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Author(s): Kimberly Rovin, Karen Hardee and Aklilu Kidanu

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RESEARCH ARTICLE

Linking Population, Fertility, and Family Planning with Adaptation to Climate Change: Perspectives from Ethiopia

Kimberly Rovin*¹, Karen Hardee² and Aklilu Kidanu³

¹ Department of Anthropology, Michigan State University, East Lansing, MI, USA, ²Futures Group, Washington, DC, USA,

³ Miz-Hasab Research Center, Addis Ababa, Ethiopia,

*For correspondence: E-mail: rovinkim@msu.edu

Abstract

Global climate change is felt disproportionately in the world's most economically disadvantaged countries. As adaption to an evolving climate becomes increasingly salient on national and global scales, it is important to assess how people at the local-level are already coping with changes. Understanding local responses to climate change is essential for helping countries to construct strategies to bolster resilience to current and future effects. This qualitative research investigated responses to climate change in Ethiopia; specifically, how communities react to and cope with climate variation, which groups are most vulnerable, and the role of family planning in increasing resilience. Participants were highly aware of changing climate effects, impacts of rapid population growth, and the need for increased access to voluntary family planning. Identification of family planning as an important adaptation strategy supports the inclusion of rights-based voluntary family planning and reproductive health into local and national climate change adaptation plans. (*Afr J Reprod Health* 2013; 17[3]: 15-29).

Résumé

Le changement climatique mondial se fait sentir de façon disproportionnée dans les pays les plus économiquement défavorisés du monde. Comme l'adaptation à un climat en évolution devient de plus en plus saillante sur des échelles nationale et mondiale, il est important d'évaluer comment les gens au niveau local se débrouillent déjà avec des changements. Il est nécessaire de comprendre les réponses locales aux changements climatiques pour aider les pays à élaborer des stratégies pour renforcer la résilience face aux effets actuels et futurs. Cette recherche qualitative a mené une enquête sur les réponses au changement climatique en Ethiopie ; plus précisément, sur comment les communautés réagissent et font face aux variations climatiques, quels sont les groupes les plus vulnérables et quel est le rôle de la planification familiale dans l'augmentation de la résilience. Les participants étaient très conscients des effets du changement climatique, les impacts de la croissance rapide de la population et de la nécessité d'avoir encore d'accès à la planification familiale volontaire. L'identification de la planification familiale comme une stratégie d'adaptation importante soutient l'inclusion de la planification familiale volontaire et la santé de reproduction fondées sur les droits dans les plans d'adaptation aux changements climatiques locaux et nationaux. (*Afr J Reprod Health* 2013; 17[3]: 15-29).

Keywords: Ethiopia, climate change, family planning, reproductive health, resilience and adaptation

Introduction

*The problems are getting worse.
The temperature, shortage of food
and rainfall situation is worsening
(Rural male, age 38 with three
children).*

The unfolding effects of global climate change are felt disproportionately in the world's most economically disadvantaged countries, emphasizing the need to focus attention on adaptation to climate

change^{1,2}. Many of these countries also face rapid population growth-among the 49 Least Developed Countries and Small Island States eligible for funding through National Adaptation Programmes of Action (NAPAs), more than half (27) are on track to double their populations by 2050 based on the United Nations Population Division's medium variant population projection. In these countries, 84% of the NAPAs noted that a rapid increase in population and population pressure will inevitably

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exacerbate the effects of climate changes that have already started³. However, the international research community has predominantly emphasized the influence of population with regards to carbon emission reductions, rather than as a component of adaptation strategies^{4,5}.

Moreover, the topic of population in relation to climate change elicits strong reaction at the international level, usually linked with the fear of population control. For policymakers the topic has been described informally as “toxic⁶.” Yet should the topic be one that policymakers refuse to touch? What do people who live in countries that are both facing changes in climate as well as rapid population growth, and other demographic change, such as rapid urbanization, migration, or aging think? Understanding local-level views on climate change and responses is essential for helping international policymakers and national leaders construct new strategies to bolster resilience and ultimately prepare people and communities to adapt to more severe changes in climate.

However, as noted, scant research exists which effectively links population growth and demographic factors with adaptation and resilience to climate change issues, although McLeman has recently proposed a typology of the interactions between population change and vulnerability to climate change⁷. Lack of attention to population and fertility in studies on adaptation has meant that the potential for strategies to address demographic factors to help people build resilience and adapt to climate change has been missed. Furthermore, the role of women in adaptation strategies has also been underrepresented in existing literature, despite the evidence that the women, especially socioeconomically disadvantaged women, are disproportionately affected by climate change⁸.

In this context, Population Action International (PAI) and Miz-Hasab Research Center (MHRC), in collaboration with the Joint Global Change Research Institute (JGCRI), conducted a study in Ethiopia, a country hard hit by the effects of climate change, to investigate the link people make between climate change and population factors. This paper describes perceptions of Ethiopians in two regions regarding: 1) understanding of and experience with climate changes, 2) factors contributing to ability to adapt

to future changes, and 3) the relationship between climate change, population, and fertility and the potential role of family planning in building resilience.

