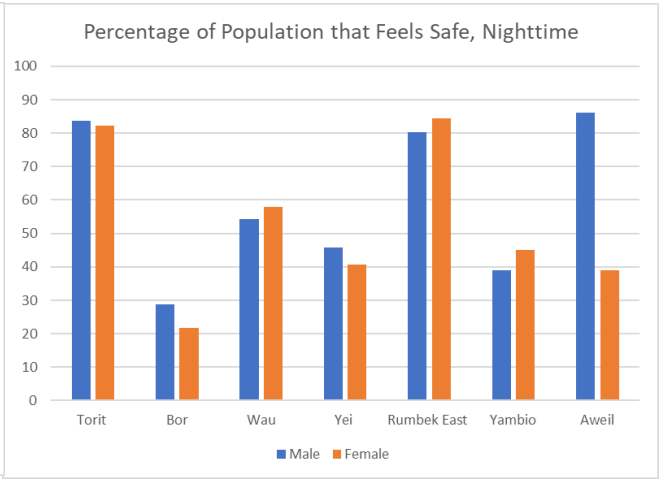
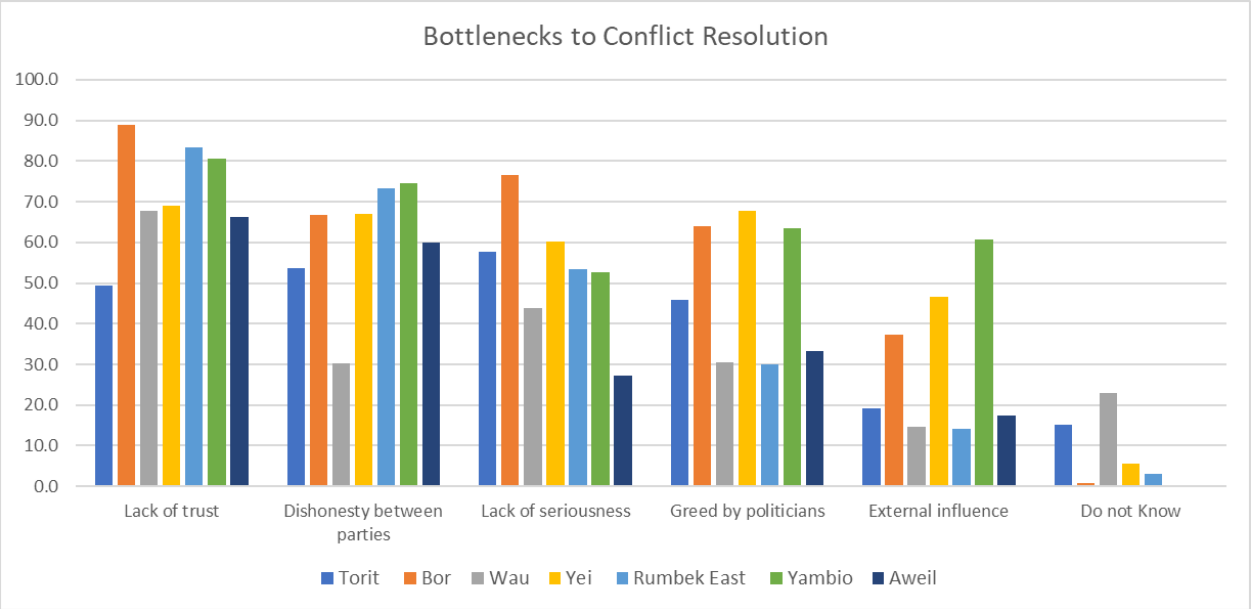


Figure 1.17


Bottlenecks to Conflict Resolution
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Lack of trust
Dishonesty between parties
Lack of seriousness
Greed by politicians
External influence
Do not Know
Torit
Bor
Wau
Yei
Rumbek East
Yambio
Aweil

1.3 ACCESS TO BASIC SERVICES

EDUCATION

Compare with the other 7 PAs, Yambio has the highest rates of literacy and household members that have been to school. Still, the discrepancy between male and female literacy and education rates is severe. Overall, low literacy (Figure 1.18) and education rates (Figure 1.19) in the PAs are associated with communities where a larger percentage of households live more than 5 km from a primary school (Figure 1.20) and where no secondary school exists (Figure 1.21), even though these communities often identified cultural barriers, not school distance, as the predominant reason not to attend school (Figure 1.22). Qualitative responses (below), including from females and youth, reveal more diverse experiences.

Figure 1.18

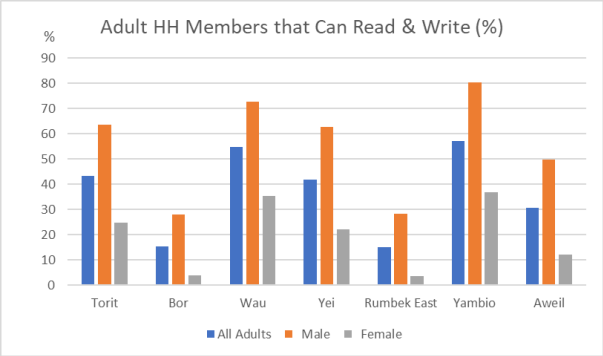
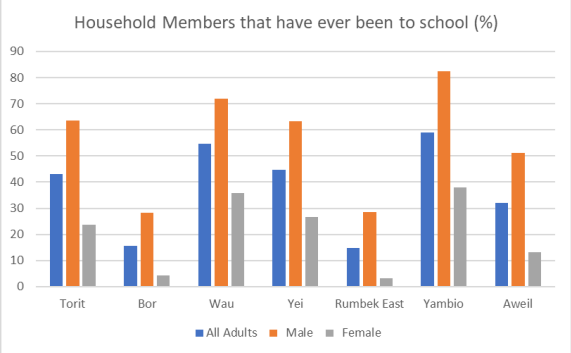


Figure 1.19



Most schools are government-funded (Figures 1.23 and 1.24), with a modest proportion of privately-owned and FBO schools.

Figure 1.20

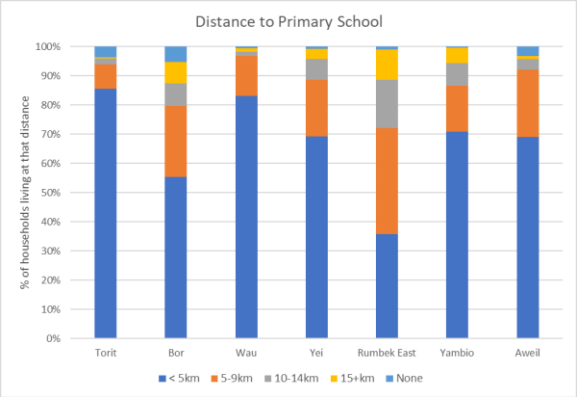


Figure 1.21

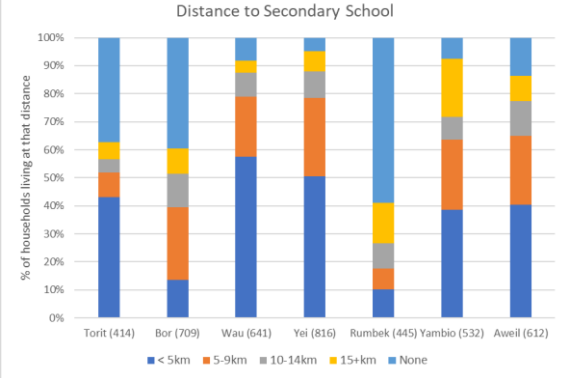


Figure 1.22

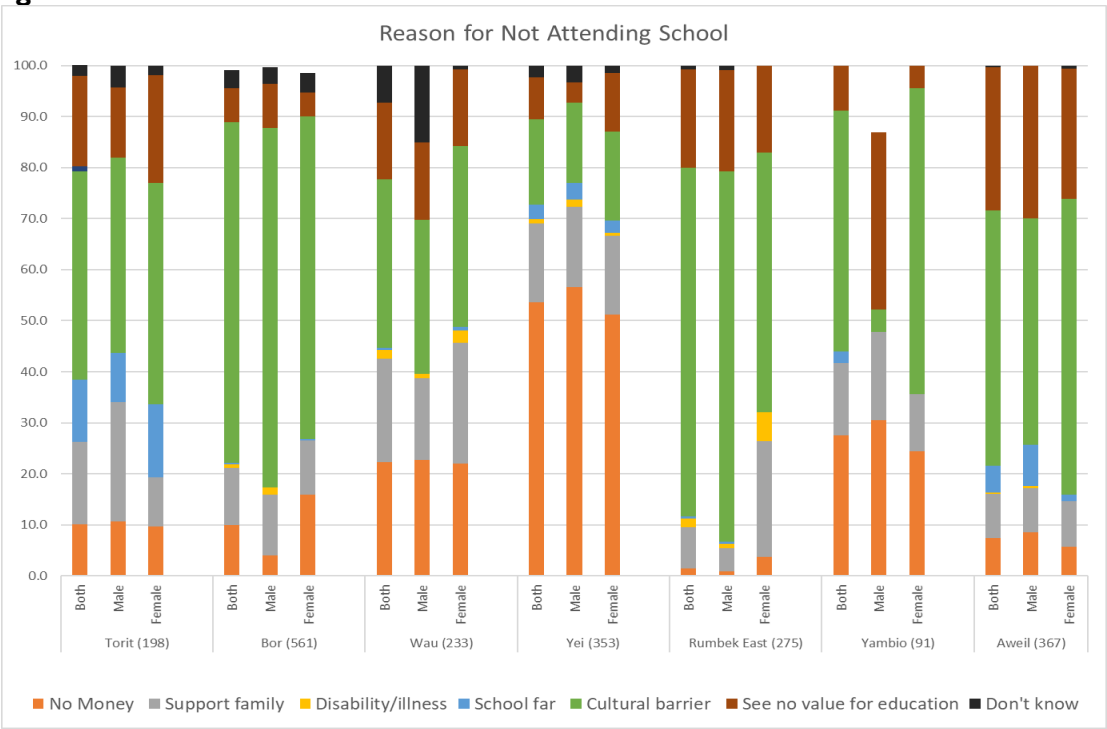


Figure 1.23

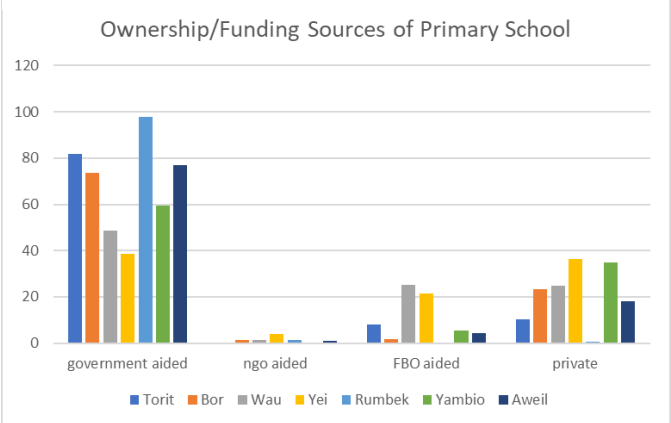
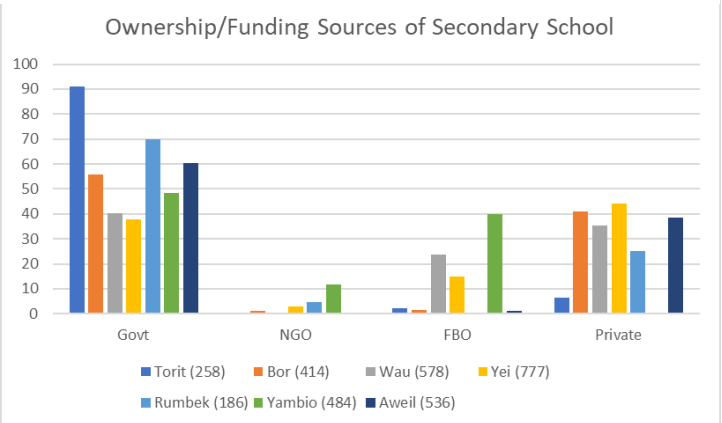


Figure 1.24



Conflict has serious implications on education. Indeed, because of conflict, schools and roads are closed or become too dangerous. Focus groups discussions indicate that dropouts increase as school fees increase. A teacher in Yambio said "During the time of peace about 600 to 700 pupils were in school, but now only 200 pupils and the girls are very few… parents are unable to pay fees to sustain them in the school." Responses stated that private schools are too expensive, yet within government schools, resources and teacher shortages affect their quality. School resources get stolen and textbooks taken. "You can go to school in the morning and spend the whole day there and no teacher, unless you go to private schools," said one girl. Teacher salaries are low, teachers often go unpaid for months, or (particularly foreign teachers) flee due to conflict. Comments were particularly sympathetic toward female teachers, who suffer disproportionately.

