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Effectiveness of the PHE Approach for Achieving Family Planning and Fertility Outcomes in Ethiopia:

A Comparative Study in the Gurage Zone

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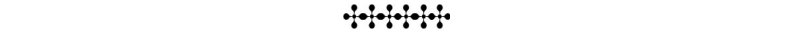

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Effectiveness of the PHE approach for achieving family planning and fertility outcomes in Ethiopia:
A comparative study in the Gurage Zone

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Executive Summary

Background: A high population growth rate increases demand for resources as well as the rate at which these resources are exploited. Population, health and environment (PHE) are inextricably connected. Population growth unbalanced with economic development creates food insecurity which leads households to consume food with reduced quality and quantity leading to increased risk of malnutrition and poor health. Food insecurity obliges people to encroach into the natural environment leading to a spiraling path to destitution. A study in the Philippines provided concrete evidence that integrated development programming incorporating PHE can be more effective at lowering population growth rates and preserving critical coastal ecosystems than single-sector development interventions (D'Agnes, D'Agnes, Schwartz, Amarillo & Castro, 2010).

Although the PHE approach has been implemented in Gurage Zone of South Ethiopia, its outcomes have not been evaluated. The objective of this study was to evaluate the effectiveness of the PHE approach for achieving family planning (FP) and fertility outcomes in Gurage Zone. A comparative cross-sectional study involving both quantitative and qualitative data was conducted from October 2 to 8, 2012. A total of 960 married women of reproductive age (15-49) were included in the study. Data were collected using an interviewer administered Amharic version questionnaire. An in-depth interview of key informants from various sectors was done using semi-structured interview guides. Descriptive statistics and multivariable linear and logistic regression analyses were performed to compare the PHE and non-PHE woredas (districts).

Results: There was no significant difference in the contraceptive prevalence rate (CPR) in both types of woredas, which we suspect to be due to the confounding effect of the Meskel holiday, during which a large-scale campaign promoted FP that resulted in a culture of FP use by the community. A subgroup analysis of CPR excluding recent new acceptors showed that PHE woredas had a significantly higher CPR as compared to non-PHE woredas. Within this sub-group, women in the PHE woredas were over four times more likely to use an FP method during the study period compared with women in the non-PHE woredas. (Women whose husbands

support their use of FP were 17 times as likely to use an FP method.) This was increased to 20 times more likely when conducting a sub-group analysis for women who were not new acceptors.

There was also significant positive change in attitude toward fertility in the PHE woredas, as shown by a decreased desire for additional children by both men and women, and increased knowledge of commonly used FP methods. Women in the PHE woredas also reported a lower ideal family size. This was also reflected in lower fertility experiences of women in the PHE woredas during the last five years.

There was better integration of FP, health, and environmental conservation issues into grassroots-level interventions in the PHE woredas. A significant number of women had control over income-generating resources and thus better access to cash, suggesting that women's empowerment is increased in the PHE woredas. The income-generating schemes in the PHE woredas are more diverse and targeted to environmental and food security outcomes compared with the non-PHE woredas. Overall, the PHE approach has better value-added outcomes with a significantly higher number of men supporting male-focused FP use and a higher percent of households using energy saving stoves. However, non-PHE woredas had a significantly higher percent of women with at least four years of schooling. There was no significant difference in the percent who had heard about FP, the number of FP methods known, and knowledge of at least one source of modern FP methods.

Although the study demonstrated significant differences between the PHE and non-PHE woredas in terms of FP and fertility behaviors, limitations of the study need to be considered in interpreting the results. Despite the fact that the study aimed to measure couple years protection (CYP), FP service delivery was not recorded by type of method due to recent changes in the management information system of the Ministry of Health. Therefore, total FP services rendered were used as a proxy indicator to compare the intervention (PHE) and non-intervention (non-PHE) woredas. As the types of FP services delivered are similar in the two woredas, this indirectly shows that there is higher CPR in the PHE woredas as compared with the non-PHE woredas. Due to the cross-sectional nature of the data, it was not possible to see the effect of improved FP and fertility attitudes on actual use of FP methods and fertility outcomes including

CPR and total fertility rate (TFR). However, from the indirect indicators used in the study, the women who contributed to the TFR during the past one year may have been new FP acceptors, thus contributing to the current CPR. Our data also showed that the proportion of new FP acceptors was high. Due to lack of baseline population data, it was not possible to show the effect of the PHE approach through a comparative analysis as differences might have come about due to confounding factors not studied. A conscious effort was made to minimize biases by making the two woredas similar at least by many of the known parameters relevant to the study.

Conclusions: The findings suggest that overall, the PHE approach has increased positive outcomes on fertility attitudes, FP use, and environmental conservation areas, while there was no significant difference in knowledge about FP. There is better integration of FP, health and environmental issues into the grassroots level interventions in the PHE woredas, however, networking and integration with key stakeholders such as the woreda environmental conservation office is critical to enhance ownership and sustainability of the programme. Integration of PHE issues needs to be strengthened and scaled up to sustain the positive gains such as lower desire for more children, and support of FP use by husbands.

Although not part of this study, strategies used in the PHE woredas such as school programs and student groups as mediums for integrated PHE interventions are effective approaches that need to be strengthened. The diverse range of income-generating schemes in the PHE woredas that are targeted to environmental and food security outcomes and better access for women to income are exemplary endeavors that should be encouraged. Future research should evaluate the relationship between fertility intentions among married women and their husbands in the PHE woredas and FP use. Further in-depth study of the socio-economic drivers behind the high TFR observed in both the PHE and non-PHE woredas is recommended to uncover key strategies for future intervention.

Key Words: Population, Health, Environment, PHE, Family Planning, Integration, Gurage Zone

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Acronyms

ASFR	age-specific fertility rate
CBRHA	community-based reproductive health agent
CIA	Central Intelligence Agency
CPR	contraceptive prevalence rate
CYP	couple years protection
DHS	Demographic Health Survey
FAO	Food and Agricultural Organization of the United Nations
FP	family planning
GPSDO	Gurage People Self Development Organization
HEW	health extension worker
HIV/AIDS	human immunodeficiency virus/acquired immunodeficiency syndrome
KAP	knowledge, attitudes, and practices
OVC	orphans and vulnerable children
PHE	population, health, and environment
SNNPR	South People Nations and Nationalities Peoples Region
TFR	total fertility rate
VCHW	voluntary community health worker
WAC	Woreda Advisory Committee

Background

Population, health, and environment (PHE) interventions are a coordinated and integrated set of activities that include goals and interventions in the PHE sectors. In 2009, the PHE-Ethiopia Consortium developed the following definition of PHE:

> [PHE is] a holistic, participatory development approach whereby issues of environment, health, and population are addressed in an integrated manner for improved livelihoods and sustainable well-being of people and ecosystems.

PHE evolved from the recognition that communities cannot exercise adequate stewardship over their natural resources and environment if their health, nutrition and economic needs are not met. Central to the PHE approach is improving access to family planning (FP) information and services, which works in a complementary fashion with basic health and environmental management activities to improve rural livelihood in Ethiopia and improve the health of women and their families.

PHE projects in Ethiopia have been designed by local organizations and communities to identify goals that cannot be met without addressing basic needs and rights. Community-based organizations realize that they cannot have long-term health or livelihood successes in a community without addressing resource scarcity, household size, and food security issues. By combining conservation and FP, organizations can more fully address the needs of communities. They can also see value-added results as women become empowered to plan their families, as well as become involved in natural resource management and income generation activities. Integrated approaches can also increase male and youth involvement in FP.

The Gurage People Self Development Organization (GPSDO) has incorporated agriculture extension and soil conservation into its FP work to improve both food security and the health of women and children in the zone. Within all of the GPSDO intervention sites, GPSDO staff work closely with health extension workers (HEWs) and community-based reproductive health agents (CBRHAs) to educate community members about FP, as well as to provide services. CBRHAs provide condoms and pills and HEWs in the Guraghe Zone, the study area, and also provide injectables and implants. GPSDO holds community education events in schools and during special holidays that include FP and reproductive health messages. In the PHE intervention sites,

GPSDO also offers a set of interventions that address the wide variety of challenges that communities face. These activities include nutrition classes, income generation activities such as beekeeping and energy saving stoves, and soil conservation activities. GPSDO uses these activities as additional opportunities to reach community members with FP information and services.

As PHE interventions are relatively new in Ethiopia, there is a need to determine the effectiveness of the Ethiopian PHE model for achieving FP and value-added goals. The study aims to answer the primary question, *What differences exist in FP outcomes in PHE and non-PHE sites where GPSDO implements FP programs*?

To effectively answer this question, the following sub-questions were considered:

1. How does GPSDO collaborate with the HEWs and development agents in their project work and how does this relationship work at PHE sites versus non-PHE sites?
2. Are there any FP and value-added outcomes found in PHE intervention sites that are not present in vertical FP sites?

Literature Review

FP entails having the number of children you want when you want them. At the macro-level, FP use can balance population growth with carrying capacity of the environment. The impact of uncontrolled population growth on both the environment and health is a daunting challenge facing the world today. Population growth, health, and environmental issues are interlinked in an intricate manner having serious impact on one another (Dabelko, 2011). Unlimited population growth would lead to competition for resources, overexploitation of the environment, and destruction of natural habitats and resources leading to spirally increasing poverty and environmental degradation.