Impacts of Climate Change in Ethiopia

Ethiopia is extremely vulnerable to climate change impacts due to a constellation of social, economic, and environmental factors. In particular, high levels of poverty, rapid population growth, a high level of reliance on rain-fed agriculture, high levels of environmental degradation, chronic food insecurity, and frequent natural drought cycles are the predominant factors increasing Ethiopia's climate change vulnerability⁹. Average annual temperatures nationwide are expected to rise 3.1° C by 2060, and 5.1° C by 2090. Compounding the negative effects of temperature increases alone, precipitation is also projected to decrease from an annual average of 2.04 mm/day (1961-1990) to 1.97 mm/day (2070-2099), for a cumulative decline in rainfall by 25.5 mm/year¹⁰. Farmers will be overwhelming affected by these changes due to a widespread reliance on rain-fed agriculture throughout the country—providing a livelihood for 85% of the population¹¹.

Drought, already endemic to Ethiopia, has increased in the past several decades, along with pervasive food insecurity and malnutrition¹²⁻¹³. Ethiopia is already heavily dependent on food aid, and this dependency is expected to grow with imminent climatic changes¹³. Annually, Ethiopia loses an estimated 1.5 billion tons of topsoil, and 82% of the country's land area is experiencing soil erosion¹²⁻¹⁵. Flooding has also increased in frequency, predominantly due to deforestation and soil degradation; by 2011 only around one percent of Ethiopia's land area was forested^{16,17}. Population pressure has increased demand for agricultural and grazing land, and wood for fuel and construction purposes. Furthermore, over-cultivation and over-grazing increase soil erosion and strip soils of nutrients, decreasing arable land and accelerating deforestation rates¹⁵.

Population, Fertility, and Family Planning in Ethiopia

In 2010 Ethiopia's population was estimated at 83 million, growing at a rate of 2% annually¹⁸. The

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country's population is expected to more than double by 2050, even with the ambitious assumption that fertility rates will decline to nearly replacement level (1.87% by 2050 based on the United Nations Population Division's medium variant population projection)¹⁸. Population density is also projected to almost double from 72 people per square kilometer in 2005 to 131 per square kilometer by 2050 using these same population estimates. Further, Ethiopia has a very young age structure with 72% of the population under age 30^{19,20}. Currently the country's population is predominantly rural-dwelling (83%), although with urban areas growing at a rate of 3.6% annually, over a quarter of the population is projected to be urban-dwelling (36%) by 2050²⁰. These demographic characteristics reveal pre-existing vulnerability to climate changes as population continues to grow, rural land is degraded, and individuals migrate to urban areas.

Underlying Ethiopia's growing population is a high fertility rate. In 2011, a national survey showed that women typically have 4.8 children in their lifetimes, a small decline from 5.4 children per woman in 2005, and a larger decline from 6.4 children per woman in 1990²¹. However, these national estimates mask huge regional and socioeconomic variations. Women in rural areas have higher fertility than their urban counterparts (5.5 vs. 2.6), and women with no education have a much higher total fertility rate than women with secondary education or higher (5.8 vs. 1.9). Fertility generally begins early and peaks among women aged 25-29 years; by the age of 18, 34% of women have given birth. Finally, fertility is strongly associated with wealth: women in the lowest income quintile have, on average, 6.6 children, while women in the highest quintile have an average of 2.8 children²¹.

While awareness of family planning is high, only 29% of married women are currently using modern methods of contraception. Use of family planning is higher in urban areas, among women with higher levels of education, and among women in higher wealth quintiles. Most importantly, an estimated 25% of currently married women have an unmet need for family planning; that is, they want to postpone

childbearing for two or more years or stop entirely, but they are not currently using contraception²¹.

Methods

Defining Vulnerability and Resilience

The Intergovernmental Panel on Climate Change (IPCC) has defined both vulnerability and resilience. In terms of human societies, vulnerability can be analyzed by examining: 1) how dependent a society is on climate for its well-being, 2) how much damage climate change will inflict on people's health and well-being, and 3) what coping and adaptation resources exist within the society. The inverse of a population's vulnerability is its resilience, defined as, "the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change²²." Adaptive capacity, "the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" is a critical element of resilience²².

Although adaptation, resilience and adaptive capacity have been defined by the IPCC, the ways individuals and groups affected by climate change (especially in developing countries) conceptualize and understand these issues remains unclear. Existing studies focus on individuals' ability to recognize climatic changes (especially farmers' recognition of environmental changes), and subsequently the specific coping strategies used to mitigate these effects (for example, changes in agricultural practices). The interaction between social, economic, and environmental issues in different communities has also been addressed as it relates to both exacerbating and perpetuating vulnerability to climate change²³. However, these studies fail to capture the subjective experiences of those most vulnerable to climatic events, including their perceived adaptation needs. Malone notes the importance of eliciting people's perceptions of climate change contending that, "an important dimension of assessing resilience is identifying the

risks people face, especially those they self-report, resilience²⁴.” Moreover programs that fulfill these felt needs will have a higher likelihood of being successful than those imposed on people and communities.