In certain situations, young females have taken incredible initiative to pay for school, working and saving up before courses begin. "If you know that your mother is not able to get money to pay your school fees, then you have to know how to make business in order to pay your school fees." When parents can pay school costs, qualitative data showed that often mothers' incomes cover school fees. Safety, cultural barriers and young motherhood further inhibit female education. Most young mothers postponed studies (often indefinitely) due to child-rearing, though many expressed desires to return.

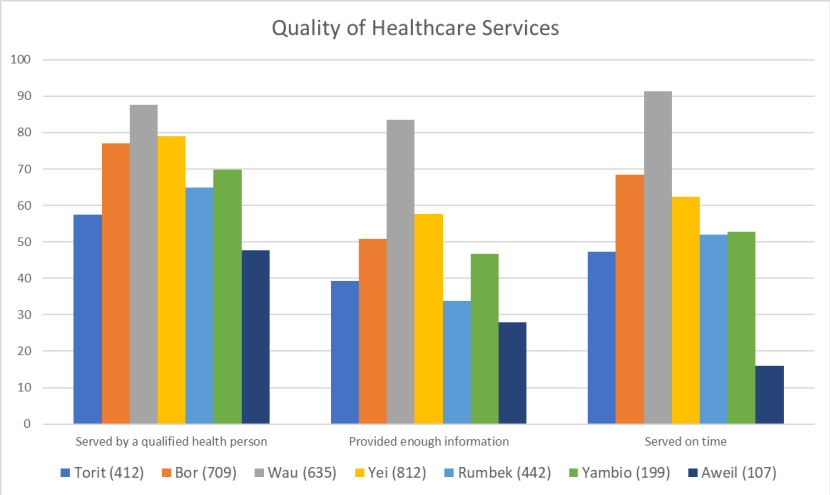
Several respondents indicated the significance of language in education. "Your own language is not helpful if you migrate," and the need for Arabic or English language skills has shifted over time. Now many are attuned to the value of learning English due to NGO work opportunities and requested that languages be taught earlier than in high school. Youth also called on their parents to teach their children the languages they know even before sending children to school, to take advantage of existing knowledge within the home. FBOs and peace committees called for schools to teach more vocational skills to help sustain one's life and livelihood. Comments indicated the commonality of children migrating to Kenya and Uganda for education, but for some this was wrought with tension, since sending children away for education is often possible only for more wealthy households.

Focus group respondents revealed a growing hunger for education across many group (i.e. youth, females, local leaders, FBOs, CBOs, peace committees, teachers). Nonetheless the lack of will and resources to put teachers on the ground and safety barriers persist. Cultural, social and economic hindrances continue, including paltry education facilities and teachers, and increasing the expected value of education. Youth, especially female youth, look to education for opportunities and meaning. Community leaders and organizations note that schools provide leadership and direction for youth—potentially keeping them out of conflict. Because of the severe cost barriers to education, organizations could consider facilitating non-cash-based options to pay for school fees in situations where exchange of goods or trade services may be appropriate.

HEALTH

Relative to other PAs, Yambio households have experienced "average" health care services; roughly half of households indicated healthcare services were not timely nor were families provided sufficient information (Figure 1.25). Focus group discussions highlighted general discouragement with health services, noting the long distances to hospitals, absence of drugs in pharmacies, and that doctors have given up because of low pay or no facilities. In addition to formal services, respondents described less community investment in caring for the sick and disabled. They also reported that NGO help was requested and called for support on trauma awareness and reconciliation.

Figure 1.25



WATER

While multiple water sources may be available in each community, most households depend on one or two primary sources. Hand pumps, boreholes (without network) and dug wells provide the predominant water sources in Yambio; open running water serves roughly 12% of households. Most households travel less than one hour to the available water source (Figure 1.27).

Many respondents manifested concern for community management to protect separate boreholes for humans and livestock, and called for NGO or government support to bring boreholes to distant rural communities. Yambio community members complained of "getting diseases" from water, and mentioned using chlorine to treat water.

Figure 1.26

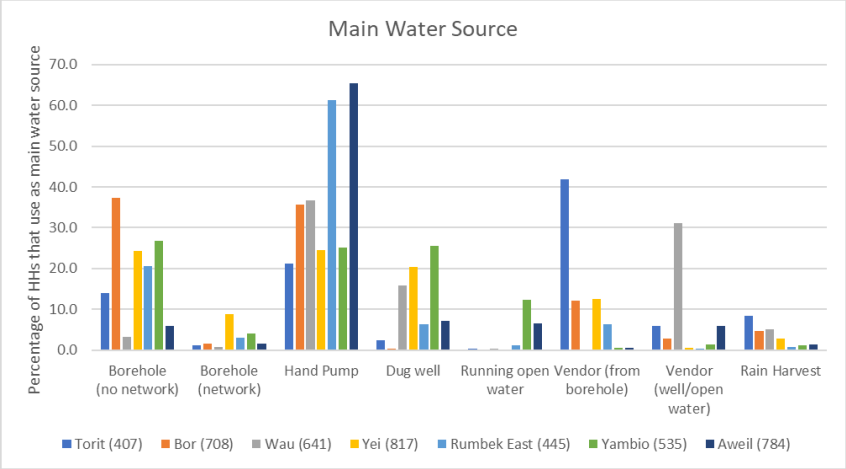
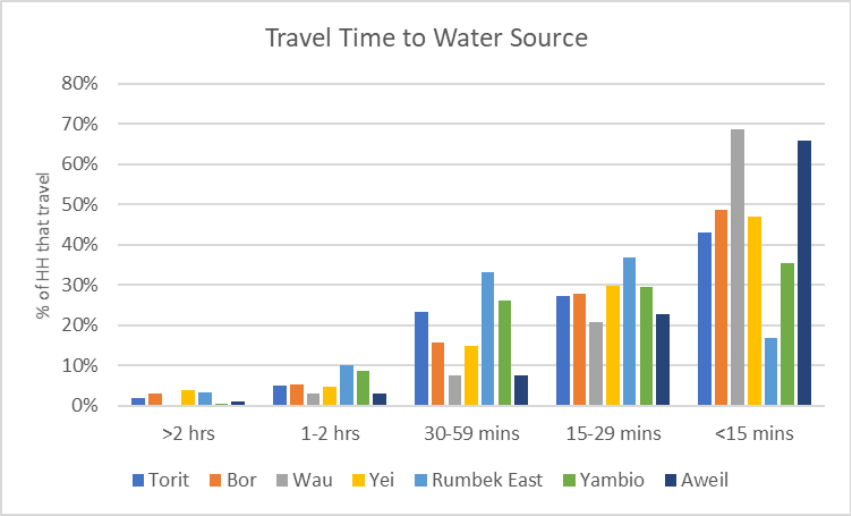
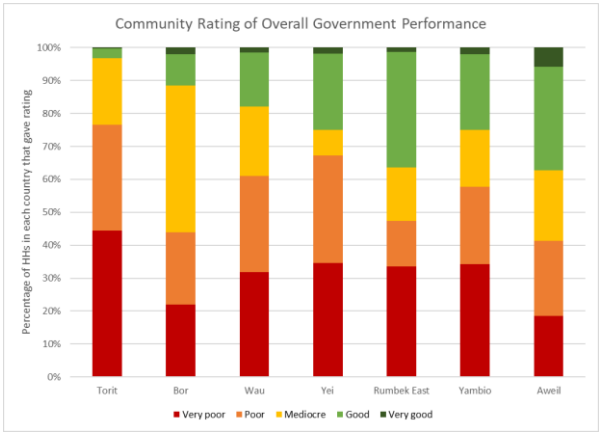


Figure 1.27



QUALITY OF GOVERNMENT SERVICES

Figure 1.28

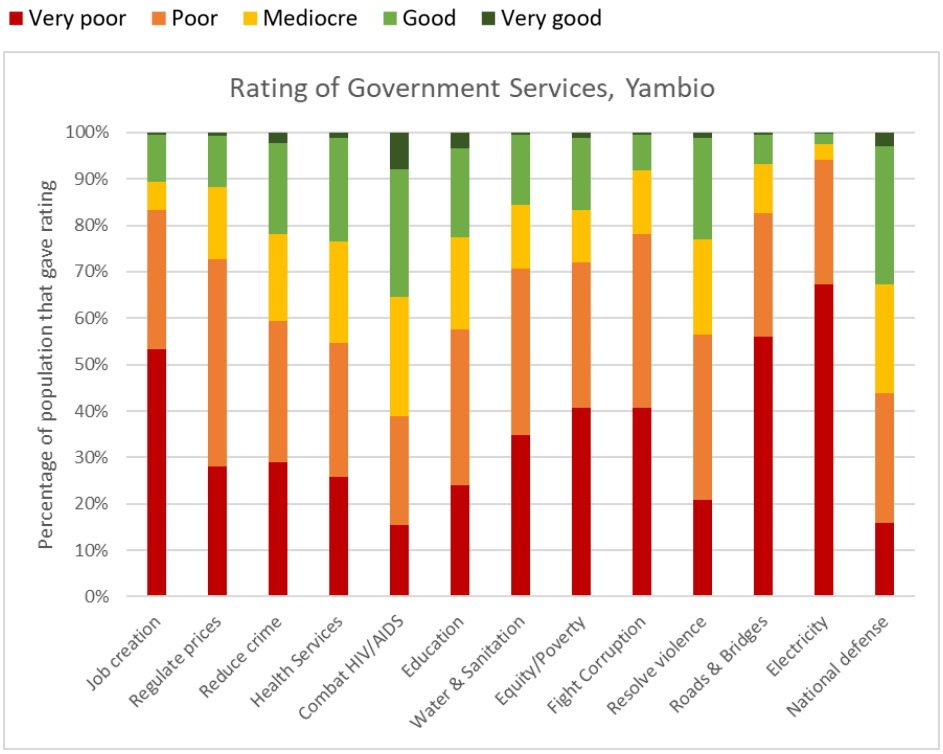


The seven PAs generally have a poor view of government services (Figure 1.28), and Yambio is no exception. Yambio's population in particular complained about poor job creation, corruption, infrastructure and price regulation (Figure 1.29).

Most focus group discussions of government services complained of lack of trust and accountability (described in section 1.2), oil and resource conflicts, unqualified appointed administrators and unequitable distribution of basic services. One Yambio peace committee believes that timely government pay would reduce night crime due to civil servants forced to go without pay, who "then use their guns to get food and money for school." Many complained about inflation and price volatility, the need to reach distant rural communities with services, and the paucity of schools, hospitals, law and order. Responses also reflect a general decline in infrastructure, including road and market access.

Peace committees in Yambio noted that most "government programs are conditional, which doesn't help communities," and that projects are implemented "without community consultation, or just based on political influence." Yambio Peace committees have helped facilitate dialogue, and in these conversations, many people have noted that "it was the first time for the government to come and listen." Local leaders urged respect for local resources, with clear community consultation and communication. For example, timber companies in Yambio that cut teak on community land often arrive without thorough prior consultation regarding the percentage of benefits that will go back to the community for development.