Experience over the last couple of decades in Ethiopia has shown that as human population increases, the population carrying capacity of the environment decreases. A high population growth rate induces an increase in demand for resources and the rate at which these resources are exploited. In Ethiopia, where technology has not kept pace with the demands for greater productivity, environmentally harmful and economically counterproductive methods of exploiting land and associated resources (forests, animal resources, etc.) are resorted to in order to meet immediate needs. As a consequence of this, climatic conditions are becoming erratic and soil quality is declining at an alarming rate.

It is believed that population growth since 1950 is behind the clearing of 80 percent of rainforests, the loss of tens of thousands of plant and wildlife species, an increase in greenhouse gas emissions of some 400 percent, and the development or commercialization of as much as half of the Earth's surface land. The world's population is predicted to reach 9.2 billion by 2050 and with this rate of growth food demand is predicted to increase substantially (Evans, 2009). Continuing population and consumption growth implicates a concomitant increase in the global demand for food for the coming decades. This will by default lead to tense competition for land, water, and energy, in addition to the overexploitation of fisheries, which will affect the ability to produce food (Evans, 2009; Rosegrant & Cline, 2003; Rosegrant, Meijer & Cline, 2002). The need to reduce the impact of the food system on the environment will also increase the tension correspondingly. The Food and Agricultural Organization (FAO) of the United Nations estimates

that global agricultural production will need to grow by 70 percent between 2005-07 and 2050, and by almost 100 percent in developing countries, to feed more than 9 billion people.

Sub-Saharan African countries are situated in drought prone regions, where climatic hardships coupled with increasing population pressure could have more horrendous consequences. As a result, agricultural development in sub-Saharan Africa faces daunting challenges. The impacts of a changing climate on agricultural production due to warming of the continent are likely to be severe such that agricultural practices will be inadequate, and food security will be more difficult to achieve as commodity price increases and local production shortfalls (Moore et al., 2011).

A meta-analysis by Misselhorn (2005) also showed that climate is the main driver of food insecurity in southern African countries**.** Environmental hardships, including drought and ever increasing desertification, make the low-input, low-output rain-dependent agriculture system in sub-Saharan Africa unable to cope with the pace of a rapidly increasing population. This is further fueled by deforestation to expand agricultural farmland leading to land degradation, decreased soil fertility, and water scarcity. The presence of exponential population growth, increased per capita food consumption, rural urban migration, and rapid urbanization (SUNRAY, 2012, Moore et al., 2011) affects the livelihoods of the current and next generations of sub-Saharan Africans through increasing demand and competition for resources, including food. Insufficient growth in production will lead to higher food prices (FAO, 2011) with the food price spike of 2008 a warning signal of what could happen in the future (Brinkman, de Pee, Sanogo, Subran & Bloem, 2010).

Poor households are particularly vulnerable to the health consequences of food insecurity due to various reasons. Food insecure households have reduced quality and quantity of foods and are at increased risk of malnutrition (Brinkman et al., 2010; Norhasmah, Zalilah, Mohd Nasir, Kandiah & Asnarulkhadi, 2010). Population groups most affected are those with the highest requirements, including young children, pregnant and lactating women, and the chronically ill (particularly people with HIV/AIDS or tuberculosis) (Brinkman et al., 2010). Malnutrition has contributed to increases in mortality and overall disease burden in children (Christian, 2010). The high mortality and disease burden resulting from these nutrition-related factors make a compelling case for urgent interventions (Black et al., 2008, Christian, 2010).

Ethiopia, being the second most populous country in Africa with a total estimated population of 93,815,992 in July 2011 (Central Intelligence Agency, 2012), has a long history of chronic food insecurity (von Braun, 2007). In the past two decades, per capita food grain production has declined due to dependence on low-input, low-output rain-fed agriculture coupled with rapid population growth (Stokes, Scozzare, & Haller, 2010; von Braun, 2007). With an annual population growth rate of with 2.6 percent, the population of Ethiopia will double after 27 years (United Nations Population Fund, 2008).

Increasing access to FP yields co-benefits that respond to this subtle interplay between population growth, environmental degradation, and poor nutrition and health, which can lead to a spiraling race to poverty. However, in less developed countries such as Ethiopia, lack of access to birth control, as well as cultural norms that encourage women to stay home and have babies, contribute to rapid population growth. In Ethiopia, like in most sub-Saharan African countries, the contraceptive prevalence rate (CPR) is low, leading to higher rates of fertility and unmet need for FP (Ethiopia Central Statistical Agency & ICF International, 2011).

The results from the 2011 Ethiopian Demographic and Health Survey (Central Statistical Agency & MEASURE DHS, ICF Macro, 2011) showed good progress towards increasing FP coverage nationwide. The CPR among married women rose to 27% in 2012 from 15% in 2005 (Ethiopia Central Statistical Agency and ICF International, 2012). GPSDO has contributed to improving the CPR within the Gurage Zone. During 2005-2010, when GPSDO began implementing an FP program funded by the Packard Foundation, a total of 48,524 new FP users were recruited. These new users contributed to an increase of CPR in the zone from 8.1 percent in 2005 to 33.46 percent in 2010 (PHE-Ethiopia Consortium, 2012). However, this improvement is still far from the ambitious goal set by the Ethiopian government to achieve a national CPR of 65 percent by 2015 (Central Statistical Agency & MEASURE DHS, ICF Macro, 2011). There is still high unmet need in Southern Nations, Nationalities and Peoples Region (SNNPR). The 2011 DHS shows a 15.2 percent unmet need for spacing and a 9.8 percent unmet need for limiting, which combine for a 25.0 percent total unmet need.

To address the current low rate of FP outcomes in Ethiopia, PHE offers a step in the right direction in a flexible and innovative way to keep pace with today's rapidly changing world and

lays the foundation for empowering generations to come (De Souza, 2009). Evidence from around the world demonstrates that the PHE approach is the way forward for sustainable solutions to population and environmental problems. A study in the Philippines (D'Agnes, D'Agnes, Schwartz, Amarillo & Castro, 2010) provided concrete evidence that:

> [I]ntegrated development programming incorporating population, health, and the environment (PHE) can be more effective in lowering population growth rates and preserving critical coastal ecosystems than single-sector development interventions.

It has also been shown that an integrated approach to conservation and reproductive health generates higher impacts on human and ecosystem health outcomes compared to the independent vertical interventions (Gaffikin, 2008; D'Agnes et al., 2010). It has been inferred that better reproductive health outcomes – including increased contraceptive access and a significant decrease in the average number of children born to women – and trends showing a significant reduction in income-poverty among young adults are added value of an integrated approach (D'Agnes et al., 2010; Pielemeier, Hunter & Layng, 2007). It is believed that the PHE approach has increased access to FP and reproductive health services in remote communities in Madagascar, Kenya, southern Asian coral Triangle, and Philippines (Pielemeier, Hunter & Layng, 2007).

Experiences from Madagascar and Philippines showed that the PHE approach of integrating the environment into reproductive health and FP programs not only integrated health into natural resource management projects prompting greater participation of women and adolescent girls, but also encouraged men and adolescent boys to get involved in reproductive health issues and decisions (Pielemeier, 2005; Pielemeier, Hunter & Layng, 2007). The integrated PHE approach leads to a more effective and sustainable solution to population and environmental issues through empowering women and encouraging their involvement in conservation activities (Diamond, 2010) and through the economies of scale that the strategy ensures (D'Agnes et al., 2010). For instance, in the Philippines, an integrated approach that improved both reproductive health and coastal resource management more than single-sector programs strongly suggests that the integrated approach adds value (D'Agnes et al., 2010). The PHE approach also helps build trust within communities as it addresses their priority issues, including health services, offering an entry point for fostering community dialogue and concerted effort at the grassroots level.

A case study from Nepal also showed that the PHE approach has impact on conservation through women's empowerment, which increased women's involvement in resource management and conservation activities (Diamond, 2010). The positive effects of the PHE integrated approach has also driven the scale-up of the PHE program in Madagascar (Gaffikin, 2008).

In general, unlike the vertical FP services used hitherto, PHE initiatives aim to address the complex connection between humans and their health and environment in terms of providing FP services. Therefore, the focus is on improving access to FP services and reproductive health care in a coordinated and synergistic manner at the community level, while also helping communities manage their natural resources in ways that improve their health and livelihoods and conserve the critical ecosystems upon which they depend. PHE has the underlying philosophy of being an integrated, inter-sectoral approach to meet communities' FP, health, and natural resource management needs. It has been demonstrated that this makes the PHE approach more effective and sustainable than delivering these services in stand-alone or parallel programs (D'Agnes et al., 2010, Gaffikin, 2008). This study aims to compare FP outcomes in PHE woredas to non-PHE woredas of Gurage Zone.

Methods

Study Area

The Gurage Zone is located in the central and southeastern mountainous area of Ethiopia in SNNPR and consists of 13 woredas (districts). GPSDO works in nine woredas involving 250 kebeles. In four woredas, GPSDO is utilizing a standard FP approach, but in five woredas (Cheha, Endegagne, Mihurna Aklil, Ezha, and Enemerina Eaner) it is implementing an integrated package of environmental protection, livelihood improvement, and health and education interventions (PHE integration) within 45 kebeles. Gurage's population is 1.4 million, of which 90 percent live in rural areas. The Gurage Zone is one of the most densely populated in Ethiopia, with the maximum density reaching 441 persons per square kilometer. The national average for Ethiopia is 281 persons per square kilometer and the average for SNNPR is 106 persons per square kilometer. The primary occupation in the zone is subsistence farming. As a result of the high population density and traditional farming practices, the area has seen extensive soil erosion. Crop yields have also declined as the quality of the soil has declined from overuse. This environmental degradation contributes to food insecurity in the zone. Few families own livestock and most farm plots are less than one hectare. According to the zonal agricultural department, only 10 percent of families have at least one complete meal per day.