Country Selection

Ethiopia was selected based on the following criteria: 1) documented changes in climate, 2) rapid population growth rate, 3) ranking as one of the world’s least developed countries, 4) Vulnerability-Resilience Indicators Model (VRIM) index indicating vulnerability to climate change, and 5) other global measures which indicate that Ethiopian citizens could be particularly vulnerable to the effects of climate change²⁵⁻²⁷. These additional measures include the United Nations Development Programme’s (UNDP) Human Development Index, which ranks Ethiopia 169 out of 177 countries, and the UNDP’s measure of gender inequality, which ranks Ethiopia 72 out of 93 countries on the degree to which women take part in the country’s economic and political arenas²⁸.

Research Design

This research used a case study approach with a qualitative cross-sectional design to capture the lived experiences of people currently experiencing the effects of climate change. Various data sources, including scientific literature, policy documents, and oral narratives, were utilized in order to represent most accurately the experiences of climate change in Ethiopia. The paper includes quantitative data on climate change in Ethiopia to the extent possible. Given the small size of the study areas, it was not possible to include local-level data on climate and environmental changes.

Qualitative data collection was accomplished through the use of semi-structured in-depth interviews (IDIs) and focus group discussions (FGDs) based on a shorter semi-structured interview guide. Both IDIs and FGDs centered on five vulnerability and resilience to climate change themes: 1) experiences of weather-related changes, 2) availability of social and economic resources in the community, 3) environment, 4) health, and 5) resilience to climate and environmental changes.

and their strategies and desired strategies to build In addition to information focused on adaptation and resilience to climate change, socioeconomic and demographic information was collected from each participant in this study. Participants were asked if they had heard of “climate change,” and they were also asked about experience with “weather-related events” and “environmental changes.” The study and questions did not imply that all weather-related events and environmental changes were necessarily caused by climate-change. But rather, the study sought to elicit participants’ views on the changes in their environments and weather patterns, if any, that they had experienced. Questionnaires were first developed in English by PAI, JGCRI, and MHRC, and then translated into Amharic, pre-tested, adapted, and finalized for use.

The study was conducted in two peri-urban sites, one rural predominantly pastoralist site and one rural predominantly agricultural site. A purposive sampling strategy was employed and potential study participants were recruited based on their location of current residence, knowledge of community life, and past experience with climate changes. Participants included national and local-level policymakers, government representatives, community leaders, civil society groups, and men and women living in communities directly threatened by climate change effects. In all, the study included 12 FGDs conducted separately with 48 men and 48 women, 24 IDIs with community members and leaders, and 14 IDIs with policymakers, government representatives, and other key leaders (Table 1).

Site Selection and Fieldwork

Fieldwork was carried out in the Oromia and Southern Nations, Nationalities and People’s (SNNP) regions of Ethiopia between December 2008 and May 2009. The research sites (peri-urban and rural) (Maps 1 & 2) were selected in consultation with regional administrations. In Oromia, selection criteria required that: 1) the area had experienced recurrent adverse climatic conditions, and 2) that the rural livelihood was predominantly pastoral. In SNNP, the selection

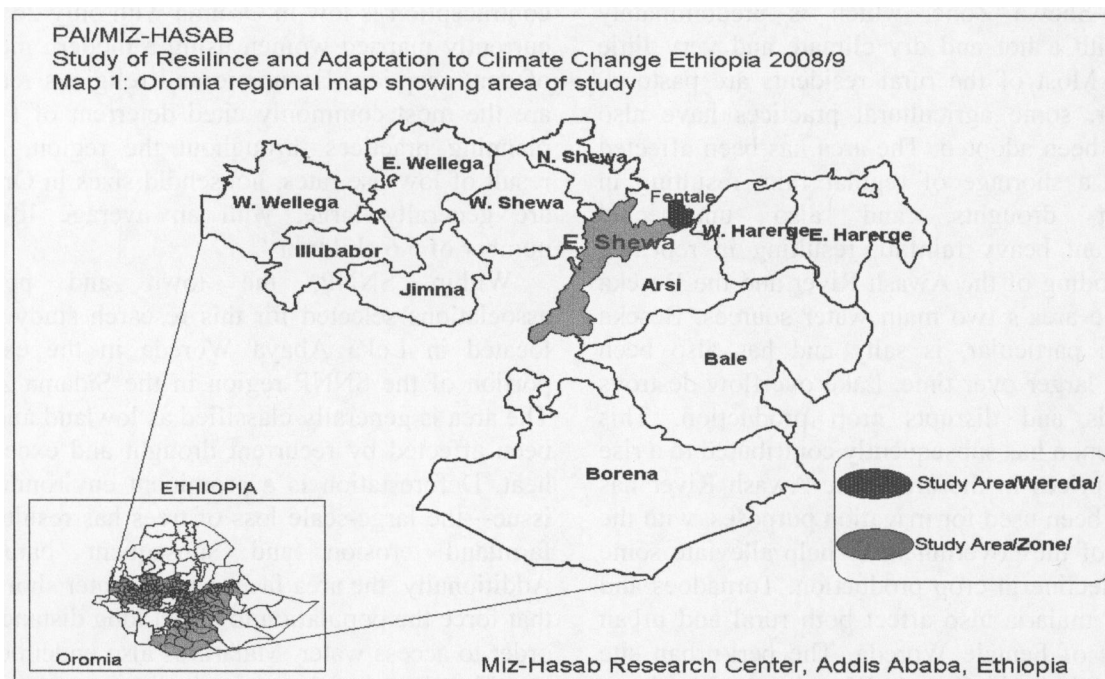
Table 1: Number and Type of Interview, by Location, Ethiopia, 2008-2009