Figure 1.29. Rating of Government Services

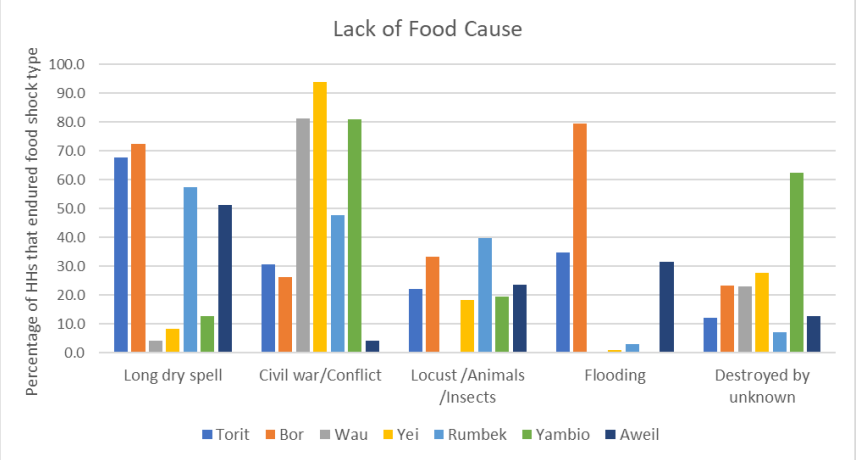


1.4. PRODUCTIVE CAPACITIES

FOOD INSECURITY AND AGRICULTURAL PRODUCTION

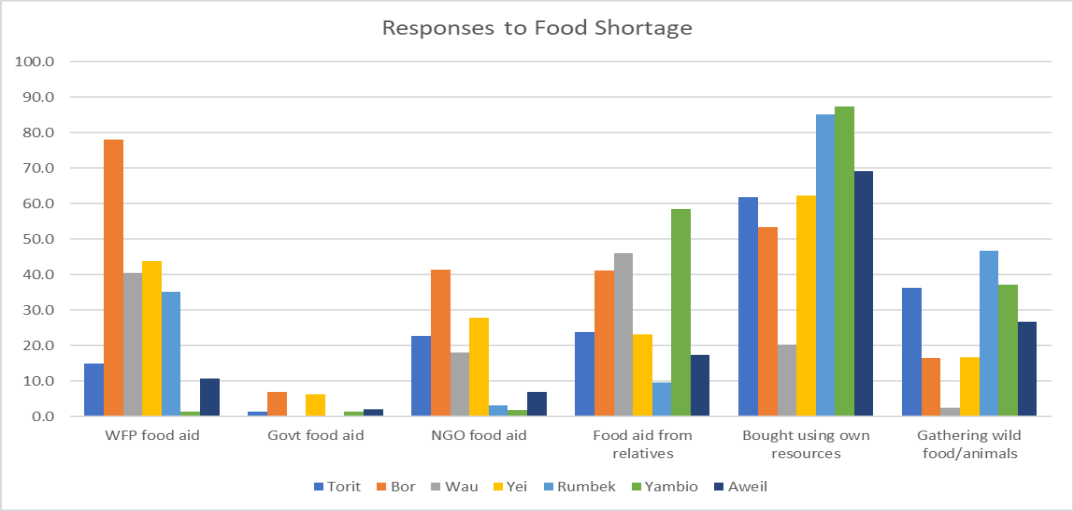
In general, food insecurity is a real and ubiquitous risk in South Sudan, entangled in warfare, conflict and climate change threats. Most households in the seven PAs experienced lack of food over a 12-month period. Comparatively, Yambio's food insecurity rate of 55% is less severe than most PAs. Civil war and conflict are the main drivers of food insecurity in Yambio, animal and insect pests modestly affected food security, and further research is required to understand the "unknown" destruction that affected over 60% of surveyed households (Figure 1.30).

Figure 1.30



Most households responded to food insecurity by purchasing food with their own resources or relying on relatives. Gathering wild plants and animals also plays a notable role in curtailing food shortages in Yambio (Figure 1.31). Given Yambio's dependency on foraging and hunting during food shortages, protection from regional violence and community access to local natural resources became critical.

Figure 1.31

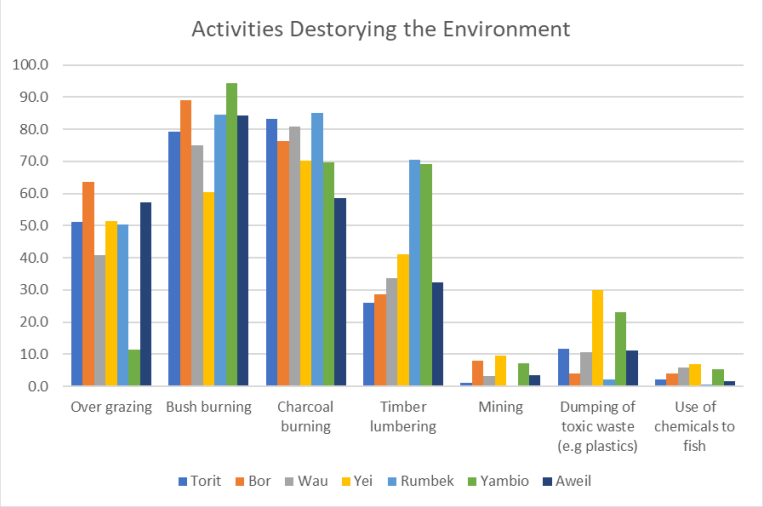


In addition to social and environmental factors that inhibit food security (Figure 1.30), human activities can threaten soil —and therefore food security resilience—as well as threaten human health and livelihoods due to pollutants and destruction of natural resources. Bush burning and timber lumbering in particular are prevalent in all most counties, but highest in Yambio. These human activities threaten resilience by deteriorating soil structure, decreasing agricultural productivity and biodiversity, and exacerbating erosion and runoff pollutants (Ozaslan et al., 2015; Vagen et al., 2005). Despite the obvious present value of bush

burning and timber lumbering, they have various deleterious future effects, so efforts must be made to *prune, plant and preserve*, and encourage applied agroecological or agroforestry knowledge that benefits ecosystem diversity—enhancing food security by building healthy soils and ecosystems. While it is difficult to make sweeping generalizations about the impact of bush burning due the particularities of ecosystems and the intensity and regularity of burning, the potential effects can be devastating to soils inherent fertility—one of the foundations of food security resilience and flood and drought resilience. Bush burning can severely diminish soil's ability to absorb and retain water. Stripping soil of its sponge-like capacity worsens the impacts of both floods and droughts. The chemical changes from burning and the devastation to soil organic matter and plant biomatter in the ground exacerbate water repellency and erosion, stripping away topsoil as well as essential soil micronutrients, microbiota and fungal life. Destroying shade systems can further heat and dry out soils, exacerbating erosion and salinization. Timber lumbering further threatens shade cover, roots systems and biodiversity resilience. Strong efforts should be made to protect, prune and plant, so that the immediate financial benefits of these activities do not devastate future ecosystems, soil health, food security and resilience.

Prevalent charcoal burning further threatens air quality and respiratory health. Timber lumbering further threatens land and biodiversity resilience. Mining, toxic dumping and fishing chemicals also affect Yambio (Figure 1.32).

Figure 1.32



With respect to farming, all counties focus on carbohydrate-dense grains as the most important crops. Yambio similarly prioritizes maize and groundnuts. Agricultural diversification can reduce household and regional vulnerability to climate and market shocks (Brenda, 2011), as well as benefit health, provided households diversify with nutrient-rich crops and animal-source foods (Kennedy et al., 2010; Hoddinott et al., 2002). Many households cultivate multiple crops. Figure 1.34 presents the most common crops in Yambio. Carbohydrate-dense grains and groundnuts still dominate, with low representation from fruits and vegetables.

Figure 1.33

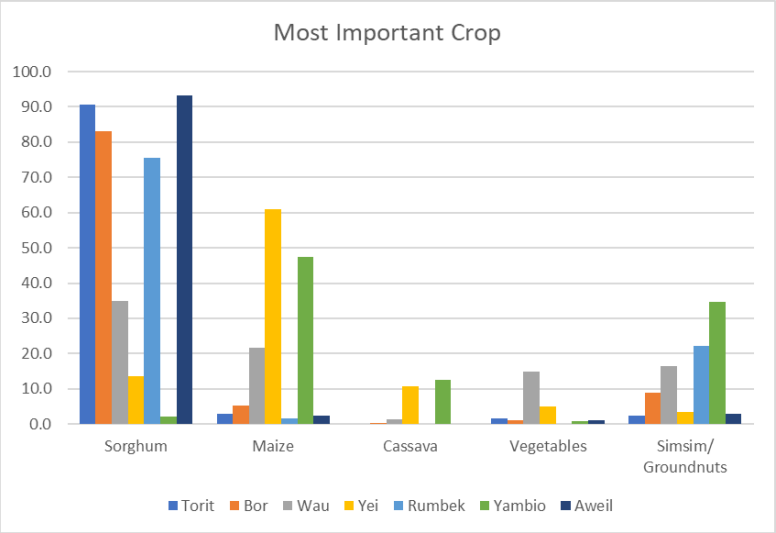
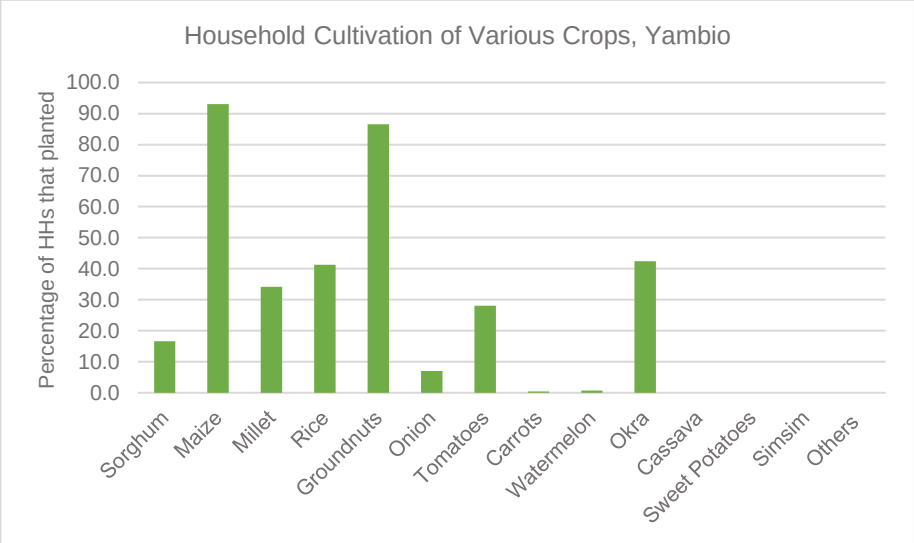


Figure 1.34



Focus group discussions highlighted agriculture's role in food security, as well as in cultural identity, peace and dignity. Many comments across demographics looked to farming for food security at the community and household level, yet others expressed a sense of vulnerability in agricultural survival and the need for training on extension services. Many respondents expressed a sense of collective strength in agriculture for information-sharing, coordination with external support ("NGOs say 'stay in cooperatives so we can help'") and collective-cultivation coordinated by cooperatives, CBOs or congregations. They highlighted the role of food security for strengthening re-integration in host communities. Some comments addressed the risks of agronomic knowledge being lost, speaking of more diverse cultivation by previous generations,

and the need to maintain agronomic education, a training center for vegetables, fish ponds and bee-keeping.

Respondents identified several threats to agricultural productivity, namely lack of tools and skills, crop pests and security. Comments called for help to bring garden tools, pest management knowledge and insecticides. Some believed that, skilled and equipped with modern tools to grow a variety of crops, "production would be enough." Security remains a constant threat to production, foraging and fishing.

LIVELIHOODS

Most of Yambio's working population is engaged in crop production. Women and young females are more likely than males to work in catering and baking, while males dominate construction, motor vehicle mechanic work and carpentry industries and to a lesser degree, livestock production (Figure 1.35). Market livelihood activities varied less by gender (Figure 1.36). Alcohol brewing stands out as the dominant market livelihood activity. Yambio has strong access to broader markets compared to the other PAs which increases the attractiveness of this activity. Unfortunately, it is also more likely to contribute to the high prevalence of alcohol abuse, domestic violence and child abuse, which are more prevalent in Yambio than most other PA communities. Firewood collection and charcoal burning are also predominant market livelihood activities, that unsustainably extract or exploit non-renewable resources; Yambio surveys indicated the environmental destruction from bush burning, charcoal burning and lumbering. To achieve more resilient futures and reduce conflict, sustainable livelihood practices should be adopted.