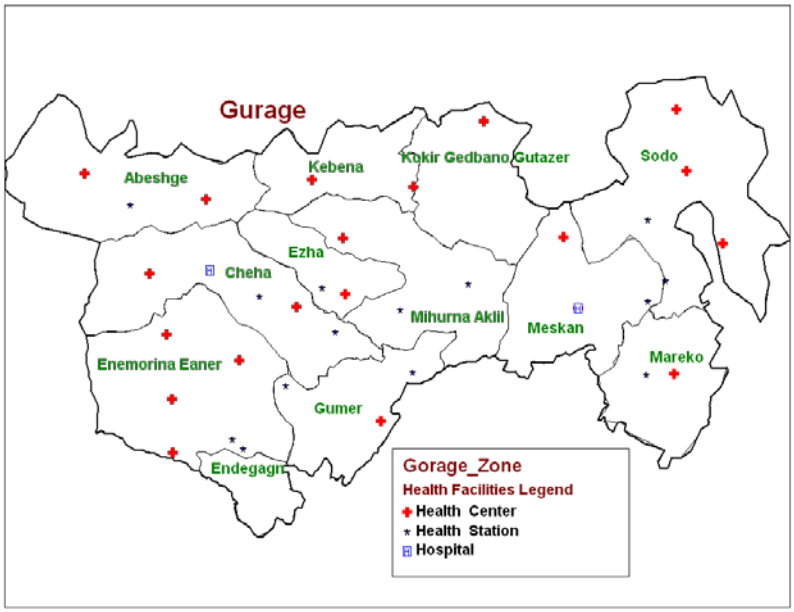


Figure 1. Map of Gurage Zone

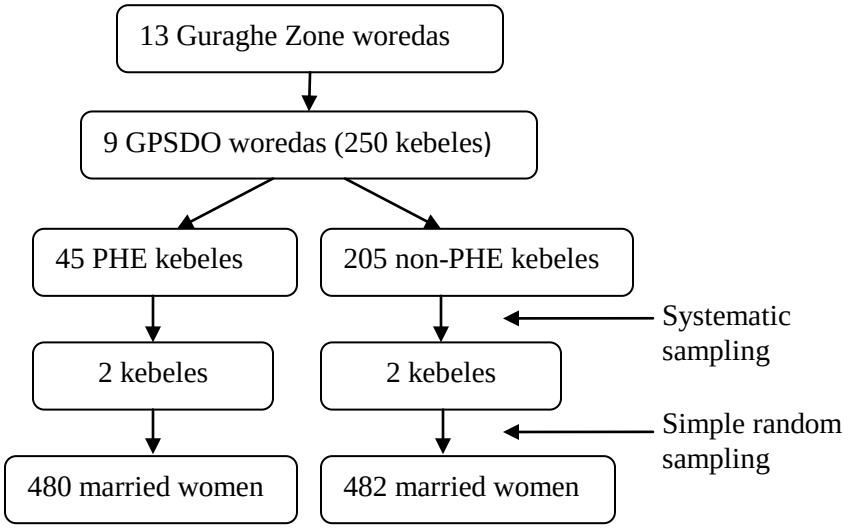
Study Design

A comparative cross-sectional study was carried out October 2-8, 2012, to determine the FP outcomes in PHE and non-PHE woredas in Gurage Zone. Detailed background data were collected from married couples using structured questionnaires. Key-informant in-depth interviews were done to capture deep understanding the issues.

Sample Size and Sampling Techniques

The study involved a total of 960 married women of reproductive age (15-49 years old) selected using a systematic sampling technique stratified by the PHE and non-PHE intervention areas, with roughly equal representation in the control and intervention groups. The sample was further allocated to four kebeles: two in the PHE woreda, Mihurna Aklil, and two in the non-PHE woreda, Gumer. Epi info stat calculator was used to determine the sample size.

Figure 2. Sampling framework



For the in-depth interviews key informants were purposively selected from GPSDO staff, HEWs, development agents, CBRHAs, and woreda officials from relevant sectors such as health, agriculture, and education both in PHE and non-PHE woredas.

Within each woreda, kebeles were randomly selected as community survey sites. To the extent possible, the woredas and kebeles were matched with similar demographic characteristics to make a fair comparison across PHE and non-PHE sites. The total sample from the quantitative study was allocated to the different woredas in the PHE and non-PHE areas proportional to the

size of their population. Within each kebele the study subjects (married women 15-49 years) were selected using a systematic sampling technique.

Measurement

To compare FP outcomes in PHE and non-PHE woredas, emphasis was given to indicators that are used for the GPSDO project outcomes, which were taken from the MEASURE Evaluation PRH family planning and reproductive health indicators database.[1] The value-added indicators were taken from the same database, as well as from Finn (2007).

The research employed primary and secondary data. The study started with a review of PHE research from around the world as well as FP interventions in Ethiopia and East Africa. It also involved gathering data on PHE statistics at the federal, regional, zonal, and woreda levels from Ethiopian government agencies, such as the Central Statistics Agency, Ministry of Finance and Economic Development, Ministry of Agriculture and Rural Development, and the Ministry of Health. The information gained from secondary sources supported the information gathered from in-depth interviews and a community survey, which provided primary data on the implementation of the PHE approach by GPSDO and PHE knowledge, attitudes, and practices (KAP) at the community level.

In-depth interviews were conducted by the consultants mainly focusing on questions that provided a picture of how GPSDO is working in the PHE and non-PHE sites, including how the sites are involving other development actors such as HEWs and development agents. This information was important in determining exactly what the different interventions are in each community so we could attribute differences in results from the community survey. The interviews were conducted following Mack and colleagues' field guide (Mack N, Woodsong C, MacQueen KM, Guest G & Namey N, 2005) and were carried out with key informants including GPSDO staff, HEWs, and woreda officials from relevant sectors such as health, agriculture and education both in the PHE and non-PHE woredas. The key informants were identified

[1] MEASURE Evaluation PRH Web site, available at http://www.cpc.unc.edu/measure/prh/rh_indicators. Accessed on 10 October 2011.

purposively. Relevant records of the health, agriculture and education sectors were also reviewed.

The community survey focused on KAPs related to FP and PHE themes to determine if there is a difference in FP outcomes between the PHE and the comparison vertical FP sites. The survey was informed by the Building Actors and Leaders for Advancing Excellence in Community Development (BALANCED) project assessment on the effectiveness of PHE in the Philippines (Pollnac & Dacanay, 2011). This resource guided the research and was adapted for the local context. Questions in the survey were based on standard items from other KAP surveys, such as socio-economic characteristics and other demographic information, fertility and birth spacing experience, and use of FP methods.

A survey guide was developed for the data collectors to use to ask questions and record responses while they were administering the survey. The survey questions were read to the respondents and the data collectors wrote their answers in the guide. The survey was pre-tested in a Gurage kebele where GPSDO works, but this kebele was not used during the full survey. The pre-test was done during the data collectors' training so that they could get acquainted with the data collection instruments, procedures, and study objectives. Data collectors were briefed on any changes made to the survey tool before they began data collection. For the actual survey, households were randomly selected using a list compiled by the kebele administration as a sampling frame. Within each household, married women of reproductive age were interviewed. The survey was conducted by trained interviewers fluent in the local language.

All activities were conducted in close supervision of PHE-Ethiopia Consortium staff in order to ensure quality and appropriateness, as well as to build the capacity of PHE-Ethiopia Consortium staff in conducting high quality research projects.

Data Analysis

Data from the community survey were analyzed using IBM SPSS for Microsoft Windows version 16.0. First descriptive statistics were provided using means and proportions. Bivariate logistic and linear regressions were performed to select variables that are candidates for entry into the adjusted model. Multivariable linear regression was fitted to identify variables that have

an independent effect on FP knowledge. A second multivariable logistic regression was performed to identify independent predictors of current FP use. Statistical significance was declared at $P<0.05$. The responses to the in-depth interviews were used to describe programmatic models to show how GPSDO is working in both the PHE and non-PHE sites.

The data captured using the voice recorders and field notes were transcribed daily verbatim into English. The transcribed data were double checked by the investigators listening to the voice recorders and looking at the field notes. The transcribed data were read carefully and key categories and thematic frameworks were identified and color coded. Data from different sources were triangulated and verified to ensure the validity of the information generated. The findings were presented in narratives by thematic area, using quotes from respondents to illustrate key points. Finally, the data were interpreted in terms of programmatic implications.

Ethical Considerations

Verbal consent of the study participants was requested before data collection. Permission from the Gurage Zonal and respective woreda health offices was granted to conduct the study in the respective woredas. The study protocol was ethically reviewed and approved by the Jimma University Ethical Review Committee. All information obtained will be kept anonymous. For this reason, none of the personally identifiable information will be used in the presentation of the findings in any form.