Region, zone and woreda	Location	Number of Interviews				
		FGDs – Community members		IDIs – Community members, leaders		IDIs –Policymakers, government representatives and other leaders
		Male	Female	Members	Leaders	
Oromia/Eastern Shewa Zone/Fentale Woreda	Peri-urban	1	1	3	1	4
	Rural	2	2	5	3	
SNNP/ Sidama Zone/Loko Abaya Woreda	Peri-urban	1	1	3	5	4
	Rural	2	2	5	3	
National						6
Total		6 groups, 48 participants	6 groups, 48 participants	16	12	14

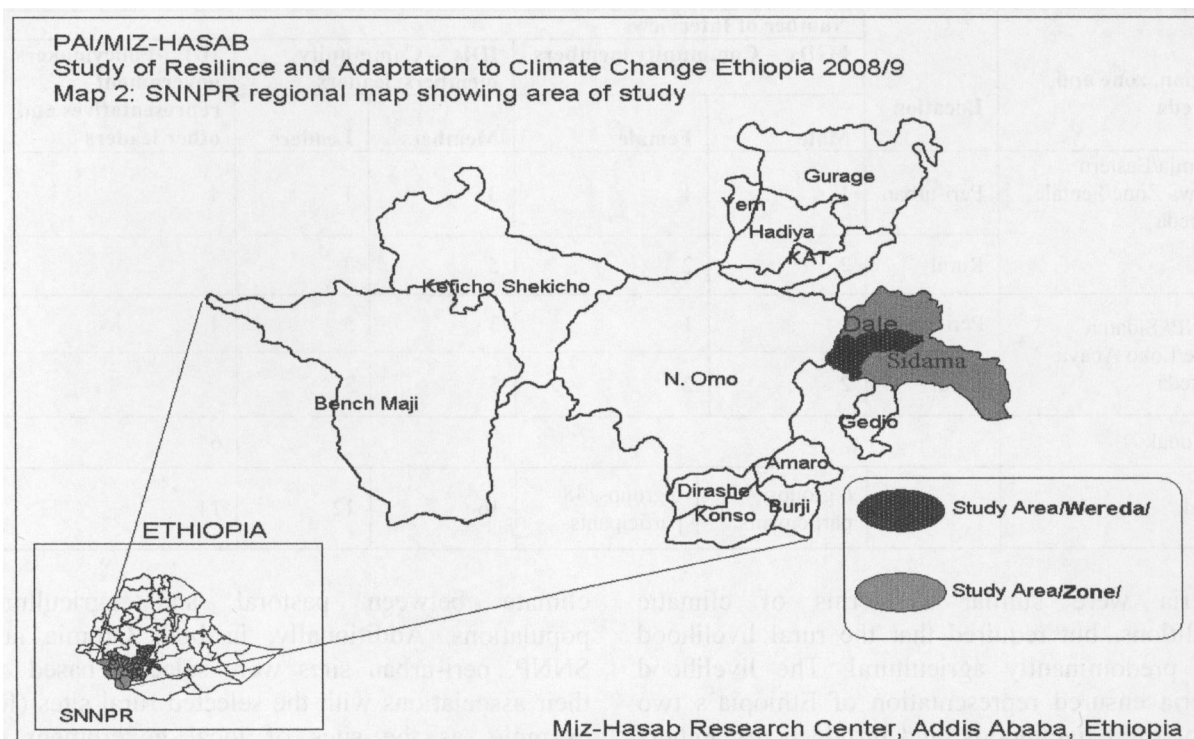
criteria were similar in terms of climatic conditions, but required that the rural livelihood was predominantly agricultural. The livelihood criteria ensured representation of Ethiopia's two major rural livelihoods, and provided researchers with the ability to assess qualitative differences in experiences with and adaptation to changes in

climate between pastoral and agricultural populations. Additionally, in both Oromia and SNNP, peri-urban sites were selected based on their associations with the selected rural sites (for example, as the sites of local government or market towns).

Map 1.



Map 2.



Within Oromia, the town and the peasant associations where research was conducted were located in the central region of Fentale Woreda of Eastern Shewa Zone, which is predominately rural, with a hot and dry climate and very little rainfall. Most of the rural residents are pastoral. However, some agricultural practices have also recently been adopted. The area has been affected by both a shortage of regular rain, resulting in recurrent droughts, and also unexpected intermittent heavy rainfall, resulting in repeated over-flooding of the Awash River and the Beseka Lake, the area's two main water sources. Beseka Lake, in particular, is salty and has also been growing larger over time. Lake overflow destroys farmlands and disrupts crop production. This phenomenon has subsequently contributed to a rise in food prices in the area. The Awash River has recently been used for irrigation purposes, with the support of the government to help alleviate some of this decline in crop production. Tornadoes and endemic malaria also affect both rural and urban residents of Fentale Woreda. The peri-urban site selected within the Fentale Woreda was Metehara.