Figure 1.35

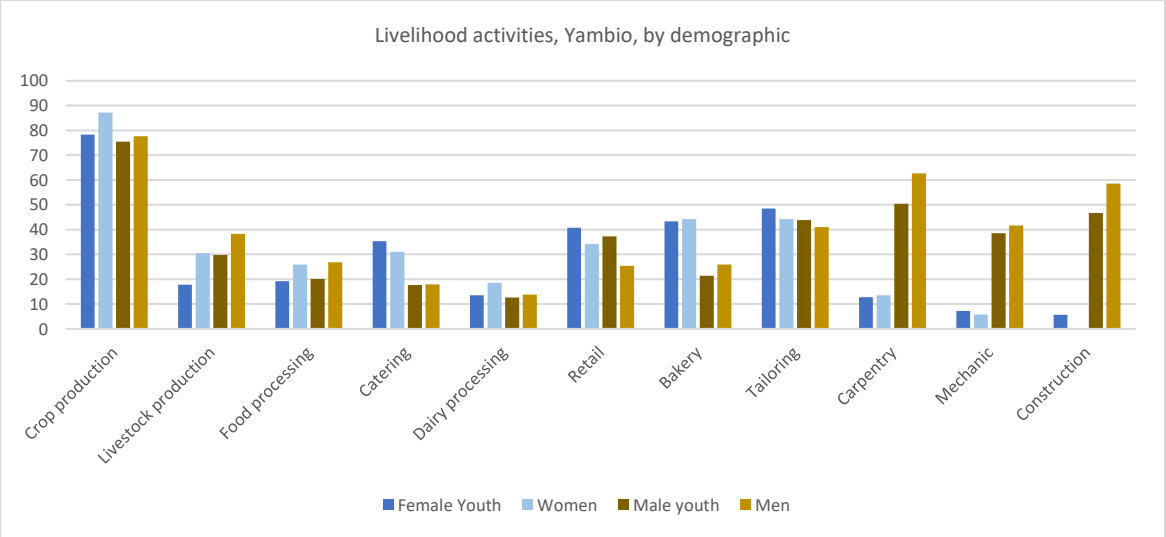
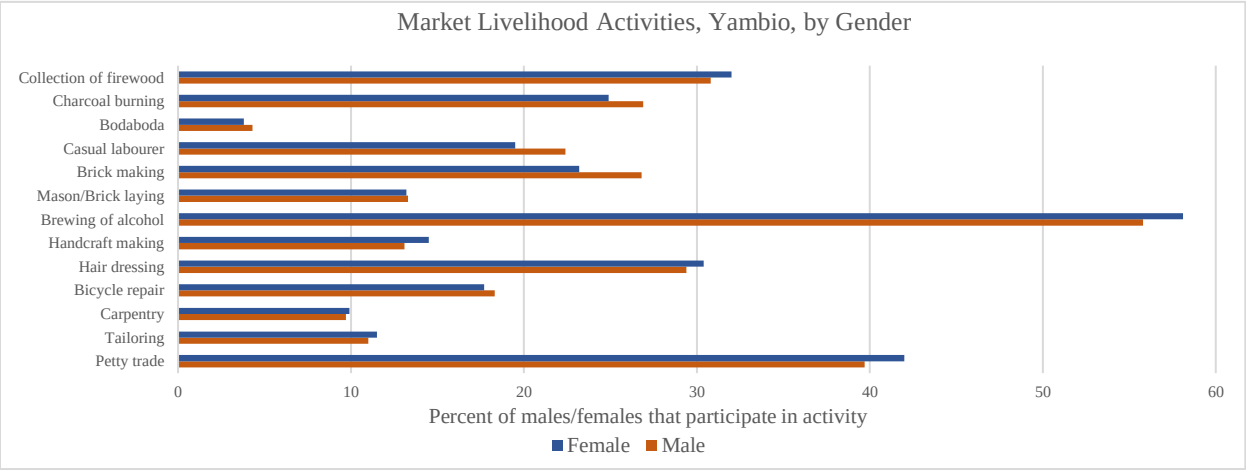
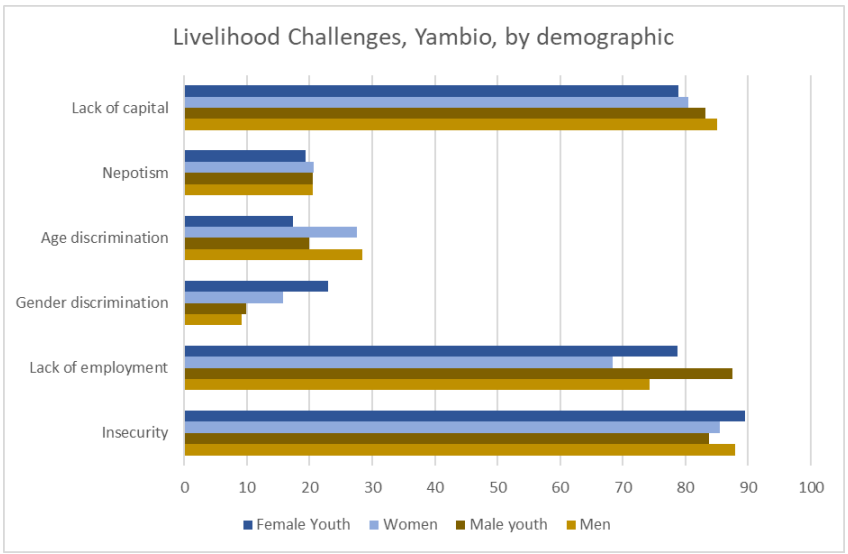


Figure 1.36



Males and females of all ages in Yambio generally agreed on the obstacles to livelihood activities, with the exception that females encountered far more gender discrimination, youth predominantly complained of lacking employment opportunities, and adults complained more of age discrimination (Figure 1.37). The latter may suggest that youth can work for lower wages, distorting the labor market for adults. All cited insecurity, lack of employment opportunities, and lack of capital as the primary livelihood obstacles.

Figure 1.37



Like the quantitative survey data, qualitative data revealed a lack of capital. FBOs articulated the need for "micro-finance, small-income generation and education" to help build financial and human capital and meet strong demand for small-business. They also called for the development of vocational skills on construction, and factories that provide jobs and enable agricultural export within the region. There were complaints over the high cost of materials, and the need for simple infrastructure to protect their

investments and labor. Women's tailoring collectives called for investment support, lamenting that "sometimes we find big contracts, but lose them because we lack machines and equipment." Farmers repeated the call for tools; "If you don't have money and the tools to clear your garden, then how can you move ahead farming?"

Again, cooperatives emerged as an important institution for financial and community support—especially for women's and youth businesses. They also play a role in evolving gender relations. Respondents indicated that government and NGOs have pushed for cooperatives, which make it easier to distribute support. Young women, in particular, indicated the importance of collective economic and social support. Collectives also present positive opportunities to build gender relations in co-ed cooperatives; as a male farmer in Yambio stated "We saw that gender has to balance; for example, in our cooperative the Treasurer, Vice Secretary and Information Secretary are all women. We see it is really very important."

Comments from women's focus groups showed vibrant participation in local business, driven by the need for income. Women stated they were good at generating money and business, and "stay long in the markets" to ensure bringing home income. They claimed that supporting women with livestock is especially helpful because women are "good at livestock," though they also expressed the risk of theft of their resources—particularly of cattle."

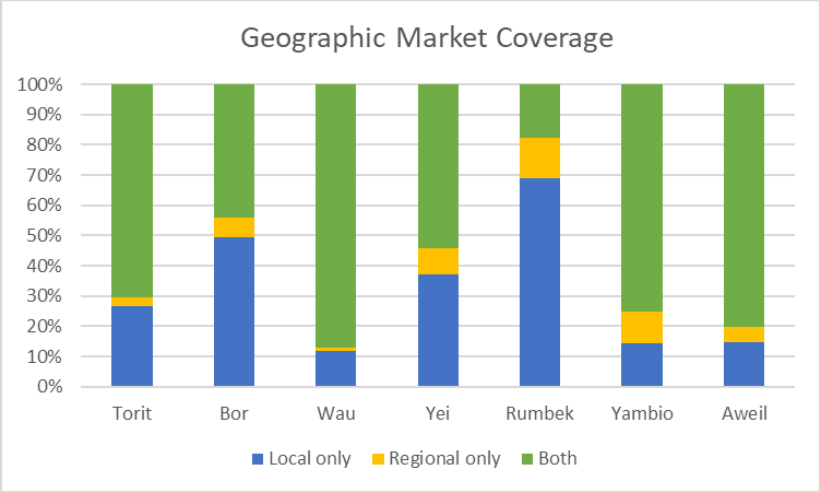
Both quantitative and qualitative data revealed the importance of alcohol brewing for income generation. Even girls indicated learning the trade from their mothers in order to pay their school fees. Interestingly, no comments articulated the connection between the livelihood activity and local conflict, even though surveys revealed a strong correlation between alcohol abuse, child abuse and domestic violence.

Livestock play a particularly contentious role in communities, due to the powerful income-generation and nutritional benefits they offer, but also the threat of theft, violence and resource conflicts associated with livestock. Furthermore, livestock plays a complicated socio-cultural role; many comments connected cattle raiding to marriage, "because without livestock there is no marriage."

MARKET ACCESS

Over 90% of Yambio's households have regular access to a common open market, though only 60% of households have daily access. However, compared with other PAs, Yambio has the highest general market access, with both local and broader regional access. (Figure 1.38)

Figure 1.38



Qualitative data illuminated the ramifications of limited market access for many farmers: "Without feeder roads our crops rot." Data articulated a decline in road and market access in recent years. But most qualitative data addressed poorly-functioning markets, rather than mere limited *physical* market access. Producers and consumers complained of price uncertainty, limited or dishonest buyers, and in some cases low demand or supply of agricultural products.

Consumers complained that "commodities in the market are still very expensive." Both consumers and producers expressed anxiety over price uncertainly tied to the dollar. A woman in Yambio complained of limited supply and high cost: "Hen's eggs are one of the most expensive things here, 150 SSP per a single egg and it is not there at all sometimes." On the other hand, some producers have "given up due to low payment," complaining that their "farm products are bought so cheaply" that going to market is not worth the cost of production. Maize producers complained that "some buyers take the maize and delay payment," or that they are "forced to sell maize in large bulk instead of smaller quantities." Other producers have faced weak demand for the quantity of their production, "If you have too much food and they don't buy, it will not help. NGO doesn't come and buy." Some well-intentioned NGOs have supplied seeds that may not have been suited for market demand.

Qualitative data demonstrates strong resolve among producers, like that expressed in a young female focus group in Yambio: "We should be self-reliant. We should be able to do little business to pay school fees and to care for our young brother and sister." While an array of data called on government or NGOs to subsidize capital investments and loans, build infrastructure and solve market failures, many comments highlighted the desire for community-based resilience and self-sufficiency. Finally, focus groups discussions reveal how intimately vocation is intertwined with mental health resilience. As a women's group communicated, "We need activities that will make us busy. The only thing to make us free from this trauma is to bring things that will make us busy and we shall be self-reliant."

Yambio is highly dependent on agriculture for food and economic security yet faces severe agronomic, capital, environmental and market constraints. In addition to climate and market uncertainties, the internal and external conflicts/violence that communities face requires special attention to the social, educational and gender components of any agriculturally-based intervention. In this regard, a diversity of agricultural development methods should be considered since some regions—particularly remote communities vulnerable to shocks—may not be suited to conventional agricultural development practices. In the absence of well-functioning markets with consistent access to agricultural inputs and consumer demand,

farmer adoption of typical production-enhancing technologies could weaken resilience over the long-term if the entire socio-ecological system is not accounted for. Research has demonstrated that some agroecological systems simultaneously enable communities to improve nutrition outcomes and recuperate the inherent productivity of degraded soils such that it reduces dependency on external (often volatile) markets and enhances climate resiliency—even in semi-arid regions (Tittonell et al., 2011; Boyd et al., 2013). In some localized efforts, stronger gender and community relationships and farmer-to-farmer education go hand-in-hand with improved livelihoods and sustainable management of natural resources, demonstrating powerful socio-ecological-economic dimensions. Biodiversity can offer protective measures for nutrition and food security, pest management, and sustainable livelihoods from ecosystem services—ranging from culinary livelihoods and food processing (Kerr et al., 2013; Gubbels, 2011).