Results

A total of 960 married women in the reproductive age group were included in the study with a response rate of 100 percent. The mean age of the women was 35 (±6.8) years in the PHE woredas and 34 (±6.5) years in non-PHE woredas. Some 62.9 percent of the women in the non-PHE woredas and 69.8 percent in PHE-woredas had not gone to school or attended informal education, while the rest had varying degrees of education. Among the husbands, 45.4 percent and 36.5 percent in the non-PHE and PHE woredas, respectively, did not go to school or attend informal education. Regarding current school attendance, 50 percent of the women in the PHE and 49 percent of the women in the non-PHE woredas were attending school at the time of the survey. Mean family size was 6.2 (±5.6) persons in the non-PHE woredas; while it was 5.7 (± 4.1) in the PHE ones. A separate kitchen was present in 47 percent of the PHE woredas and in 45 percent of the non-PHE woreda households.

FP Use and Fertility Outcomes

The results showed that the percent of women who had heard about FP methods was similar between the PHE and non-PHE woredas (92.5 percent and 95 percent, respectively). There was no significant difference in the number of FP methods the women knew out of 13 total methods. However, when asked about the eight commonly used FP methods,[2] women in the PHE woredas mentioned 3.03 (±1.64) methods while those in non-PHE woredas knew 2.74 (±2.26) methods.

There was no significant difference in the CPR between the two woredas (70.7 percent PHE vs. 73.9 percent non-PHE). However, the percent of new acceptors of modern FP methods was higher in the non-PHE woredas (69.5 percent) compared with the PHE woredas (26.2 percent, P<0001). There was no significant difference in the percent of women who had heard at least three contraceptive methods and in the percent of women who knew at least one source of modern FP methods between the two woredas.

[2] Oral contraceptive, injectables (Depo-Provera), hormonal implants(Norplant), tubal ligation, vasectomy, intrauterine devices, condoms, and spermicides.

When we examine the CPR by age category of women, there was a significant difference between the different age groups in both PHE and non-PHE woredas showing that the CPR is lower in the younger age groups and in the older age groups (table 1).

Table 1: CPR by Age Group of Women and Type of Woredas

Woredas	Age group	CPR	*P*
Non-PHE (n=482)	20-24	60.0%	*<0.0001*
	25-29	78.2%	
	30-34	83.8%	
	35-39	83.7%	
	40-44	50.6%	
	45-49	48.1%	
	Total	73.8%	
PHE (n=480)*	20-24	63.6%	*0.0300*
	25-29	73.8%	
	30-34	74.7%	
	35-39	73.2%	
	40-44	67.0%	
	45-49	61.2%	
	Total	70.6%	

* There was only one woman in the age group 15-19, in the PHE woreda; and she was using an FP method at the time of the survey.

As the CPR rates are very high in both woredas, we suspected that these could be due to the effect of Meskel holiday when the Gurage people return to the region[3]. The government launched a campaign promoting FP that resulted in large uptake of FP use by the community. Therefore, we did subgroup analysis for married couples who had not been using a modern FP method for more than one year. The overall CPR of this subgroup was significantly higher (78 percent) in the PHE woredas as compared to the non-PHE woredas (52 percent).

Couple years of protection (CYP) could not be estimated as it was not possible to capture FP services delivered by type of method due to a change in the reporting system. However, the total FP services rendered from 2008 to 2012 in the PHE and non-PHE woredas was obtained through interviews with health facility and woreda health office personnel and compared. The results were indirectly indicative of an overall higher CYP in the PHE woredas compared with that of

[3] During the Meskel holiday each September, the Gurage people typically travel to visit family, and spouses living in different locations are reunited. Marriage ceremonies are popular during the holiday. Consequently, use of family planning may increase. Also, health organizations have used the holiday to promote family planning.

non-PHE woredas as the types of contraceptives given in both areas were similar, but the quantity distributed in the PHE woredas was higher.

Despite the fact that the PHE woredas had fewer FP services delivered in 2008, the FP service delivery in the PHE woredas had increased very much over the subsequent years resulting in greater number of services delivered each year compared with the non-PHE woredas. Since 2009, PHE woredas have demonstrated greater performance with regards to the total number of FP services rendered.

Regarding the reason for FP use among the current users, more women in the PHE woredas practiced FP for limiting their children (50.9 percent vs. 29.3 percent in non-PHE woredas), while a larger proportion of women in the non-PHE woredas used FP for spacing their children (55.2 percent vs. 30.4 percent).

The PHE woredas have better outcomes in many indicators related to fertility intentions. For instance, in the PHE woredas 42.7 percent of woman had future desire for more children, while this was 68.3 percent in non-PHE woredas. Similarly, percentage of husbands who had future desire for more children was 53.7 percent in the PHE woredas, while it was 70.3 percent in the non-PHE woredas. Women in the PHE woredas desired to have an average of two more children, which is significantly lower than an average of three more children desired by women in the non-PHE woredas. The proportion of women who do not desire any more children was significantly higher in the PHE woredas, while the proportion of women who desire to have more children was higher in the non-PHE woredas**.**

Analysis of the desire to have children by age group and woreda showed that for both PHE and non-PHE woredas, a larger proportion of women in the younger age group had a desire for more children. However, for all age groups, women in the non-PHE woredas have desire for more children. Similarly, analysis of the average number of children desired by age group and woreda showed a similar decline by age group, especially in the PHE woredas. Women in each age group in the non-PHE woredas desired a higher number of children. Analysis of desire for additional children by parity of the women showed that desire is significantly high among women with lower parity, and decreases as parity increased. Women in the PHE woredas

reported the appropriate number of children that a woman should bear is 4.8, which is significantly lower than 5.5 children reported from non-PHE woredas (table 2).

Table 2: Indicators on Fertility Intentions and FP Use by PHE and Non-PHE Woredas

Variables	PHE (n=480)	Non-PHE (n=482)
Heard about FP methods	92.9%	95.0%
Mean number of FP methods (out of 13) known by women (±SD)	3.69 (±2.73)	3.56 (±2.76)
Mean number of FP methods (out of eight commonly used*) known by women (±SD)	3.03 (±1.64)	2.74 (±2.26)
CPR	70.7%	73.9%
CPR excluding new acceptors†	78%	52%
Percent of new acceptors of modern FP methods	26.2	69.5
Percent of women of reproductive age who have heard of at least three contraceptives	67.5%	65.5
Percent of women who knew at least one source of modern FP methods	96.1	96.7
Percent of woman who had future desire for more children	42.7%	68.3%
Percent of husbands who had future desire for more children	53.7%	70.3%
Number of additional desired children by woman	1.9 (±2.1)	2.9 (±2.5)
Appropriate number of children reported by woman (mean)	4.8 (±2.7)	5.2 (±3.1)
Live birth during the last 1 years	25.2%	33.1%
Live birth during the last five years	1.07 (±0.9)	1.34 (±0.8)

Notes:
* The eight commonly used FP methods are pills, Norplant, Depo-Provera, condom, IUD, tubal legation, vasectomy, and spermicides.
† New acceptors are defined as women/couples who started using modern FP methods for the first time during the last one year before the survey.

The average number of children born during the last five years was significantly lower in the PHE woredas compared with that of the non-PHE woredas. An average of three children per woman were born in the non-PHE woredas during the last five years before the survey compared to an average of two children in the PHE woredas.

The total fertility rate (TFR), which is the potential number of children that women can be expected to deliver provided that the current age-specific fertility rates continue and the woman lives through her reproductive years, was calculated for total births and for wanted births. The findings show that the TFR for all children was higher in the non-PHE woredas. A woman in a non-PHE woreda is expected to have 9.6 children compared with a woman in a PHE woreda who is expected to have 8.5 children in her life (table 3).

Table 3: Age-Specific Fertility Rate (ASFR) and TFR by Type of Woredas

Woredas	Age group	# of women	# of births	ASFR
Non-PHE	15-19	0	0	0.00
	20-24	25	8	0.32
	25-29	110	45	0.40
	30-34	105	38	0.36
	35-39	135	45	0.33
	40-44	79	22	0.28
	45-49	27	6	0.22
			Total	1.91
		TFR=1.91(5)=9.6		
PHE	15-19	1	0	0
	20-24	22	13	0.59
	25-29	81	32	0.39
	30-34	95	33	0.35
	35-39	126	31	0.25
	40-44	105	9	0.09
	45-49	49	1	0.02
			Total	1.69
		TFR=1.69(5)=8.5		

Similarly, the total wanted fertility rate was also higher in the non-PHE woredas by one child. If the current fertility continues, it is expected that the women in the PHE woredas will give birth to an average of 6.35 wanted children, while those in the non-PHE woreda will deliver 7.45 wanted children (table 4).

Table 4: Wanted TFR and ASFR by Type of Woredas

Age group	PHE Woredas			Non-PHE Woredas		
	Number of women	*Number of wanted births*	*ASFR*	*Number of women*	*Number of wanted births*	*ASFR*
15-19	1	0	0.00	0	0	0
20-24	22	9	0.41	25	6	0.24
25-29	81	24	0.30	110	39	0.35
30-34	95	28	0.29	105	33	0.31
35-39	126	23	0.19	135	39	0.29
40-44	105	6	0.06	79	12	0.15
45-49	49	0	0.02	27	4	0.15
Total	479		1.27	481		1.49
Wanted TFR= 1.27(5) = 6.35				Wanted TFR= 1.49(5) = 7.45		

There were a total of 29 and 27 unplanned births in the non-PHE and in the PHE woredas, respectively, showing an unmet need in these group of women. Comparing the two types of woredas, the number of unplanned births was higher in the younger age groups in the PHE woredas, while it was higher in the older age groups in the non-PHE woredas.