Residents of this town are predominantly small traders and government employees.

Overall, the use of modern methods of contraception is low in Oromia with only 26 % of currently married women using a modern method of contraception. Economic and religious reasons are the most commonly cited deterrent of family planning practices throughout the region. As a result of low use rates, household sizes in Oromia are generally large, with an average lifetime number of 5.6 children²¹.

Within SNNP, the town and peasant associations selected for this research study were located in Loka Abaya Woreda in the eastern portion of the SNNP region in the Sidama Zone. The area is generally classified as lowland and has been affected by recurrent drought and excessive heat. Deforestation is a prominent environmental issue—the large-scale loss of trees has resulted in farmland erosion and subsequent bareness. Additionally, the area faces severe water shortages that force the population to travel long distances in order to access water. Malaria is also endemic and considered one of the major health hazards of the

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area. The peri-urban site selected was Hantete Town, which has a population of about 2,000. Peri-urban residents of the Woreda are mainly government employees and small-scale traders, while most rural households practice subsistence farming and rely heavily on “ensent” (nutritious bread made of the roots of *Ensete superbum*, or “false banana” trees) for food. Peri-urban residents also grow some crops including pepper and small numbers of coffee trees, both for consumption and to generate income. Household sizes in this region are somewhat smaller than in Oromia, with an average of 4.9 children per woman and only 26% of currently married women are using a modern method of contraception throughout the SNNP region²¹.

Study Limitations

Qualitative research is a powerful way to reflect the real voices of study participants and also allows for a unique in-depth exploration of various topics in ways that quantitative research is unable to capture. However, the trade-off of using a qualitative method is a lack of generalizability of research findings. This study includes findings from peri-urban and rural areas; therefore, the views of Ethiopians from large urban areas are not included, thus rural voices are overrepresented in this research. Furthermore, as participants were selected purposively rather than randomly, participant characteristics are not representative of the country as a whole. In general, the study participants tended to be older on average than the general Ethiopian population. Furthermore, given that the peri-urban research sites were very close to the rural sites, on some characteristics, like education, the peri-urban and rural participants were more similar than if the study had included large urban areas, such as Addis Ababa. Background characteristics were also not collected for government representatives and community leaders.

Another limitation of this study is in the accuracy of participant recollections of changes in climate. Specifically, participants were required to differentiate between the effects of changes in climate versus changes due to other factors, such as natural environmental variations, or human

caused environmental degradation unrelated to climate change. *This distinction is not always clearly distinguished in people’s minds*²⁹⁻³³.

For example, the expansion of Beseka Lake in Oromia, which participants attributed to climate change, is more likely due to other environmental and anthropogenic causes³⁴. Despite these limitations, this study makes an important contribution to the existing literature and to the policy dialogue on adaptation to climate change. It is among the first to highlight the links that people themselves make between their experience dealing with climate change and population, family size, and family planning.

Participant Characteristics

Table 2 shows the background characteristics of focus group participants. FGDs were composed of half men and half women. On average, men were older than women (mean of 38 years compared to 29 years of age). Around three-quarters of the participants were currently married. Most participants (67% in rural sites and 59 percent in peri-urban sites) in both regions had lived in their communities for more than 10 years. Further, in both regions, almost all participants reported living in households with an average of more than five people. Average household size was slightly higher in peri-urban compared to rural sites in both regions. However, participants in both peri-urban and rural areas reported the same average number of children, 3.3. Participants from peri-urban and rural areas had similar educational backgrounds, with 13% of peri-urban and rural participants indicating they had not received any formal education. The four most frequently mentioned occupations amongst FGD participants were farmer (29%), pastoralist (15%), government worker (14%), and merchant (8%) (not shown in Table 2). On average, participants from rural areas said that their households spent about 60 minutes a day collecting water, which is three times longer than the 23 minutes noted by peri-urban participants. The difference was particularly dramatic in Oromia, where virtually all peri-urban residents have water piped into their houses or compounds, compared to rural residents, who have to travel for water.

Table 2: Background Characteristics of FGD Participants, by Region, Residence and Sex, 2008

Characteristics	Oromia			SNNP			Residence		Sex	
	Total (N=48)	Rural (N=32)	Peri-urban (N=16)	Total (N=48)	Rural (N=32)	Peri-urban (N=16)	Rural (N=64)	Peri-urban (N=32)	Male (N=48)	Female (N=48)
Average Age	37.4	30.3	51.4	29.0	30.6	25.9	30.5	38.7	37.9	28.5
Average Number of Children	3.2	3.1	3.2	3.5	3.5	3.4	3.3	3.3	4.1	2.5
Married (percent)	79%	78%	81%	73%	72%	75%	75%	78%	83%	69%
Years in current community										
Less than one year	1	1					1			1
1-5 years	5	5		14	8	6	13	6	4	15
6-10 years	10	4	6	4	3	1	7	7	3	11
More than 10 years	32	22	10	30	21	9	43	19	41	21
Number of People in Household	5.2	5.0	5.6	5.7	5.5	5.9	5.3	5.8	6.3	4.5
Time spent by household collecting water (minutes)										
Highest level of schooling completed (percent)										
None	29	43	2	66	76	45	60	23	46	49
Some primary school	23%	22%	25%	2%	3%		13%	13%	15%	10%
Completed primary school	38%	44%	25%	21%	22%	19%	33%	22%	25%	33%
Some secondary school	2%		6%	10%	9%	13%	5%	9%	8%	4%
Completed secondary school	10%	9%	13%	35%	34%	38%	22%	25%	25%	21%
Technical/Vocational Certificate	13%	6%	25%	19%	22%	13%	14%	19%	19%	13%
University/College Diploma	13%	19%		13%	9%	19%	14%	9%	6%	19%
	2%		6%					3%	2%	