MEASURING AND EXPLAINING RESILIENCE

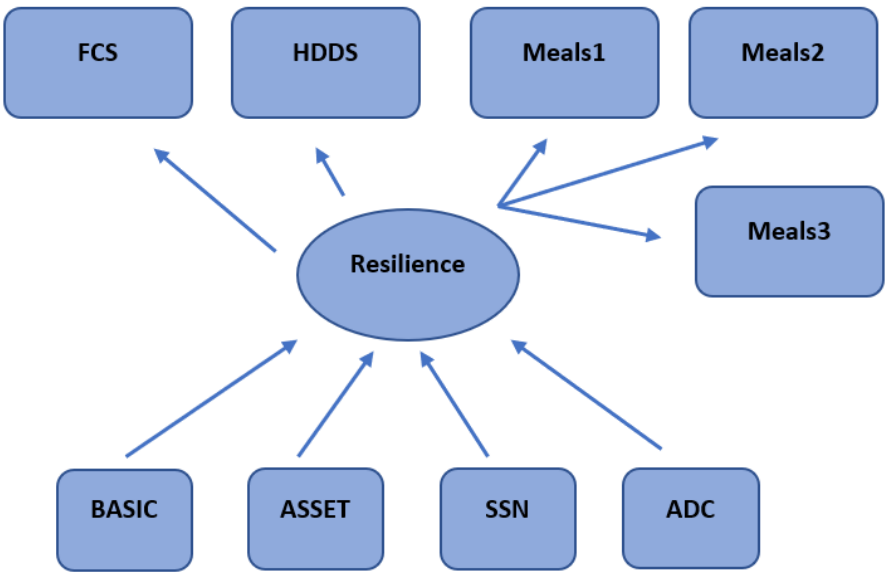
2.1. METHODOLOGY AND DATA

We adapt the FAO's Resilience Index Measurement and Analysis-II (RIMA-II) methodology, which, along with its predecessor RIMA, has been implemented in around 15 African countries to estimate households' ability to maintain well-being in the face of shocks (FAO, 2015; FAO, 2016). In RIMA and RIMA-II, resilience is estimated as an index, based on observed indicators of assets, livelihoods, and access to services and safety nets, which are organized into pillars.

It should be noted that whenever the RIMA/RIMA-II methodology is applied to cross-sectional data, it would be accurate to interpret the resulting measure in terms of capacity to prevent vulnerability rather than resilience per se. Indeed, because resilience is a dynamic concept, it usually is defined as the ability to maintain a minimum level of well-being despite stressors or shocks. Thus, it is best measured with panel or longitudinal data in which changes in well-being over time, as a result of shocks, are observed. In a cross-sectional setting, the RIMA-II methodology measures the contribution of different variables to current well-being (usually represented by food security outcomes), rather than measuring the maintenance or improvement of well-being over time as a result of shock. In the remainder of this section, we will refer to the latent variable estimated as "resilience," but it is better understood as a capacity index associated with household and location characteristics, grouped under the pillars, which contribute to resilience and ultimately to the desirable well-being outcomes.

Figure 2.1 demonstrates the resilience measurement framework graphically.

Figure 2.1. Resilience measurement framework



Source: Authors, based on FAO (2016)

Note: BASIC—Access to Basic Services; SSN—Social Safety Nets; ADC—Adaptive Capacity; RES--Resilience; FCS—Predicted Food Consumption Score; HDDS—Predicted Household Dietary Diversity Score; Meals1—Per capita number of cooked meals consumed the previous day by children over 12 and adults; Meals2—per capita number of cooked meals consumed the previous day by children aged 6-12 years; Meals 3—Per capita number of cooked meals consumed the previous day by children aged 2-5 years.

Following the computation of the resilience index we use regression analysis to estimate the effects of household characteristics and other factors on resilience. To account for the social and institutional environment, we construct variables to represent the quality of governance as perceived by households, strength of institutions, and exposure to conflict, based on a set of underlying variables.

We apply the RIMA-II methodology to cross-sectional household survey data collected by Management Systems International (MSI) in the 7 Partnership Areas (PAs) in 2018 to estimate the resilience of households in Yambio. Like FAO, we use indicators of food security as the outcomes of resilience. Data were collected on household characteristics and livelihood sources; the availability of livelihood opportunities; weather shocks and conservation; food security and coping strategies; health and health care; community participation by women and children and community organization; violence and insecurity; conflict; and perceptions of the quality of governance and the causes of conflict. The variables and sub-pillars constituting each pillar are listed in Table 2.1.[1]

TABLE 2.1. RESILIENCE PILLARS AND INDICATORS

PILLAR	INDICATORS
Access to Basic Services	**Education:**
	Distance to primary school
	Distance to secondary school
	Participation in vocational training
	Existence of agricultural extension workers
	Markets:
	Access to a common open market
	Market located along trade routes
	Health services:
	Number of health facility types where household members go when sick
	Health facility provides free care

[1] The specific lists of variables used for resilience analysis in each PA are subsets of the list in Table 2, as some variables were dropped in some PAs due to missing values or other issues.

	Time to reach the health facility
	Respondent was satisfied with quality of health service
	Respondent was served by a qualified person
	Time spent waiting until attended to
	Health provider treated respondent with respect
	Respondent was served on time
	Health personnel give respondent enough time
	Respondent was provided with enough information
Social Safety Nets	Access to remittances from within South Sudan
	Access to remittances from outside of South Sudan
	Number of ways in which household overcame lack of food (e.g., food aid from WFP, government, friends and relatives, etc.)
	Knowledge of organizations doing humanitarian / development work in the community
Assets	Predicted landholdings
	Predicted numbers of wheelbarrows; beds; sponge mattresses; chairs; tables; radios; televisions; cellphones; mosquito nets; motor bikes; bicycles; flat irons; stoves; solar panels
Adaptive Capacity	Educational attainment of household head
	Number of types of fuel used by household for cooking
	Number of agriculture-related livelihood activities household members are involved in
	Number of non-agriculture-related livelihood activities household members are involved in
	Number of formal employers of household members
	Number of crop types planted in 2018
	Access to information to warn about natural disaster

The variables used to construct the institutions, governance and conflicts scores are listed in Table 2.2. The governance score is composed of variables representing respondents' perceptions of the quality of

the governments' performance in different areas, including creating jobs, reducing crime and corruption, improving access to education, etc. Thus, the governance score directly measures perceptions and can serve as a proxy for actual governance quality. For the conflict score, we use variables representing the presence or frequency of conflicts and violence, such that the higher scores are associated with more conflict and violence.

TABLE 2.2. INSTITUTIONS, GOVERNANCE AND CONFLICTS INDICATORS

PILLAR	SUB-PILLAR AND INDICATORS
Institutions	Number of organizations/groups named that support this community
	Number of community institutions named that affect households' daily lives
	Presence of a traditional leader
	Frequency of community meetings held by traditional leaders
Governance	Respondents' ratings of government's efforts to create jobs; keep prices down; reduce crime; improve basic health services; combat HIV/AIDS; address educational needs of the country; provide water and sanitation services; ensure that everyone has enough food; fight corruption; resolve violent conflict between communities; maintain roads and bridges; provide a reliable supply of electricity; defend the country
Conflict and Violence	**Conflicts sub-pillar:**
	Existence of conflicts during in-migration or out-migration
	Existence of conflict related to the market
	Household's involvement in conflict in the post-independence period
	Number of types of conflict household involved in after independence
	Number of ways listed in which the household has been affected by conflict
	Number of ways listed in which the community has been affected by conflict
	Existence of ethnic based conflict in the last 12 months
	Violence sub-pillar:
	Existence in the community of burglaries; robberies; assaults; gangs; vandalism; violent disputes; alcohol abuse; drug abuse; domestic violence; child abuse; prostitution; rape; cattle raiding

Perception of safety moving around compound at night
Perception of safety going about daily activities

Following FAO (2016), we implement the RIMA-II methodology using four pillars: i) Adaptive Capacity, representing households' ability to absorb and adapt to shocks and stressors; ii) Social Safety Nets, representing the availability of formal or informal social protection and other resources to lessen the impact of shocks; iii) Assets, representing a households' physical assets and income; and iv) Access to Basic Services, indicating the households' access to and use of services such as education, extension, markets, and health facilities. Since the MSI survey data does not include detailed information on assets, we used predicted values of household assets and landholdings based on recorded assets and landholdings of similar households in the same areas from data collected by WFP and FAO. For each PA, we use the WFP/FAO data to run truncated tobit regressions for landholdings and numbers of different assets owned (e.g. mattress, cell phone, bicycle, etc.), using as explanatory variables location attributes and household characteristics which are also recorded in the MSI data (e.g., age, sex and education level of household head, type of toilet, and main water source). We then use the regression results to predict level of each asset for households in the same PA in the MSI data, based on household characteristics. These predicted land and asset levels are used to calculate the Assets pillar.

The pillars are indices composed of several observed variables; the computed pillars are then used to estimate a resilience index as a latent variable. Theoretically, all pillars should contribute positively to household well-being via the latent variable measuring resilience. It should be noted that in practice, the construction of each pillar index is sensitive to the extent to which the indicators composing the pillar are correlated with each other. When pillar variables are negatively correlated, it becomes difficult to predict the overall effect of the pillar on outcomes; for this reason, we drop variables if necessary to avoid negative correlations between pillar variables.

As pointed out above, the RIMA-II methodology as implemented by the FAO measures "food security resilience," or the ability to maintain food security in the face of stressors and shocks; food security indicators are functions of resilience. The MSI data contains only one binary variable indicating whether a given household lacked food within the past 12 months. This food security measure has very little variation across households and thus is not very informative for the purposes of resilience analysis. The proportion of households which experienced lack of food in the past 12 months was over 75 percent in four out of the seven PAs, which reflects the widespread food insecurity in the priority areas.

Instead, we opted to use five predicted food security variables—the Food Consumption Score (FCS), Household Diet Diversity Score (HDDS), and numbers of meals consumed by different age groups—as the resilience outcome variables. The FCS captures the number of food groups consumed in the past 7 days, while the HDDS measures the number of food groups consumed in the past 24 hours; the variables on meals measure the per capita number of warm and cooked meals consumed in the previous day by children aged 2-5 years, children aged 6-12 years, and children over 12 and adults. The variables were measured in the data collected by WFP/FAO in the same PAs, and were predicted for each household in MSI dataset based on the values of similar households in the WFP/FAO data using the methodology employed for the predicted Asset variables described above. In addition to the greater variation, the predicted variables offer richer information than the binary food security variable in the MSI data. Dietary

diversity variables such as the FCS and HDDS have been found to be good predictors of undernutrition indicators and reflect the influence of shocks and stressors (Headey and Ecker, 2013).

2.2. PILLAR CONSTRUCTION

In Table 2.3, we report the weight[2] of each variable in the Access to Basic Services pillar. Physical proximity plays a strong role, with distance to primary school and travel time to health facility playing the most prominent roles in the pillar.[3] These are followed in importance by health care variables. Access to extension services, vocational training and markets play the least roles. Households in Yambio have relatively close proximity to education, with the majority of households traveling less than 5 km to a primary school. Access to health services is more constrained as around 50 percent of the sample households have travel times to health facilities of between 15 and 59 minutes, and close to another quarter experiencing travel times between 1 and 2 hours. Almost three-fourths of households are provided with free health care at their health facility, but only slightly over half of households were satisfied with the quality of health care received during the most recent visit, suggesting access to good-quality health care is low. Access to extension services and vocational training are also fairly low, with less than 15 percent of households reporting access to or usage of each service. The limited role of markets in the pillar estimation may simply reflect the lack of variation in market access as measured by the survey, with 94 percent of households having access to a common open market.

TABLE 2.3. ROLE OF VARIABLES IN PILLAR ESTIMATION: ACCESS TO BASIC SERVICES

PILLAR VARIABLES	WEIGHT	MEAN VALUES
Distance to primary school	0.717	3.51*
Time to reach the health facility	0.537	2.26**
Health facility provides free care	0.467	0.73
Respondent satisfied with quality of health service	0.357	0.52
Existence of agricultural extension workers	0.312	0.13
Participation in vocational training	0.278	0.14
Access to a common open market	0.138	0.94

Note: Unless otherwise noted, variables are 0-1 binary indicators
*0: none; 1: 15+ km; 2: 10–14 km; 3: 5–9 km; 4: less than 5 km
**0: more than 2 hours; 1: 1–2 hours; 2: 30–59 mins; 3: 15–29 mins; 4: less than 15 mins

The Assets pillar (Table 2.4) is constructed from the predicted numbers of household assets, based on asset holdings of similar households in the more detailed FAO-WFP dataset. The predicted numbers of

[2] Pillars are constructed using principal component analysis; the weights of each variable are the factor loadings of the first factor.
[3] Only variables used in the Yambio analysis are shown in Tables 2.3-2.6. Additional variables shown in Table 2.2 were not used due to high numbers of missing values, negative correlations with other pillar variables, and other factors.

tables and beds make similar contributions to the overall pillar. Households had slightly over 1 table and 2 beds on average, while most households did not have cell phones.