Predictors of knowledge about FP and current contraceptive use

The multivariable linear regression model showed that after adjusting for different variables, women's educational level, women's occupation, and husband's occupation were significantly associated with knowledge of FP methods. Higher knowledge of FP methods was positively associated with increased years of education of the women, woman's occupation of being a farmer, and women's occupation of being a student/private employee. A sub-group analysis of women excluding new FP acceptors showed a similar finding regarding the predictors of knowledge of FP.

We also analyzed the predictors of current use of FP methods. A multivariable logistic regression model, after adjusting for different socio-demographic and fertility-related variables, showed that older age of the women and husband's desire for more children were negatively associated with current contraceptive use. On the contrary, husband's support of FP use by his wife was very strongly associated with the current use of contraceptives. Women whose husbands support their use of FP were 17 times more likely to use FP at the time of the survey.

Sub-group multivariable logistic regression analysis excluding new FP acceptors showed that the number of children a woman has, husband's support of wife's use of FP methods, and being from a PHE woreda were strong positive predictors of current FP use. Within the sub-group, women whose husbands support their use of FP were over 20 times more likely to use an FP method. Similarly, women in the PHE woredas were 50 percent more likely to use FP at the time of the survey.

Environmental and conservation outcomes

Assessment of the integration of a PHE intervention showed that the PHE woredas had better outcomes in integrating PHE issues compared with the non-PHE woredas. For instance, in giving

health education, the issues of population are linked to the effect that they have on the environment and health. The GPSDO program coordinator in the PHE woreda stated:

> We have a philosophy of economics of scale in integrating the issues of population, health, and environment. Students are involved in afforestation and area closure activities in addition to passing the key messages to their parents. Rather than making different interventions at different times, integrating our intervention … caters for the best use of resources. For example, we have a very strong integrated school health program. We use school students as [a] medium to educate their parents on family planning, health, and environmental issues. We have school education program, students are educated by different sectors including health and agriculture on the link between population, health, and environment. Health education is given twice per month in five schools. The other strategy is community mobilization where PHE has a capacity building and facilitation role.

Similarly, through community mobilization activities, with the collaboration of different sectors, biological and physical land rehabilitation activities have been performed. For instance, in a PHE woreda, Cheza Kebele, a number of areas that were exposed to gully erosion have been rehabilitated.

In-depth interviews with the key informants from the different sectors – including education, health, and agriculture – and GPSDO staff, indicated that there are varying levels of integration among the activities of the sectors within the PHE and non-PHE woredas. PHE has the role of facilitating and capacity building (training and some material support) to align the activities from the different sectors, more evidently at the frontline (grassroots) level. For instance, a staff member in one health center in Chesza Kebele stated the following, which gives evidence for better integration of frontline workers such as the voluntary community health workers (VCHWs), development workers and schools:

> We work very closely with the voluntary community health workers and development workers. For instance, the voluntary community health workers go to the houses of our clients and give them pills, identify their family planning method needs, and refer them to our health post. They are also key actors for community mobilization, be it for family planning or for environmental conservation activities such as afforestation. We collaborate with the natural resource management people from the agricultural sector and developmental agents in giving education about family planning …. The natural resource management people also give education to students on the need of protecting the

> environment with the emphasis on the negative effects of failing to protect the environment.

However, this integrated effort is less conspicuous at the woreda level. The PHE intervention site, Mihur Aklil, did not have a woreda advisory committee (WAC) meeting as regularly as compared to Gumer Woreda (a non-PHE site). Explaining this state of affairs, a key informant from the Mihur Akilil Woreda Natural Resource Management Office said that, "networking and integration with the agriculture office is less frequent at the woreda level. It would have been good if this integration is improved and the networking role of PHE is enhanced."

A key informant from the woreda education office stated that there is an integration of education with the health and agricultural offices, especially on activities related to schools and students. He stated the following to demonstrate how the integration worked:

> PHE works with schools on environment, health, and family planning. For example: education is given on HIV/AIDs and other communicable diseases and family planning issues are addressed for grades 5-8 in five schools. There is also support of orphans and vulnerable children. PHE also supports girls' education programs rendering a girls' tutorial support program. A revolving fund has been established for sustaining the girls' tutorial support program even after the phase out of the PHE project. Regarding environmental protection activities, PHE also supports seedling production. The strategy used for integrating the population health and environmental issues is the establishment of different clubs. For instance, there are health clubs, environmental clubs, and clubs which help girls to change sanitary pads during menses in the school.

He stated that the integrated approach of PHE had different added values, such as increased opportunity for community mobilization and awareness creation as well as fewer unwanted pregnancies among adolescents and more positive reproductive and health related behaviors.

In the non-PHE woreda (Gumer), although there was a monthly WAC meeting, the integration at the frontline level was marginal to non-existent. For instance, the Gumer Woreda GPSDO coordinator explained that, although there is co-planning of PHE issues at the woreda level, effects are not seen on the ground. In other words, the integration between FP and environmental issues remain more theoretical.

As indicated in table 5, a significantly higher proportion of households in the PHE woredas use fuel-saving stoves (9.8 percent) compared with those in the non-PHE woredas (2.7 percent).

Table 5: Use of Energy-Saving Stove and Other Environmental Issues, by Type of Woreda

Variables	PHE Woredas (n=480)	Non-PHE Wordedas (n=482)	P
Household has separate kitchen	47.6%	45.4%	0.5010
The cooking place has window (air vent)	38.6%	38.0%	0.8390
Percent of women using energy saving stove	9.8%	2.7%	P<0.0001
Average time spent to collect fire wood (hours)	2.03(±1.6)	2.17(±4.9)	0.5440

The qualitative data also indicated that 54 energy-saving stoves were distributed both in the rural and urban areas of the in the PHE woredas, as compared with a total of 50 stoves distributed in non-PHE woredas, but only in the urban areas. The stoves in the PHE woredas were produced locally by an organized women's group, while the ones in the non-PHE woredas were purchased from other areas. An in-depth interview with women using the energy-saving stoves in the PHE woredas indicated that they are becoming more accepted and in-demand. One of the women using the energy-saving stove explained the benefits of the stove:

> We were about to sell our children in exchange for getting fuel; now as user of the energy-saving stove, we are enjoying the benefits. I am also one of the women involved in the production of the stove. We are very happy in producing it, as it is highly needed and accepted by the community.

Because there is no local production of the energy-saving stove in the non-PHE woredas, the stoves are distributed only in urban areas.

Value-added outcome indicators

The other major area in which PHE woredas performed very well is on the value-added indicators. Although it is not significant, the proportion of households who had an alternative source of income was higher in the PHE woredas. As presented in table 6, in the PHE woredas, a significantly higher percent (57.7 percent) of the alternative income generating schemes are operated by women compared to the non-PHE woredas (15.2 percent), suggesting that women have access to cash and are more empowered in the PHE woredas. The in-depth interviews also indicated that in the PHE woredas, women are organized and given support by the PHE project

to run income generating schemes including local production of energy saving stoves and agricultural production.

Similarly, in the PHE woredas, a larger percent of men (30.2 percent vs. 7.3 percent in non-PHE woredas) support the use of FP by themselves, which is another striking finding.

Table 6: Value-Added Indicators by Type of Woreda

Variable	PHE Woredas (n=480)	Non-PHE Wordedas (n=482)	P
Household have alternative source of income	17.3%	16.8%	0.584
Person involved in generating alternative income source:			
husband	42.7%	84.8%	P<0.0001
wife	57.7%	15.2%	
Percent of women in reproductive age with four or more years of schooling	15.2%	24.3%	P<0.0001
Percent of husband supporting use of FP methods himself	30.2%	7.3%	P<0.0001

However, in contradiction to the above findings, the percent of women who had four or more years of schooling was significantly higher in the non-PHE woredas (24.3 percent) when compared with that those in the PHE woredas (15.2 percent).

In-depth interviews with the different sectors including the woreda health, education, agricultural offices, woreda and zonal GPSDO coordinators, HEWs, health professionals, and women's groups and beneficiaries, indicated that the PHE woredas have performed better in terms of integrating PHE issues. A summary of the comparison between PHE and non-PHE woredas based on certain key variables is presented in table 7. The fact that the PHE approach targets PHE integration is clearly reflected. These qualitative findings are supported by the quantitative findings.