Because the number of community members who participated in IDIs was small (16), their characteristics are not included. However, in comparison to the FGD participants listed in Table 2, IDI participants tended to be slightly older and to have larger households (8 persons per household compared to 5.5 persons per household). Other study participants, whose background characteristics were not collected, included government officials and key community and national leaders. These participants ranged from a vice mayor to the heads and staff of departments responsible for: environmental protection, agricultural and rural development, disaster prevention and food security, water resources, youth and sports, security, public health, population, health and environment, and biodiversity conservation.

Findings

Knowledge and Experience of Climate Change

Almost all participants from both regions, as well as local and national-level participants, indicated having heard about climate change and cited local media (radio, television, and newspapers), as well as school and government institutions as their main sources of information. Participants' descriptions of climate change ranged from personal observations of environmental changes to more scientific information received from media sources. Moreover, participants attributed recent environmental changes in their communities—in particular, deforestation, lack of rainfall, and increasing temperatures—to climate change. Destruction of forests and soil erosion were frequently described as exacerbating climate changes in Ethiopia. *"One of the main reasons for this climate change is there is no forest in this area and the temperature is increasing because of this,"* according to a 40 year-old man from peri-urban SNNP who has three children and works as a merchant. A government representative from Addis Ababa added, *"I think one indicator [of climate change] is the temperature increment, which is getting worse day to day. The other thing... is the absence of rain in some seasons."*

Participants also noted that lack of rainfall and increasingly hot temperatures have resulted in the

degradation of farm and grazing lands, deforestation due to an increasing need to cut trees for charcoal production to substitute for lost income from agriculture, increased food prices, food shortages, and in the Oromia region, flooding as a result of overflow from Beseka Lake. Additionally, access to water was identified as a particularly important issue, even in the peri-urban areas where access to piped water was far more common. A combination of decreased rainfall and increasing temperatures—events participants identified as weather-related events associated with climate change—has led to the desiccation of wells and small lakes, which are crucial sources of water for many people. As a result of this severe shortage, people are forced to travel long distances to acquire water. A 25 year-old woman living in peri-urban SNNP with three children explained, *"In earlier times, our Woreda was very green, and there was no famine... but now everything has changed. We cannot get harvest after planting, and rain doesn't come on time as a result of these changes."*

Groups Most Vulnerable to Climate Change

Participants generally identified women and children as the groups most vulnerable to weather-related events. Participants attributed women's increased vulnerability to their responsibility for the majority of household activities and childcare, a cultural norm throughout the area. In particular, women's responsibility to supply the family with water was identified as an activity increasingly affected by changes in climate because it often requires women and girls to travel long distances, increasing their risk of physical harm, in addition to increased energy expenditure. For example, a male teacher living in peri-urban Oromia who has three children, said, *"A woman after marriage will have children. At this time, since the climate is changing and the temperature is hot, she will be affected because she holds all the responsibility [for] the family."*

For children, community members describe the impacts of weather-related difficulties—drought and famine—as particularly severe and with long-term implications, especially regarding education. During times of weather-related difficulties,

families may withdraw their children from school, either due to lack of finances or in order to migrate in search of better living conditions or employment. Children are also required to aid in household activities or to help support their families by working, and in most cases, find it difficult to pursue an education. Participants from both research sites and living in both peri-urban and rural settings emphasize that during times of difficulty, the nutritional needs of children are not met, resulting in malnutrition, fatigue, inability to perform in school, increased incidence of disease, and sometimes even death. According to a 46 year-old man living in rural Oromia who has 13 children and works as a pastoralist, *"During difficult times, children, unlike other times, are highly affected by food shortages...In addition, during difficult times, children are forced to keep cattle when the family moves, and they drop out of school."*

Changes in Livelihoods Related to Climate Change

Climate changes have affected participants differently depending on their livelihoods (pastoral or agriculture) and their places of residence (rural or peri-urban). However, both pastoralists and farmers reported increased frequency of weather-related events in recent years and having to change aspects of their livelihoods in the face of changes in the environment. For example, some farmers described having to abandon their farms to make charcoal from local trees as an alternative livelihood strategy due to lower agricultural production, and both agriculturalists and pastoralists reported having lost cattle to drought. One woman, age 23, living in rural Oromia with three children explained, *"The majority of farmers are displaced from their land and are working on processing charcoal, and some are migrating to cities. As there is no reasonable seasonable rainfall, it's impossible to cultivate land. Cattle are dying and forests are being destroyed."* Additionally, a 35 year-old man farmer from SNNP with six children linked climate change with poor crop yields and subsequent economic hardship. He suggested that, *"In the past, when we had enough rainfall, we used to get a good harvest*

from our farm. But now we plant crops but there are times [when] they won't grow. We buy fertilizers [at] high prices...but at times we come out with nothing."