TABLE 2.4. ROLE OF VARIABLES IN PILLAR ESTIMATION: ASSETS

PILLAR VARIABLES	WEIGHT	MEAN VALUE
Predicted number of tables	0.998	1.21
Predicted number of beds	0.998	2.20
Predicted number of cell phones	-0.023	0.01

The variables that contribute the most to the Adaptive Capacity pillar are those concerned with diversity of livelihood activities: the number of agricultural livelihood activities, the number of crops planted, and the number of nonagricultural livelihood activities (Table 2.5). The level of education of the household head and access to information about natural disasters play smaller roles, while the number of formal employers of household members actually contributes negatively to the pillar. This is due to the low or negative correlations between this indicator and those concerning agricultural and nonagricultural livelihood activities, and suggests that households with members in formal employment are less engaged in agriculture and also pursue a smaller set of non-agricultural livelihood activities than households without access to formal employment. On average, surveyed households were involved in 3.8 agricultural livelihood activities, ranging from 0 to 10, including cultivation of crops such as sorghum, maize, and millet, and raising poultry or other livestock. Households were involved in an average of 2.7 nonagricultural livelihood activities, ranging from 0 to 9; common activities included petty trade, alcohol brewing, casual labor, and firewood collection. Very few households did not engage in agricultural or non-agricultural livelihood activities, and most households combined multiple activities in both areas.

The majority of household heads had some education, with many having advanced relatively far—the average value of 1.8 of the educational attainment corresponds to primary school or *khalwa* (religious education) in addition to some secondary school. Households tended to have lower values in the indicators which contributed less to the Adaptive Capacity pillar. A large majority of households did not have access to information to warn about natural disasters. Around two-thirds of surveyed households had no formal employment; most of the remaining third had one formal employer.

TABLE 2.5. ROLE OF VARIABLES IN PILLAR ESTIMATION: ADAPTIVE CAPACITY

PILLAR VARIABLES	WEIGHT	MEAN VALUE
Number of agricultural livelihood activities	0.599	3.83
Number of crop types planted	0.522	3.57
Number of nonagricultural livelihood activities	0.472	2.74
Educational attainment of head	0.230	1.81*
Access to information to warn about natural disaster	0.034	0.03
Number of formal employers	-0.034	0.36

Note: "Access to information about natural disasters" is a 0-1 binary indicator

*0–None; 1–Primary or khalwa; 2–Secondary; 3–Certificate; 4–Diploma; 5–First degree; 6–Postgraduate

Access to remittances from South Sudan and from other countries carried equal weight in the Social Safety Nets pillar (Table 2.6). The numbers of households benefitting from either type of remittances is quite low, under 5 percent in both cases; this reflects the wide gap between the average pillar values and the minimum values required before improvements in social safety nets start to positively affect resilience. There is fairly low overlap between the groups of households receiving remittances from within and outside of the country, with around 6 percent of surveyed households receiving remittances from at least one source.

TABLE 2.6. ROLE OF VARIABLES IN PILLAR ESTIMATION: SOCIAL SAFETY NETS

PILLAR VARIABLES	WEIGHT	MEAN VALUE
Access to remittances from South Sudan	0.441	0.4
Access to remittances from outside South Sudan	0.441	0.3

Note: Variables are 0-1 binary indicators reflecting whether households have received remittances

2.3. RESULTS AND DISCUSSION

The results of the structural equation model for Yambio are presented in Table 2.7. As expected, the latent variable resilience has a positive effect on food security, as measured by the predicted Household Dietary Diversity Score (HDDS). The effect of resilience on the HDDS is stronger than that on the Food Consumption Score (FCS), which is constrained to a value of one. HDDS measures food consumption over the past 24 hours while the time horizon of the FCS is the past 7 days; to the extent that 24-hour recall is more accurate, the effects on HDDS may be more informative of the impact of improvements in resilience on food security. Resilience also positively affects two of the measures of numbers of meals eaten during the previous day: meals eaten by children aged 2 to 5 years, and meals eaten by children over 12 and adults. Resilience has an unexpected negative effect on the number of meals eaten by children aged 6 to 12 years.

The effects of the pillars on resilience is not linear. For the Access to Basic Services, Assets, and Adaptive Capacity pillars, the pillar coefficient is negative and significant while that of the square term is positive and significant. This indicates that pillar scores have quadratic[4] relationships with the resilience capacity index and suggests the existence of threshold values that must be reached before increases in the pillar values begin to affect resilience positively. The only pillar which does not affect resilience significantly is Social Safety Nets.

Table 2.7. Resilience structural equation model results for Yambio

TABLE 2.7 RESILIENCE STRUCTURAL EQUATION MODEL RESULTS FOR YAMBIO

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	RES	FCS	HDDS	Meals1	Meals2	Meals3

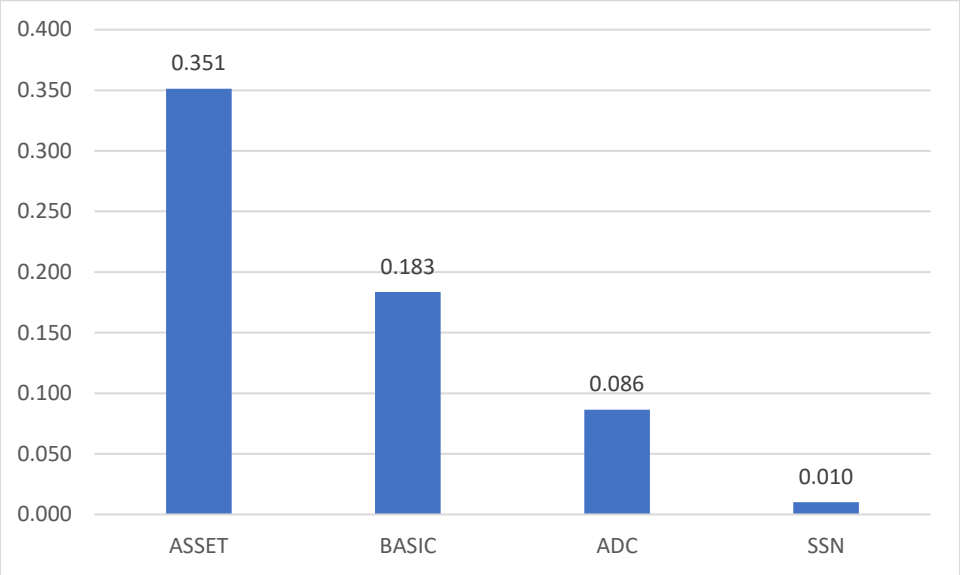
[4] Of the following functional form $y = a + bx + cx^2$; it follows that elasticity is given by $(b + 2c\bar{x}) * \frac{\bar{x}}{\bar{y}}$, where $\bar{x}$ and $\bar{y}$ are averages.

BASIC	-0.538***					
	(0.159)					
BASIC^2	0.269**					
	(0.124)					
SSN	-0.184					
	(0.149)					
SSN^2	0.116					
	(0.229)					
ASSET	-0.780***					
	(0.0905)					
ASSET^2	0.315***					
	(0.119)					
ADC	-0.489***					
	(0.187)					
ADC^2	0.426**					
	(0.197)					
RES		1	1.049***	0.0822**	-0.767***	0.583***
		(0)	(0.0251)	(0.0351)	(0.0708)	(0.0517)
Constant		1.135***	1.067***	1.009***	0.368***	0.704***
		(0.0655)	(0.0699)	(0.0228)	(0.0648)	(0.0501)
Observations	537	537	537	537	537	537

LR test of model vs. saturated: $chi^2(37) = 778.38$, Prob > $chi^2 = 0.00$
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: Pillar variables are expressed as indices ranging from 0 to 1. BASIC—Access to Basic Services; SSN—Social Safety Nets; ADC—Adaptive Capacity; RES--Resilience; FCS—Predicted Food Consumption Score; HDDS—Predicted Household Dietary Diversity Score; Meals1—Per capita number of cooked meals consumed the previous day by children over 12 and adults; Meals2—per capita number of cooked meals consumed the previous day by children aged 6-12 years; Meals 3—Per capita number of cooked meals consumed the previous day by children aged 2-5 years.

To estimate the response of resilience to the change in each pillar, we compute elasticity of the resilience score with respect to each pillar (Figure 2.2). Elasticities are positive for all pillars, and highest for Assets and Access to Basic Services—for these pillars, a one percent increase in the pillar value can be expected to increase the resilience score by respectively 0.35 percent and 0.18 percent. The corresponding change in resilience resulting from an increase in the Adaptive Capacity pillar is 0.09 percent.

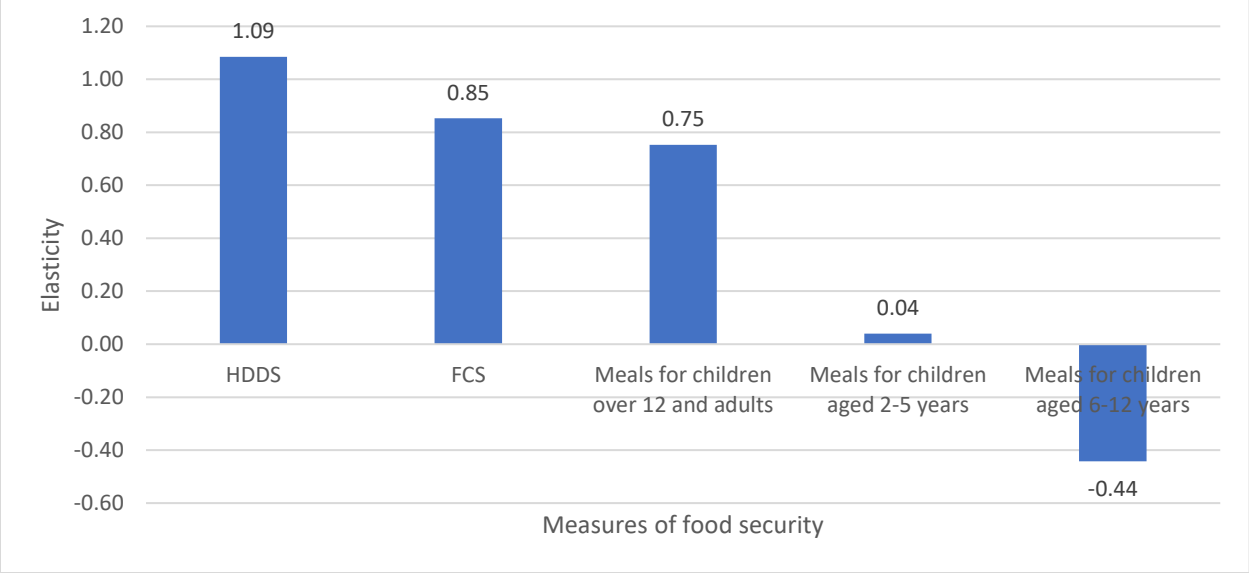
Figure 2.2. Elasticities of resilience with respect to pillar values



Source: Authors, from modeling results
Note: BASIC—Access to Basic Services; SSN—Social Safety Nets; ADC—Adaptive Capacity

As expected, an increase of one percent in resilience is expected to increase household food consumption score 1.09 percent and the dietary diversity index by 0.85 percent (Figure 2.3). However, the distribution within household is rather uneven; although the net effect is positive for the household as a whole, per capita meals increase for children aged 2-5 and those over 12 years while it decreases for children aged between 6 and 12 years.

Figure 2.3. Elasticities of food security with respect to resilience



Source: Authors, from modeling results

Note: HDDS—Household Dietary Diversity Score; FCS: Food Consumption Score

Box 1. Drivers of Resilience: Pillars and Underlying Variables

The four pillar scores represent households' attributes in the areas of Access to Basic Services, Assets, Adaptive Capacity, and Social Safety Nets, respectively. Each pillar is calculated based on indicators reflecting aspects of the overall concept represented by the pillar. For households in Yambio, the **Access to Basic Services, Assets, and Adaptive Capacity pillars** are found to contribute significantly to the resilience capacity index. However, the effects of increases in the pillar values on resilience are not linear: each pillar has a threshold value which must be reached before increases in pillar values begin to affect resilience positively. Increases in Assets have the highest impacts on resilience, followed by increases in Access to Basic Services, with Adaptive Capacity having the smallest positive impact on resilience. However, many households have pillar scores which are too low to have contributed to increasing their resilience: average pillar scores are below the threshold values for all three pillars, with the largest gap in the Assets pillar.