Table 7: Summary of Findings from In-depth Interviews with Different Sectors

Issue	PHE Woredas	Non-PHE Woredas
Integration of PHE issues during implementation	FP issues are better integrated with health and environmental issues at the frontline level of various sectors. The integration at the woreda level remains to be improved.	Better networking of sectors at the woreda level in co-planning, but interventions are vertical and non-integrated at the frontline worker level
Main focus of interventions	FP and reproductive health (HIV/AIDS), other communicable disease prevention, support of OVCs, and environmental conservation	FP and reproductive health (HIV/AIDS), other communicable disease prevention, and support of OVCs
Income generating schemes	More diversified and customized to environmental protection and food security e.g. Beekeeping, banana plantation, energy saving stove production, animal fattening, handcrafts, and corn farms of women's groups. They are also targeted to women.	Limited, although they are customized to environmental protection and targeted to women.
Information, education, and communication	Integrated focusing on the interplay between PHE.	Given vertically with minimal/no focus on the interplay between PHE.
Strategies used for implementation	School clubs and using students as a means of outreach to parents on PHE issues and conducting community mobilization using VCHWs.	More based on community mobilization using VCHWs.
Networking and communication between different sectors	PHE has a facilitation and capacity building role at the woreda and frontline level. Sectors have an implementation role. At the frontline level, VCHWs have a mobilization role, while HEWs and development agents have an implementation role. They network very well at the grassroots level. At the woreda level, networking with the agricultural office is minimal.	GPSDO has a facilitation and capacity building role at the woreda and front- line level. Sectors have an implementation role at the woreda level. Theoretically, at the frontline level, VCHWs have a mobilization role while HEWs and development agents have an implementation role. But in practice, networking doesn't happen at the grassroots level. At the woreda level, the sectors network through monthly WAC meetings.
A forestation activities	A total of 1,103,00 trees were planted during the previous fiscal year, of which 75-80% have survived.	15,240 trees planted during the previous fiscal year. The status of survivors is not determined yet.
Percent of leadership positions held by the natural resource management committee	10-15%	10-15%

Discussion

The findings from the qualitative and quantitative data analyses showed that the PHE woredas had better integrated PHE issues and networking at the community level. The fact that there was no significant difference in the CPR between PHE and non-PHE woredas could be due to the effect of the Meskel holiday, as the study was carried out right after the holiday and an ensuing large-scale FP campaign. We did a subgroup analysis excluding the new acceptors of FP to investigate if there is a difference among those women who had used an FP method for more than a year, thereby avoiding the confounding effect of the Meskel holiday. The result showed a significantly higher CPR in the PHE woredas (78 percent) compared to the non-PHE woredas (52 percent), indicating the effects of the positive behavioural changes that the PHE approach had encouraged. Our findings also showed a significant positive change was demonstrated in fertility desires and FP use in the PHE woredas. Knowledge about FP methods that are commonly used was significantly higher in the PHE woredas and a larger proportion of husbands in the PHE woredas supported using FP themselves. Similarly, husbands' and wives' desire to have more children was significantly lower in the PHE woredas. This finding is similar to the findings of a study in the Philippines (D'Agnes et al., 2010), which showed that an integrated model showed a better outcome, compared with the single-sector models, in terms of improvements in health, individual FP and reproductive health practices, and community-level indicators of food security and vulnerability to poverty.

In this study, both the total births during the last five years, when the PHE project started, and births during the last one year were significantly lower in the PHE woredas. This difference might be related to awareness creation given in an integrated way linking issues of population, health, and environment in the PHE woredas. The fact that a significantly higher proportion of couples used FP methods for limiting the number of children in the PHE woredas as compared to the non-PHE ones indicates the positive attitudinal change that the PHE approach has brought in building the norm of having smaller family size, as the data also showed that desire for additional children is significantly lower in the PHE woredas.

Our findings showed that both TFR and wanted TFR are lower in the PHE woredas. Although the TFR and wanted TFR of PHE woredas are lower than in the non-PHE woredas, the TFR in

both are higher than the aggregate TFR reported for SNNPR in 2009, at 5.9 children per woman (Reggasa & Yusufe, 2009). Given the high CPR, which is higher than the Ethiopian government's goal for 2015, the higher TFR observed in this study could possibly be explained by the fact that a large proportion of women may have been new acceptors to FP one year before the survey. These women could have recently delivered their last baby and then accepted FP. The fact that the study was conducted immediately after the Meskel holiday might have inflated the CPR in both types of woredas. This could also explain the high TFR regardless of the high CPR, as the current CPR does not have an effect on the fertility rates reported by the women during the last year. Secondly, all women sampled in this study were married and at risk of pregnancy. The high TFR observed both in the PHE and non-PHE woredas needs further in-depth analysis of the socio-cultural drivers of higher fertility in Gurage Zone, which has a remittance-based economy (from urban to rural) driving the need for higher fertility. Qualitative information indicates that women are incentivized to have eight or more deliveries. Based on local tradition, women with eight or more children garner respect and are provided a special name and extra care by their husband and neighbors. This needs further investigation.

Husbands' support of their wives' FP use was strongly associated with current use of FP methods. Studies in Ethiopia and Kenya also showed that communication between husband and wife on FP issues, and husband's support (approval) of FP use by his wife are critical factors determining FP outcomes including CPR and unmet need (Lasee & Becker, 1997; Korra, 2002). In this study, men in the PHE woredas also support using FP methods themselves. These findings suggest the need for enhancing dialogue and advocacy to involve husbands in FP issues to improve FP outcomes.

In the PHE woredas, a significantly higher proportion of the income generating activities are managed by women, implying that there is a better empowerment of women in the project area. Reports showed that the PHE approach empowers women and facilitates their involvement in conservation activities (Diamond, 2010) ensuring an effective and sustainable solution to population and environmental issues (D'Agnes et al., 2010).

The findings also showed that there is better integration of environmental conservation activities into FP and health activities in the PHE woredas. For instance, there is better acceptance of the

fuel saving stoves, better afforestation, and more diversified, environmentally-friendly income generation activities in the PHE woredas. This might be due to the positive attitude among community members resulting from the PHE-facilitated awareness creation activities that use students as a medium, and through community mobilization efforts with VCHWs. A report also indicated that, despite the different challenges, PHE projects generate improved attitudes towards conservation and may play a critical role in laying the groundwork for successful conservation, particularly in areas where goodwill and trust in conservation organizations is not as strong (Honzak & Oglethorpe, 2011).

Although the program showed better outcomes in different measures related to fertility and FP use, networking and integration of interventions at the woreda level, especially with the woreda natural resource management office, is the weakest link, which needs further work. This is especially important when we consider scaling up of the program. Evidence shows that efforts to scale up programs in Madagascar and the Philippines have been relatively successful due in part to early and continued recognition of the interplay between FP and environmental issues by the conservation community, and recognition by FP advocates and other health partners of the benefits of partnering with conservation organizations (De Souza, 2009; Gafikin, 2008; De Souza, 2009; D'Agnes et al., 2010). Efforts to address unmet need for FP in rural communities in Madagascar have been strongly influenced by local, regional, national, and international FP, conservation, and development initiatives, as well as through focused site-based PHE projects (Gaffikin, 2008). This implies that a very close partnership with the sectors is critical in ensuring the sustainability and scale up of the program.

The significantly higher proportion of women who had attended at least four years of schooling in the non-PHE woredas could be due to the fact that the non-PHE woreda (Gumer) is on a main road which facilitates better access to schools, unlike Minhur Aklil, which is far from the main road. In addition, qualitative data showed that there have been different interventions in the education sector of Gumer woreda by different organizations including Irish Aid; while Mihur-Aklil is a newly established woreda separated quite recently from the former Eza and Wolene woredas. As a result, the education infrastructure is inadequately developed in some of the study kebeles.

In general, the effect of PHE approach on educations could not be visible on the cohort of married women included in the study as these backlog situations could have affected their enrollment in schools when they were young girls making the indicator less informative for this group. It is expected, that the effect will be more apparent in the cohort of young girls at the moment who will be the future mothers.

Although a larger proportion of women were engaged in the new income generating activities in the PHE woredas compared to the non-PHE woredas, not all income generating activities were funded by the PHE-Ethiopia Consortium. However, the practice of engaging women in the new income generating activities is significantly more prevalent in the PHE woredas compared to those in the non-PHE ones, which could be a positive attitude built due to the PHE interventions.

Although the study demonstrated significant differences between the PHE and non-PHE woredas in terms of FP use and fertility intentions, the following limitations need to be considered in interpreting the results. FP service delivery is not recorded by type of method due to recent changes in the management information system of the Ethiopia Ministry of Health. Therefore, total FP services rendered were used as a proxy indicator to compare CYP in the two woredas. As the types of FP services delivered are similar in the two woredas, this can indirectly show that there is higher CYP in the PHE woredas as compared with the non-PHE woredas.

Due to the cross-sectional nature of the data, it was not possible to see the effect of improved FP and fertility intentions on actual FP use and fertility outcomes, including CPR and TFR. However, from the indirect indicators used in the study, it is possible that the women who contributed to the TFR during the past one year may have been new FP acceptors, thus contributing to the CPR. Our data also showed that the proportion of new FP acceptors was high. Due to lack of baseline population-based data, it was not possible to show the effect of the PHE approach through a comparative analysis, as difference might have come about due to changes not studied. However, conscious effort has been made to minimize biases that could creep in by making the two woredas similar at least by many of the known parameters that are relevant to the study.

Conclusions

Based on the study findings, the following observations were made:

1. There was no significant difference between PHE and non-PHE woredas in the percent of married women of reproductive age who had heard about FP or knowledge of at least one source of modern FP methods, though there was a significant difference in knowledge of the most common eight FP methods.

2. There is a significant positive change in the PHE woredas in the behaviors related to fertility, such as lower fertility desire both by the index women and their husbands and lower number of children born during the last five years and during the last one year.

3. Although there was no significant difference in overall CPR between women in the PHE and non-PHE woredas, the number of FP services delivered since 2009 was higher in the PHE woredas. Excluding new acceptors, there was a significant increase in CPR in the PHE woredas. The number of new FP acceptors was significantly higher in the non-PHE woredas, most likely due to a large-scale FP campaign following the Meskel holiday.

4. There is a better integration of PHE issues into the grassroots-level interventions in the PHE woredas, but woreda-level inter-sectoral networking needs to be improved.