Participants noted other issues related with climate change. Several pastoralist participants mentioned an increased potential for conflict with other community members as they shifted their livelihoods. A 39 year-old man living in rural Oromia with eight children described the hardships specific to the frequent migrations inherent in a pastoralist lifestyle, and the risk of coming into conflict with other groups while migrating, asserting, *"We pastoralist people...face a lot of problems during migration...all this is happening due to the climate change."* Peri-urban residents, in particular, identified high food prices and increasing costs of living as the most serious problems facing their communities. An unemployed 20 year-old woman with two children living in peri-urban SNNP reflected that, *"In earlier times, fuel wood was easily accessible, but now those people who are not able to buy kerosene are traveling long distances to get fuel wood."*

Linking Climate Change to Population and Family Size

Limiting the number of children will help us to cope with the change in climate (Rural woman, age 25 with three children, SNNP).

Participants-most notably from SNNP where pressure on agricultural land is growing stronger-frequently, and without prompting, mentioned population growth as a contributing factor in, or as a main cause of, observed environmental changes. For participants from SNNP, population growth linked with a decline in forests was perceived as related to changes in climate. For example, a rural man farmer with six children from SNNP stated, *"I think the major problem is population increase, not diminishing forest reserves, because it is population increase that causes the loss of forests."*

Additionally, participants noted that the number of children in a household is an important determinant of that household's ability to support itself in the face of current economic and

environmental conditions. Many individuals asserted that historically throughout Ethiopia the prevalent attitude towards the number of children per family has been to have as many children as possible and let God's will provide the necessary resources to raise them. Women are also frequently granted prestige within their families and communities based upon the number of children they have. Further, children may also play an economic role in the family by providing labor for pastoral or agricultural practices and thus have traditionally been considered an asset rather than a burden.

However, participants demonstrated changing attitudes towards large families. Most significantly, the identification by many participants that families with fewer children are better positioned to deal with current challenges, including difficulties related to the environment. For example, A 38 year-old man government worker with three children living in rural Oromia explained that, *"In earlier times, people said that children are gifts from God and God knows how they will grow. But now they are saying that we can have children and we need to save money also."* Another male government worker, age 36, residing in peri-urban SNNP with five children added, *"Yes, it is known that [having an] unlimited number of children is a problem for the family...For the household with few children, it is easy to feed all the children balanced food and to give them a good education."*

However, some barriers still exist to the implementation of family planning in Ethiopia-cultural pressures to bear more children, disagreement on whether religion expressly prohibits family planning, and a lack of contraceptive knowledge. For example, a 50 year-old female pastoralist with five children from Oromia explained that, *"The community itself is using the tablet [oral contraception] or is having a child after enough [a gap of enough] years. The community is also accepting the education and using the family planning,"* although she herself believed family planning was against her religious tenets. Participants also noted a discrepancy between the number of children a household has typically had in the past and the number of children most households are now able to sustain.

This sentiment is evidenced by the testimony of a woman living in peri-urban SNNP, who at the age 22 already had three children, and who stated that, *"Everyone needs to have children based on the resources [they have], and I feel two to four children are enough."*

Increasing Resilience

Study participants identified various strategies that would help them become more resilient to both current and future climate changes. In particular, irrigation, loans for microfinance projects, migration to less affected areas, replanting trees-and access to family planning-were repeatedly mentioned as adaptation strategies that would increase resilience. For farmers, soil and water conservation achieved through strategies such as terrace farming were suggested by participants as solutions for loss of agricultural productivity due to climate change, soil degradation, and deforestation. Varying the types of crops planted to include more drought-resistant species and increasing the planting of vegetables with high marketplace value were also identified as possible strategies for the current economic and climate issues. A prominent theme throughout both FGDs and IDIs was a general sentiment that the government is responsible for helping communities. For example, a male farmer age 30 from SNNP with six children said, *"When we have no rain and a drought is [expected], we will be forced to look for government aid."* Similarly, a 29 year-old man pastoralist from rural Oromia with two children added, *"There are a lot of things that are done by the government. The government is working to change the lifestyle of the people from pastoralist to agricultural farming and the government is also seriously working to improve the livelihood of the people from agriculture."*

Participants frequently mentioned family planning as a component of adaptation strategies that would also boost resilience. For example a 60 year-old man pastoralist from rural Oromia who has ten children stated that, *"The government has to give education for the community and give training about climate change, family planning, and loan and saving activities."* A rural woman from Oromia, age 37 with five children and

involved in both pastoral and agricultural livelihoods, was pointed in her assessment that, “*The only solution to adapt to climate change is to [undertake] agricultural activities [along with pastoral activities] in order [to] fulfill the needs for food and start to use family planning services...By doing this, they are going to be able [to] adapt [to] the situation.*” Further, a 25 year-old peri-urban woman from SNNP with three children who works as a merchant and agriculturalist agreed, “*We want to have less than four children. We are using family planning and we also believe that we have to give advice for others about family planning.*” However, participants noted that access to family planning services is not always constant. Participants identified insufficient contraceptive supplies as well as lack of economic means to purchase contraception as barriers to using family planning, especially in times of drought.