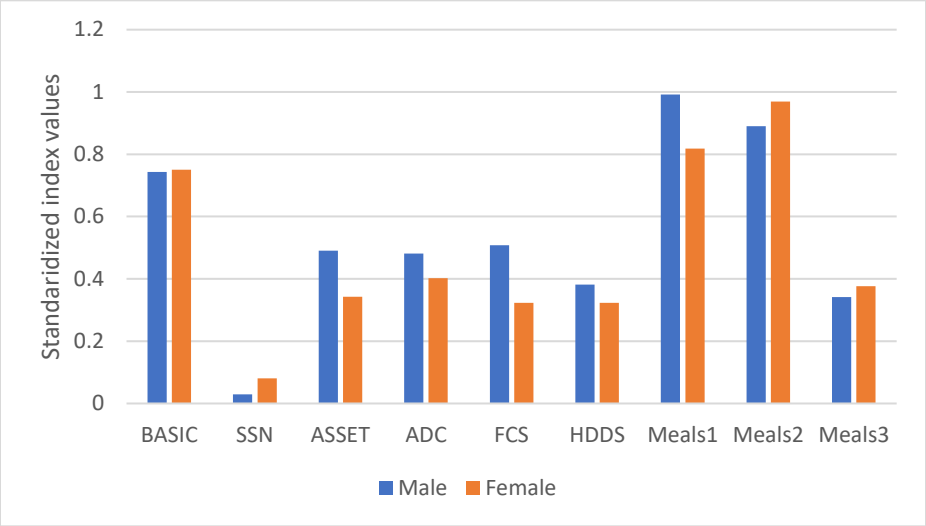
While social safety nets should normally be expected to increase households' resilience, there are several reasons for which the analysis might fail to capture these effects. Most significantly, the presence of social safety nets may be more pronounced in areas or for households with lower resilience. The social safety nets pillar is constructed from variables on remittances received by households; migration rates and therefore remittances received may be higher among poorer households. If the resilience-strengthening benefits of the remittances are not enough to outweigh the households' overall lower resilience, then higher levels of social safety nets could be associated with lower resilience scores.

The four pillars are scores constructed from related underlying variables. To better understand how to increase resilience, we must look at the variables that make up the pillars and their weights in the pillar scores, which reflect their relative importance. The **predicted numbers of tables and of beds** have the highest weights in the Assets pillar. Physical proximity to services plays the strongest role in the Access to Basic Services pillar, with the **distance to a primary school** and **travel time to the household's health facility** having the largest weights. These are followed in importance by other health care variables—access to free health care at the households' health facility, and the quality of health care provided. Access to extension services, vocational training and markets also contribute to the pillar. The variables that contribute the most to the Adaptive Capacity pillar are those concerned with diversity of livelihood activities, particularly in agriculture: the **number of agricultural livelihood activities** and the **number of crops planted**, followed by the number of nonagricultural livelihood activities. The level of education of the household head and access to information about natural disasters also contribute to the pillar.

As shown in Figure 2.4, female-headed households in Yambio have worse outcomes than male-headed households for several of the food security indicators, including the Food Consumption Score and Household Dietary Diversity Score; male-headed households also perform better regarding the number of meals consumed by older children and adults, while younger children consumed more meals in female-headed households. Female- and male-headed households have similar scores for the Access to Basic Services pillar, but male-headed households have higher scores for the Assets and Adaptive Capacity

pillars. Female-headed households have higher values for the Social Safety Nets pillar, but this pillar makes the smallest contribution to resilience, as seen earlier.

Figure 2.4. Average pillar values and food security scores for male- and female-headed households

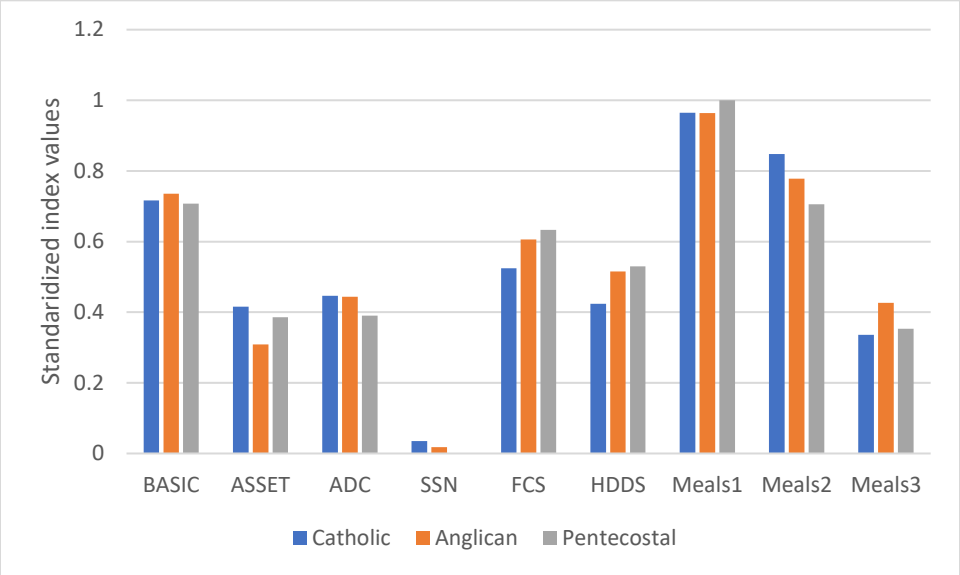


Source: Authors.
Note: BASIC—Access to Basic Services; SSN—Social Safety Nets; ADC—Adaptive Capacity; FCS—Food Consumption Score; HDDS—Household Dietary Diversity Score; Meals1—Per capita number of cooked meals consumed the previous day by children over 12 and adults; Meals2—per capita number of cooked meals consumed the previous day by children aged 6-12 years; Meals 3—Per capita number of cooked meals consumed the previous day by children aged 2-5 years.

The majority of surveyed households in Yambio identified themselves as Catholic. Anglican households have higher resilience scores than Catholic households, while Pentecostal households do not differ significantly from Catholics. Anglican households show higher FCS and HDDS values than Catholic households and perform better on the Access to Basic Services pillar (Figure 2.5). Pentecostal households show better FCS and HDDS outcomes than either Catholic or Anglican households, but represent a small subset of the sample, with only 17 households identifying as Pentecostal.

Around 78 percent of the surveyed households are located in Yambio payam, with the next largest share in Gangura payam. Households of different religions are fairly evenly distributed between the payams, with Catholics representing 57 and 52 percent of the populations of Yambio and Gangura payams, respectively, and Anglicans representing 39 and 44 percent. Households in Gangura have significantly higher resilience scores and higher food security than those in Yambio, performing better on four of the five food security indicators (Figure 2.6). Interestingly, Gangura shows higher pillar scores only for the Adaptive Capacity pillar, suggesting that Adaptive Capacity has a stronger effect on resilience in Gangura than for the PA as a whole.

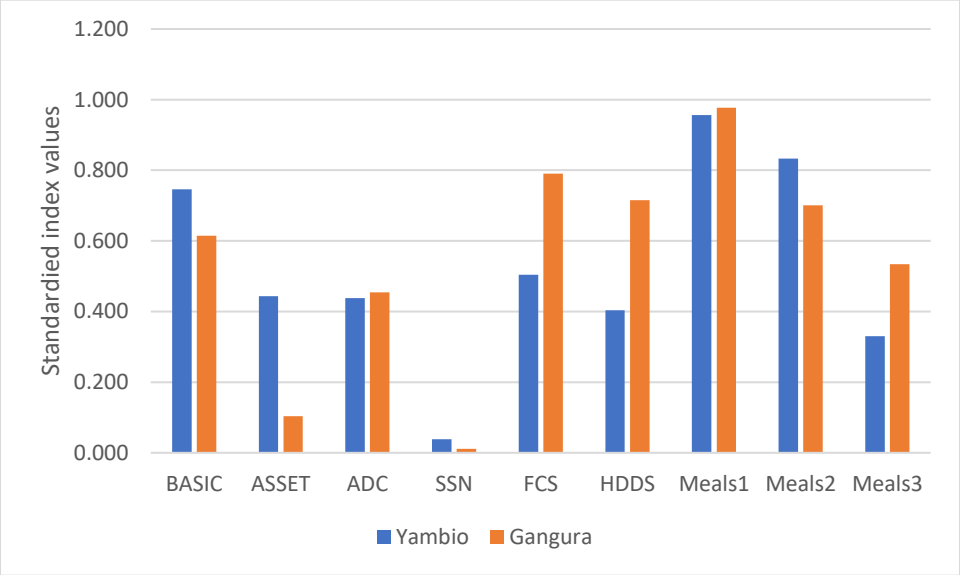
Figure 2.5. Average pillar and food security values by religion



Source: Authors

Note: BASIC—Access to Basic Services; SSN—Social Safety Nets; ADC—Adaptive Capacity; FCS—Food Consumption Score; HDDS—Household Dietary Diversity Score; Meals1—Per capita number of cooked meals consumed the previous day by children over 12 and adults; Meals2—per capita number of cooked meals consumed the previous day by children aged 6-12 years; Meals 3—Per capita number of cooked meals consumed the previous day by children aged 2-5 years.

Figure 2.6. Average pillar and food security values by payam



Source: Authors

Note: BASIC—Access to Basic Services; SSN—Social Safety Nets; ADC—Adaptive Capacity; FCS—Food Consumption Score; HDDS—Household Dietary Diversity Score; Meals1—Per capita number of cooked meals

consumed the previous day by children over 12 and adults; Meals2—per capita number of cooked meals consumed the previous day by children aged 6-12 years; Meals 3—Per capita number of cooked meals consumed the previous day by children aged 2-5 years.

2.4. RESILIENCE DETERMINANTS

To understand the determinants of resilience beyond the pillar variables used to estimate the resilience score, we perform regression analysis using household characteristics and other variables. We first standardize the resilience score so that all values fall between 0 and 1. The first column of Table 2.8 displays the results of regression analysis exploring the effects of the gender and age of the household head, religion of the household, and payam (the administrative division below county) on the resilience score. While it is informative to examine the effects of gender and religion on resilience, it should be noted that including these variables reduces the size of the dataset by almost 25 percent due to missing observations.

Female-headed households show significantly lower resilience than male-headed households. This echoes the findings of previous RIMA analyses in the Karamoja region of Uganda and in Somaliland, which found female-headed households to have lower resilience scores in most areas (FAO, 2017; FAO, 2018).

TABLE 2.8. DETERMINANTS OF RESILIENCE

VARIABLES	(1)	(2)	(3)
Female	-0.0672***	-0.0665***	
	(0.0206)	(0.0205)	
Age 26-35	-0.0120	-0.00912	-0.0406
	(0.0339)	(0.0336)	(0.0370)
Age 36-55	-0.0510	-0.0413	-0.0778**
	(0.0328)	(0.0328)	(0.0360)
Age >55	-0.0290	-0.0204	0.185***
	(0.0382)	(0.0380)	(0.0376)
Anglican	0.0776***	0.0674***	
	(0.0178)	(0.0182)	
Pentecostal	-0.0380	-0.0307	
	(0.0548)	(0.0544)	
Institutions		0.130**	0.109**
		(0.0506)	(0.0514)
Conflict		-0.0477	-0.0989**
		(0.0441)	(0.0460)
Governance		0.0423	0.0770*
		(0.0440)	(0.0429)
Gangura payam	0.175***	0.169***	0.214***
	(0.0286)	(0.0291)	(0.0247)
Constant	0.390***	0.345***	0.401***
	(0.0318)	(0.0452)	(0.0475)
Observations	407	407	536

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1
Notes: Results for Islam and Adventist religion and for Bakwiri, Yabongo, Nabiapai and Ngindo payams omitted due to low numbers of observations.

In column 2 of table 2.8, we add scores representing the strength of institutions, perceived quality of governance and exposure to conflict. Each score ranges from 0 to 1. Higher values of the institutions score increases resilience, but the governance and conflict indicators do not show a significant effect on resilience. However, in column 3, we test the effects of these variables on the resilience using the full dataset, which requires omitting gender and religion. In this specification, improvements in governance have a significant positive effect on resilience, and conflict reduces resilience. The governance, institutions and conflict variables are unlikely to be capturing information from the omitted gender variable, as independent samples t-tests suggest that mean scores for male- and female-headed households do not differ significantly (Table 2.9). The quarter of sample observations which are missing the gender indicator do show significantly higher values for the governance score, and significantly higher values for institutions.