5. Husbands' support of FP use by their wives is a strong independent predictor of FP use among married women.

6. The PHE approach overall has better value-added outcome, such as a significantly higher number of men supporting FP use by themselves (i.e. condom use and vasectomies) and a higher percent of households using energy-saving stoves.

7. The income generating schemes in the PHE woredas are more diverse and targeted to environmental and food security outcomes compared with the non-PHE woredas.

8. Women had better access to cash and more control over income generating resources in the PHE woredas, indicating greater women's empowerment than in the non-PHE woredas.

Recommendations

Based on the above findings, the following key actions are recommended for further improvement of the outcomes of the PHE approach.

1. Strategies used in the PHE woredas, such as using schools and students as media for integrated PHE interventions, are commendable approaches that need to be strengthened.

2. Future FP and fertility interventions need to target husbands (men) to enhance FP use and improve fertility outcomes and integrate PHE approaches to facilitate this.

3. Integration of PHE issues needs to be strengthened and scaled up to sustain positive fertility and FP behaviors, such as lower desire for more children and support of FP use by husbands.

4. More networking and integration with key stakeholders, such as the woreda environmental conservation office in the woreda agriculture office, is critical to enhance ownership and sustainability of the program.

5. The PHE approach should be scaled up to more woredas as far as possible.

6. There is a need to strengthen networking and integration of PHE issues at the grassroots' level in the non-PHE woredas.

7. Future research should evaluate the effect of better fertility behaviors among married women and their husbands (such as FP use and TFR) in the PHE woredas.

8. Further in-depth study of the socio-economic drivers behind the high TFR observed in both the PHE and non-PHE woredas is recommended to uncover key strategies for future interventions.

References

Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, Mathers C, Rivera J. Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet*. 2008;371(9608):243-260.

Brinkman HJ, de Pee S, Sanogo I, Subran L, Bloem MW. High food prices and the global financial crisis have reduced access to nutritious food and worsened nutritional status and health. *J Nutr*. 2010;140(1):153S-1561S.

Christian P. Impact of the economic crisis and increase in food prices on child mortality: exploring nutritional pathways. *J Nutr*. 2010;140:177S-181S.

Central Intelligence Agency (CIA). Ethiopia demographics profile 2012 [Web page]. Available at http://www.indexmundi.com/ethiopia/demographics_profile.html.

Central Statistics Agency (CSA) [Ethiopia], MEASURE DHS ICF Macro [USA]. *Preliminary Ethiopian Demographic and Health Survey 2011*. Addis Ababa, Ethiopia; Calverton, MD, USA: CSA and MEASURE DHS; 2011.

Central Statistical Agency (CSA) [Ethiopia], ICF International [USA]. *2011 Ethiopia Demographic and Health Survey: Key Findings*. Calverton, MD, USA: CSA and ICF International; 2012.

Dabelko GD. Population and environment connections: the role of U.S. family planning assistance in U.S. foreign policy [working paper]. New York, NY, USA: Council on Foreign Relations; 2011. Accessed 19 February 2013 at: http://i.cfr.org/content/publications/attachments/CFR_WorkingPaper6_Dabelko.pdf.

D'Agnes L, D'Agnes H, Schwartz JB, Amarillo ML, Castro J. Integrated management of coastal resources and human health yields added value: a comparative study in Palawan (Philippines). *Enviro Conserv*. 2010;37(4):398-409.

De Souza R-M. The integration imperative: how to improve development programs by linking population, health, and environment. *Focus Population, Enviro, Security*. 2009(19):1-9.

Diamond NK. *Engendering Conservation Constituencies: Understanding the Links between Women's Empowerment and Biodiversity Conservation Outcomes for PHE Programs: WWF Nepal Case Study*. Washington, DC, USA: World Wildlife Fund; 2010.

Evans A. The Feeding of the Nine Billion. Global Food Security for the 21st Century. A Chatham House Report. London, United Kingdom: The Royal Institute of International Affairs, Chatham House; 2009. Accessed 19 February 2013 at http://www.cic.nyu.edu/staff/docs/alx_evans/evans_9_billion.pdf.

Food and Agriculture Organization (FAO). *The State of Food Insecurity in the World. How Does International Price Volatility Affect Domestic Economies and Food Security?* Rome, Italy: FAO of the United Nations; 2011. Accessed 19 February 2013 at: http://www.fao.org/docrep/014/i2330e/i2330e.pdf.

Finn T. *A Guide for Monitoring and Evaluating Population-Health-Environment Programs.* Chapel Hill, NC, USA: MEASURE Evaluation; 2007.

Gaffikin L. *Scaling Up Population and Environment Approaches in Madagascar: A Case Study*. Washington, DC, USA: World Wildlife Fund; 2008. Accessed 24 August 2012 at: http://www.worldwildlife.org/what/communityaction/people/WWFBinaryitem10856.pdf .

Honzak C, Oglethorpe J. *Learning Brief Number 1: Conservation and Family Planning: What Is the Value of Integrating Family Planning into Conservation Projects?* Washington, DC, USA: World Wildlife Fund; 2011. Accessesd 19 February 2013 at http://assets.worldwildlife.org/publications/366/files/original/18_WWF_Learning_Brief_on_Value_of_PHE_for_Conservation.pdf?1345736790.

Pielemeier J, Hunter L, Layng R. *Assessment of USAID's Population and Environment Programs and Programming Options* [report no. 07-001-47]. Washington, DC, USA: Global Health Technical Assistance Project; 2007. Available online at http://www.ehproject.org/PDF/phe/phe_assessment2007.pdf.

Pielemeier J. Review of population health-environment programs supported by the Packard Foundation and USAID [consultant's report]. Washington, DC, USA: Woodrow Wilson International Center for Scholars; 2005. Accessed 19 February 2013 at http://www.wilsoncenter.org/events/docs/Pielemeier%20USAID%20Report1.doc.

Korra A. *Attitudes Toward Family Planning, and Reasons for Nonuse among Women with Unmet Need for Family Planning in Ethiopia*. Calverton, MD, USA: ORC Macro; 2002. Accessed at http://www.measuredhs.com/pubs/pdf/FA40/ETFA40.pdf.

Lasee A, Becker S. Husband wife communication about family planning and contraceptive use in Kenya. *Intern Fam Plann Perspect*. 1997;23(1):15-20,33.

Mack N, Woodsong C, MacQueen KM, Guest G, Namey N. *Qualitative Research Methods: A Data Collector's Field Guide.* Research Triangle Park, NC, USA: Family Health International; 2005

Misselhorn AA. What drives food insecurity in southern Africa? a meta-analysis of household economy studies. *Global Environ Change.* 2005;15:33-43.

Moore N, Alagarswamy G, Pijanowski B, Thornton P, Lofgren B, Olson J, Andresen J, Yanda P, Qi J. East African food security as influenced by future climate change and land use change at local to regional scales. *Climatic Change*. 2011;110(3):823-844.

Norhasmah S, Zalilah MS, Mohd Nasir MT, Kandiah M, Asnarulkhadi AS. A qualitative study on coping strategies among women from food insecurity households in Selangor and Negeri Sembilan. *Malays J Nutr*. 2010;16(1):39-54.

PHE Ethiopia Consortium. *PHE Ethiopia's Spotlight, Integrated Practical Success Stories and Challenges from the Field*. Addis Ababa, Ethiopia: PHE Ethiopia Consortium; 2012. Accessed 10 January 2013 at http://phe-ethiopia.org/pdf/GPSDO_Spotlight.pdf.

Pollnac RB, Dacanay K. *An Assessment of the Benefits of Integrating Family Planning and Environmental Management Activities in the Visayas Region of the Philippines.* Narragansett, RI, USA: BALANCED Project; 2011.

Regassa N, Yusufe A. Gender differentials in migration impacts in southern Ethiopia. *Anthropologist*. 2009;11(2):129-137.

Rosegrant MW, Cline SA. Global food security: challenges and policies. *Science*. 2003;302(5652):1917-1919.

Rosegrant MW, Meijer S, Cline SA. *International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT): Model Description*. Washington, DC, USA: International Food Policy Research Institute; 2002. Accessed at www.ifpri.org/themes/impact/impactmodel.pdf.

Stokes L, Scozzaro AT, Haller J. The food crisis in Ethiopia and Egypt: contrasting hydrological and economic barriers to development. *Consilience: J Sustain Devel*. 2010; 3(1):117-138.

SUNRAY. Challenges for nutrition in sub Sahara Africa: background documents for the SUNRAY regional workshops, 2012. Accessed at http://sunrayafrica.co.za/sunray_cms/ downloads/ dynamic/compound_text_content/background_papers_no_water__english.pdf.

United Nations Population Fund (UNFPA). *Summary and Statistical Report of the 2007 Population and Housing Census*. New York, NY, USA: UNFPA; 2008.

Von Braun J. *The World Food Situation: New Driving Forces and Required Actions*. Washington, DC, USA. International Food Policy Research Institute; 2007. Accessed at http://www.ifpri.org/sites/ default/ files/pubs/pubs/fpr/pr18.pdf.