Discussion

In this study, women and men from two areas highlighted the increasing challenges they face daily in adapting to climate change. In particular, participants described how rising temperatures, more frequent droughts, increased flooding, receding agricultural grazing land, and diminishing forests, all phenomena quantified in Ethiopia’s statistics, are creating difficulties for families and communities to cope with environmental changes. Importantly, a large portion of study participants linked population pressures with the effects of climate change, a topic that has received limited attention, and is just now beginning to be addressed in climate change literature^{5,35-40}. For example, participants suggested that families should consider having fewer children to mitigate some of the hardships-financial and environmental-inherent in climate changes, strategies that are now being promoted by larger national policies. These findings strongly demonstrate the importance of considering local-level concerns and strategies in any type of population and climate policy.

Further, in this study in Ethiopia, the identification of family planning as an important adaptation strategy by participants, supports

moves to include rights-based voluntary family planning and reproductive health services into local and national adaptation plans. As Ethiopia moves to develop a longer-term climate change adaptation strategy, strengthening the country’s national family planning program should be a primary concern. Moreover, because 82% of women throughout Ethiopia obtain family planning from government sources, the government of Ethiopia must significantly expand its efforts within health centers, health clinics, and health posts and through the health worker outreach program to provide family planning services to women and couples who express a desire to slow or stop childbearing^{21,40}. That 25% of married women currently have an unmet need for family planning services underscores the need for an expanded family planning program²¹.

Further, Ethiopia has historically addressed population, poverty, reproductive health, and climate change issues separately. For example, Ethiopia’s 1997 *Environmental Policy*, 1993 *National Policy on Disaster Prevention*, and 2007 *National Adaptation Programme of Action* (NAPA), focus on the sustainable use of renewable and non-renewable resources, ecosystem maintenance, and the rehabilitation of degraded regions, ameliorating the impacts of drought, and the effects of climate changes⁴¹⁻⁴³. The NAPA identifies droughts as the most threatening climate-related hazard facing Ethiopia and recognizes dependence on rain-fed agriculture, poor water resource development, and importantly, a high population growth rate as key underlying causes of Ethiopia’s vulnerability to climate change. However, in general, policies addressing environment and climate change have only included a cursory discussion of population issues (in explicating superficially the effects of population pressure and rapid population growth on environmental degradation and climate change vulnerability). Ethiopia’s NAPA includes no projects related to family planning. In terms of addressing population issues, the 1993 *National Population Policy* of Ethiopia asserted its main goal as achieving harmony between the country’s rate of population growth and capacity to utilize its natural resources⁴⁴. Additionally, the 2006 *Reproductive Health Strategy*, lists the already

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unattained goals of increasing contraceptive prevalence to 60% by 2010, reducing unwanted pregnancies, and improving access to family planning services, and Ethiopia's *Poverty Reduction Strategy Paper* (PASDEP), among many other objectives, seeks to increase the country's contraceptive prevalence from the current 15 to 60% by 2009/10, to increase family planning service availability, and improve female education⁴⁵⁻⁴⁶. However, these population-related policies similarly disregard environmental issues.

Most recently Ethiopia has developed a new policy, the Growth and Transformation Plan (GTP), in 2010 that details goals to be achieved by 2014/2015⁴⁷. The GTP represents Ethiopia's first attempt to integrate population issues, climate change, economic development, and reproductive health in one comprehensive document. Specifically, the GTP highlights the important interrelation of population growth on the country's economic growth and development, while also addressing the overwhelming threat of climate change on Ethiopia's economy. With regards to reproductive health, the GTP seeks to expand contraceptive prevalence to 80% by 2015, a hugely ambitious endeavor in light of the country's current rate of contraceptive use (29%)²¹⁻⁴⁷. Regardless, the GTP is a significant and important step towards a productive integration of social, economic, and environmental issues.

Lastly, the global community, through the UN Framework Convention on Climate Change and national delegations meeting to forge an international climate plan, should listen to the voices of people most affected by climate change and should incorporate issues of salience to these groups. Access to voluntary family planning services as a means of supporting adaptation efforts is one of these concerns, highlighted by both national-level policymakers and local community members⁴. Within communities hard hit by climate change, population is not a "toxic" issue but one of many factors affecting people's lives, a factor that should be addressed by adaptation policies and strategies. Voluntary family planning helps support slowed population growth, and increased access to family planning services will have profound social, economic, and environmental effects that include poverty-

reduction, health improvement, environmental sustainability, and bolstered resilience to climate change. Without an increased commitment to family planning by national and international stakeholders, these aims, elaborated in the Millennium Development Goals and various NAPAs, will not be achieved⁴⁸.

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