TABLE 2.9. AVERAGE INSTITUTIONS, CONFLICT, AND GOVERNANCE SCORES BY GENDER OF HOUSEHOLD HEAD

	INSTITUTIONS	CONFLICT	GOVERNANCE
Gender of head			
Male (346)	0.287	0.964	0.356
Female (99)	0.276	0.975	0.382
H: difference ≠ 0,	0.503	0.478	0.273
P (|T|>|t|)			
Presence of gender data			
Present (445)	0.284	0.966	0.362
Missing (92)	0.256	0.957	0.452
Test for inequality	0.060*	0.549	0.000***

However, the column 3 results likely do reflect bias due to the omission of the religion variable, as Anglican households have significantly higher scores than Catholic households for governance as well as for institutions (Table 2.10).

TABLE 2.10. AVERAGE INSTITUTIONS, CONFLICT AND GOVERNANCE SCORES BY RELIGION OF HOUSEHOLD

	INSTITUTIONS	CONFLICT	GOVERNANCE
Religion of household			
Catholic (282)	0.276	0.970	0.353
Anglican (194)	0.301	0.966	0.425
H: difference ≠ 0, P (|T|>|t|)	0.047**	0.782	0.000***

Box 2. Drivers of Resilience: Demographics and Environmental Variables

Household demographic characteristics as well as households' environments also affect their resilience. Female-headed households have lower resilience than male-headed households, as well as lower scores on the Assets and Adaptive Capacities pillars and lower dietary diversity. Households' religion and geographic location are also associated with differences in resilience. Anglican households have significantly higher resilience than Catholic households, and households in Gangura payam (the administrative division below county) have significantly higher resilience than households in Yambio payam.

The analysis also tested the effects of environmental factors—namely the strength of institutions, the quality of governance, and the presence of conflict—on household resilience. Stronger institutions, as measured by households' knowledge of organizations that support their communities, institutions that affect their lives, and the presence of traditional leaders, lead to greater resilience among households in Yambio. There is also some suggestive evidence that higher-quality governance—as measured by households' assessments of the effectiveness of the government's efforts at providing services—increases resilience, and that exposure to conflict reduces resilience.

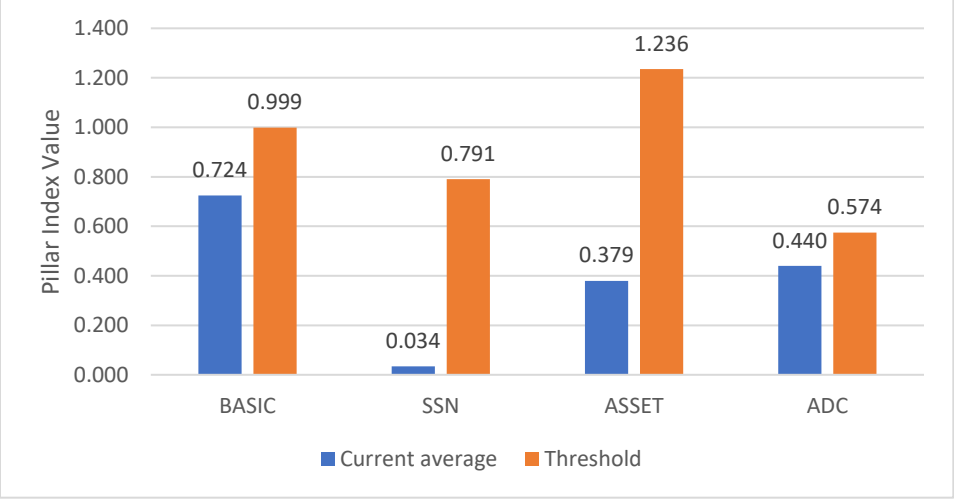
INTERVENTION OPTIONS

As shown in Figure 2.7, there are many ways to improve food security by improving household resilience. However, for Yambio, bridging the gap between current resilience level and the minimum required should be the first step. Accordingly, for each pillar, we calculate the required values to achieve minimum resilience[5] (Figure 2.7). With observed pillar scores normalized to fall between 0 and 1, the minimum values required to affect resilience are relatively high, ranging from 0.57 for Adaptive Capacity to 1.24 for Assets (corresponding to a higher score on the Assets pillar than the maximum observed in the data). Average pillar values are below the thresholds required to increase resilience. This illustrates the relatively

[5] With resilience estimated according to the following functional form $y = a + bx + cx^2$; it follows that the minimum value of y corresponds to $x = \frac{-b}{2c}$. This x value is the threshold after which increases in x begin to affect the value of y positively.

low resilience of the surveyed households and the scale of the efforts required to increase resilience and ultimately improve food security in Yambio. Average pillar values are closest to the threshold values for Access to Basic Services (73 percent) and Adaptive Capacity (77 percent). Increases in Assets scores were found to have relatively strong effects on resilience as suggested by the elasticity values; however, the surveyed households are on average far from reaching the asset levels required to improve resilience, with average pillar values representing only 31 percent of the threshold. The limited impact of the Social Safety Nets pillar on resilience may reflect the very low attainment of surveyed households in this area, with average values representing under 5 percent of the threshold. Policymakers may wish to prioritize efforts to improve the indicators related to the Access to Basic Services pillar, as this pillar both has a strong effect on increasing resilience and represents an area in which a large number of households may be relatively close to threshold levels.

Figure 2.7. Threshold and average pillar values

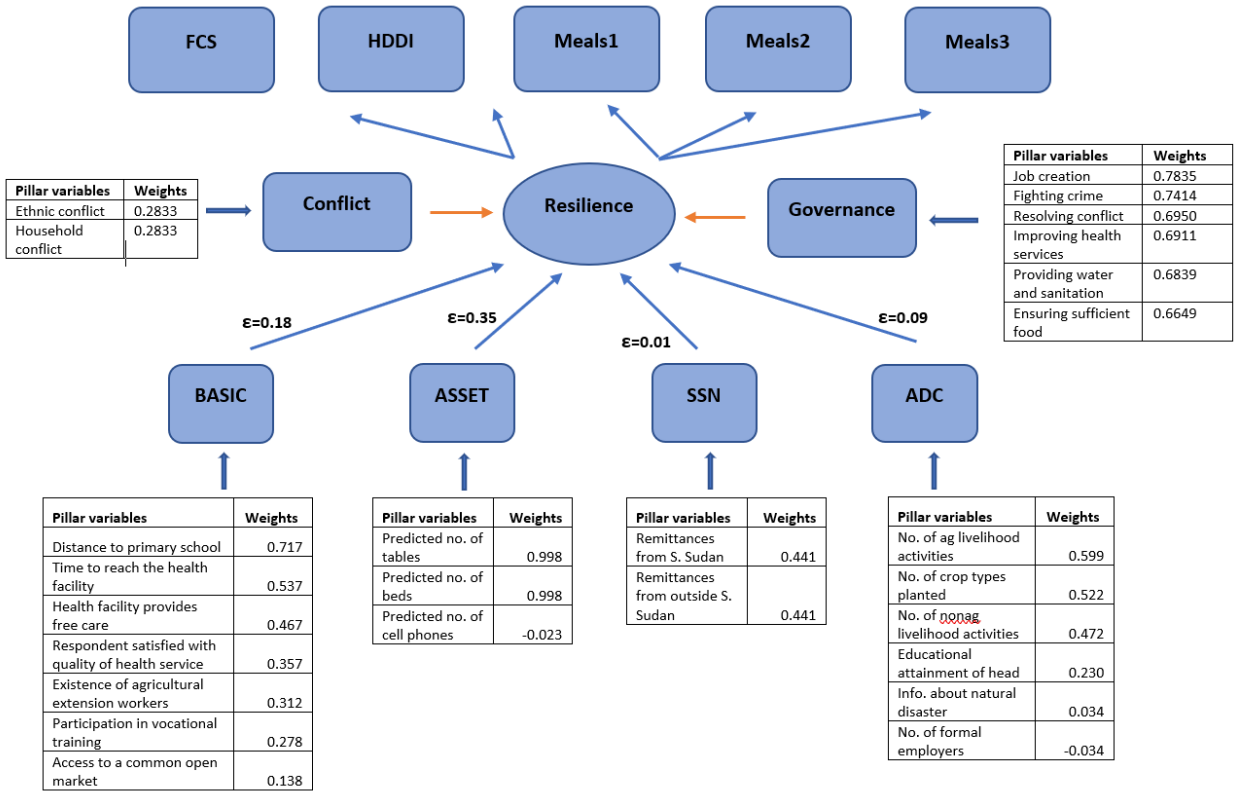


Source: Authors, from modeling results

Note: BASIC—Access to Basic Services; SSN—Social Safety Nets; ADC—Adaptive Capacity

Figure 2.8 provides the complete pathway to resilience and food security for Yambio. For both resilience pillars and the crosscutting factors (governance and conflict), listed variables define the number, magnitude and nature of pathways policymakers and development partners ought to consider when planning to improve food security by increasing household resilience.

Figure 2.8. Estimated pathways to resilience and food security



Pillar variables	Weights
Ethnic conflict	0.2833
Household conflict	0.2833

Pillar variables	Weights
Job creation	0.7835
Fighting crime	0.7414
Resolving conflict	0.6950
Improving health services	0.6911
Providing water and sanitation	0.6839
Ensuring sufficient food	0.6649

Pillar variables	Weights
Distance to primary school	0.717
Time to reach the health facility	0.537
Health facility provides free care	0.467
Respondent satisfied with quality of health service	0.357
Existence of agricultural extension workers	0.312
Participation in vocational training	0.278
Access to a common open market	0.138

Pillar variables	Weights
Predicted no. of tables	0.998
Predicted no. of beds	0.998
Predicted no. of cell phones	-0.023

Pillar variables	Weights
Remittances from S. Sudan	0.441
Remittances from outside S. Sudan	0.441

Pillar variables	Weights
No. of ag livelihood activities	0.599
No. of crop types planted	0.522
No. of nonag livelihood activities	0.472
Educational attainment of head	0.230
Info. about natural disaster	0.034
No. of formal employers	-0.034

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ANNEX: DETAILED METHODOLOGY

We estimate the resilience measure in two steps, first by constructing the pillars from observed data, and second by estimating the resilience index based on the pillars and outcomes. We estimate the pillars using principal component analysis (PCA). Given that the variables composing the pillars are discrete, we first estimate polychoric correlations between the variables and then apply PCA to the correlation matrix.[6] The pillars are then standardized using the min-max procedure[7] so that all values fall between 0 and 1.

Following the pillar estimation, we estimate resilience as a latent variable based on the pillars and on the five food security variables using structural equation modeling and a maximum likelihood estimator. We include the quadratic terms for each pillar to allow for the existence of thresholds, or minimum values required before an increase in a pillar value affects resilience. A resilience score is generated for each household and then standardized so that values fall between 0 and 1, with higher scores indicating greater resilience.

The mathematical expression of the RIMA framework is as follows (FAO, 2016):

$$y = \lambda\eta + \varepsilon \qquad (1)$$

$$\eta = \beta x + \zeta \qquad (2)$$

where η is the latent variable representing resilience; y is an indicator or outcome of resilience; and (x_1, x_2, ..., x_n) are the determinants of resilience. In our analysis, as in typical RIMA-II analyses, food security indicators are used as y variables and the four resilience pillars enter as the x variables.

Following the computation of the resilience score, we perform regression analysis using tobit to estimate the effects of household characteristics and other factors on resilience, while controlling for payam (the administrative division under counties) specific effects. To account for the social and institutional environment, we construct variables to represent the quality of governance, strength of institutions, and exposure to conflict, using polychoric principal component analysis to estimate scores based on a larger number of underlying variables, as was done to calculate the pillars.

[6] Standard methods of performing factor analysis (i.e., those based on a matrix of Pearson's correlations) assume that the variables are continuous and follow a multivariate normal distribution. If the model includes variables that are dichotomous or ordinal a factor analysis can be performed using a polychoric correlation matrix. See Kolenikov and Angeles (2009) for a discussion of the advantages of using polychoric correlations when performing PCA on discrete variables.

[7] (Z-Zmin)/(Zmax-Zmin)