Annex

Survey Questionnaire

Identification number(ID)_____		
Area: 1. PHE 0. Non-PHE		
Woreda_____Kebele_____		
A. Background characteristics of woman and their husbands		Response
1.	What is your age? *Age in Completed Years*	_____Years
2	What is your educational status? 0. Illiterate/ informal education 1. Formal education, Grade_____	_____
3	What is your educational status of your husband? 0. Illiterate/ informal education 1. Formal education, Grade_____	_____
4	Are currently attending education?((1. Yes 0. No)	_____
5	What is the level of educational you are attending? 0. informal education 1. Formal education, Grade_____	_____
6	What is your occupation? 1. Housewife 2. Farmer 3. Government Employee 4. NGO Employee 5. Merchant 6. Daily laborer 7. Other (specify)_____	_____
7	What is your occupation of your husband? 1. Farmer 0. Government Employee 1. NGO Employee 2. Merchant 3. Daily laborer 4. Other (specify)_____	_____
8	What is the household size (number of people living in the HH)?	_____
9	Where is the place of residence of the respondent? 1. Rural 2. Urban 3. Small Town	_____
10	Does the household have a separate kitchen? 1. Yes 0. No	_____

11	Does the household have ventilation in cooking area? 1. Yes 0. No	_____
12	Are you using fuel efficient stoves? 1. Yes 0. No	
13	If Yes, who gave you the fuel efficient stove? _____	
14	What is the average time it takes to collect a fire wood?	_____hours

B. Household income

1.	Household annual income (Birr)	_____ Birr
2	What is the main source of income for the household?	_____
3	Does the household have new or alternative income-generating activities? 1. Yes 0. No	
4	What is the new income generating activity?_____	
5	When did this income generating activity start?	____months
6	Who supported you to start this income generating activity?_____	
7	Who is making the money in the new income generating activity 0. Husband 1. Wife	_____

C. Household Wealth

Now I will ask you about some fixed assets that your household have.

Does the household have any of the following properties? **(Circle)**		**Yes**	**No**
1	Functioning radio/Tape recorder/CD player	1	0
2	Functioning Television	1	0
3	Gas Stove	1	0
4	Kerosene stove	1	0
5	Electric stove	1	0
6	Bicycle	1	0
7	Motor Cycle	1	0
8	Cart/Gari	1	0
9	Watch (Hand/Wall)	1	0
10	Mobile phone	1	0
11	Plough	1	0
13	Sofa	1	0
14	Spring mattress	1	0
15	Sponge/Foam mattress	1	0
16	Cotton mattress	1	0
17	Grass Mattress	1	0
18	Chair/Stool	1	0
19	Generator	1	0
20	Milling	1	0
21	Water pump	1	0
Does the household have any of the following animals? 1. Yes 0. No		Y/N	#
22	Oxen		
23	Cows		
24	Horse/mules		
25	Goats/Sheep		
26	Chickens		

27	Donkey		
28	Pig		
D. Family Planning Knowledge ***In this section I will ask you about Family planning methods.***			
1	Have you heard of any contraceptive methods? 1. Yes 0. No===>30	_____	
If Yes tell me the type of contraceptive methods you know 1. Mentioned 0. Not mentioned			
2	Oral contraceptive		
3	Injectable (Depo-Provera)		
4	Hormonal Implants(Norplant)		
5	Tubal ligation		
6	Vasectomy		
7	Intrauterine devices,		
8	Condoms		
9	Spermicides		
10	Diaphragms		
11	Calendar method (or rhythm),		
12	Withdrawal		
13	Abstinence		
14	Lactation amenorrhea (LAM)		
Can you tell me any place where you can get modern contraceptive methods? 1. Mentioned 0. Not mentioned			
15	Health facility		
16	Health Posts		
17	Shops		
18	Other specify_____		
E. FAMILIY PLANING USE			
1	Are you /your husband currently using contraceptive methods? (1. Yes 0. No)	_____	
2	What is the reason you/your husband are using it? : 1. Limiting 2. For spacing 3. Other (specify)_____	_____	
3	When did you start using contraceptives? (months)	_____months	
If you/ your husband are currently using family planning methods, what is the type contraceptive you/ your husband is currently using?		1. Yes 0. No	
3	Oral contraceptive	_____	
4	Injectable (Depo-Provera)	_____	
5	Hormonal Implants(Norplant)	_____	
6	Tubal ligation	_____	
7	Vasectomy	_____	
8	Intrauterine devices,	_____	
9	Condoms	_____	

10	Spermicides	_____
11	Diaphragms	_____
12	Calendar method (or rhythm)	_____
13	Withdrawal,	_____
14	Abstinence,	_____
15	Lactation amenorrhea (LAM)	_____
16	Did you start using any modern contraceptive method for the first time in your life within the last year? 1. Yes 0. No	_____
17	If you are not using, contraceptive methods what is the reason? 1. I do not have the right choice 2. I do not know where to get it 3. My husband does not support 4. I want more children 5. I am infertile(Infecund) 6. Other(specify)_____	_____
F. FERTILITY	***Now I will ask you about fertility.***	
1	How many term deliveries do you have?	_____
2	What was your age at marriage?	_____Years
3	What was your age at first delivery?	_____Years
4	Do you have a live birth during the last 1 year? 1. Yes 0. No	_____
5	If yes, did you want to become pregnant? (Was the pregnancy intended)? 1. Yes 0. No	_____
6	Do you wish to have more children in the future? 1. Yes 0. No	
7	If yes, how many more children do you want to have?	_____
8	If no, why not?_____	
9	What do you think is the desired number of children?	____children
10	In total how many children did you did give birth to during the last 5 years?	____children
11	How many children have delivered in your life?	____children
12	Does your husband want more children? 1. Yes 0. No	_____
13	Does your husband support your use of modern contraception? 1. Yes 0. No	_____
14	Does your husband support using modern contraception for himself? 1. Yes 0. No	_____
15	From one menstrual period to the next, are there certain days when a woman is more likely to become pregnant if she has sexual relations? 1. Yes 0. No	_____
16	When is this time she is likely to be become pregnant? 1. Just before her period begins 2. During her period 3. Right Just before her period begins 4. After her period has ended 5. Halfway between two periods?	_____

Health Service Record review from the catchment health centers and health posts

Name of the health facility_____ Woreda: 1. PHE 2. Non-PHE		Woreda					
Modern FP Method	Number of services given/ products distributed by institutions during one year	2008	2009	2010	2011	2012	Remark
1. Tubal ligation							
2. Vasectomy							
3. Injectable							
4. Oral Contraceptives (Cycles)							
5. Intrauterine devices							
6. Diaphragms							
7. Hormonal Implants							
8. Spermicides							
9. Condoms							

Integration indicators

1. Number of new communication material, such as an advertisement, video, or educational book, which counts as a "created" message_____
2. Number of materials that demonstrate and educate about the linkages between population, health, and environment are considered linked messages_____

Value added indicators

(Data source: reports /log books)

1. Percent of communities with functioning community-based natural resource management committees_____
2. Number of educational sessions provided on new or alternative income-generating activities_____
3. Percent of youth participating on community-based natural resource management committees_____
4. Percent of leadership positions held by women on natural resource management committees_____
5. Number of fuel-efficient stoves distributed_____
6. Number of trees planted _____
7. Percent of trees planted that survive _____
8. Number of educational sessions on improved agricultural practices _____
9. Area of legally protected habitat _____
10. Percent of communities in target area that have developed a community-based natural resource management plan _____total number of communities (Kebeles)_____

Guiding Questions for the In-depth Interview (only for PHE Woreda)

Questions	**Probes**
1. Do you know PHE?	
2. What is it doing?	
3. How is it is delivering family planning services? What is its relationship with other sectors in the Woreda? Kebele?	Who else is involved?
4. What are the other sectors involved in implementing PHE activities related to Family Planning?	
5. Were your sectors involved in PHE activities?	How do PHE activities align with your sectoral objectives?
6. How different is PHE approach in providing FP program compared to the routine FP programs? In what ways?	Please cite examples
7. What are the impacts of PHE on family planning outcomes? (Are there positive OR negative as a result of PHE?)	Can you give examples?
8. What added values does PHE approach provide?	
9. What is the attitude of the community about PHE? About family planning services?	Anything more?
10. What should be modified /changed to improve the way PHE is implanted?	What else?
11. Anything you want to tell me?	

Guiding Questions for the In-depth Interview (only for non-PHE Woreda)

Questions	**Probes**
1. Do you know PHE?	
2. What is it doing?	
3. Do you know any organization working on family planning services?	What else?
3. How is it functioning? What is its relationship with other sectors in the Woreda? Kebele?	Who else is involved?
4. Who is involved in implementing family planning activities	
5. What is your role in implementing family planning services?	Please cite examples
6. What are the impacts of Family Planning services? (Are there positive OR negative as a results of FP services ?)	Can you give examples?
8. What is the attitude of the community about family planning services?	Anything more?
9. What should be modified /changed to improve the way family planning services are implemented?	What else?
10. Anything you want to tell me?	

Guiding Questions for the In-depth Interview (only for PHE Woreda)

Questions	**Probes**
1. Do you know PHE?	
2. What is it doing? What is its role in Family planning?	
3. How is it functioning? What is its relationship with other sectors in the Woreda? Kebele? Including HEW GPSDO	Who else is involved?
4. which sector/ organization is involved in implementing PHE activities ?	
5. What is the role of your sector in PHE?	How do PHE activities align with your sectoral objectives?
6. How different is PHE from the vertical FP program? In what ways?	Please cite examples
7. What are the impacts of PHE? (Are there positive OR negative as a result of PHE?) What added values does the PHE approach have?	Can you give examples?
8. What is the attitude of the community about PHE?	Anything more?
9. What should be modified/changed to improve the way PHE is implanted?	What else?