The Interrelationship between Population Dynamics and Childhood Mortality in Butajira District, South Central Ethiopia

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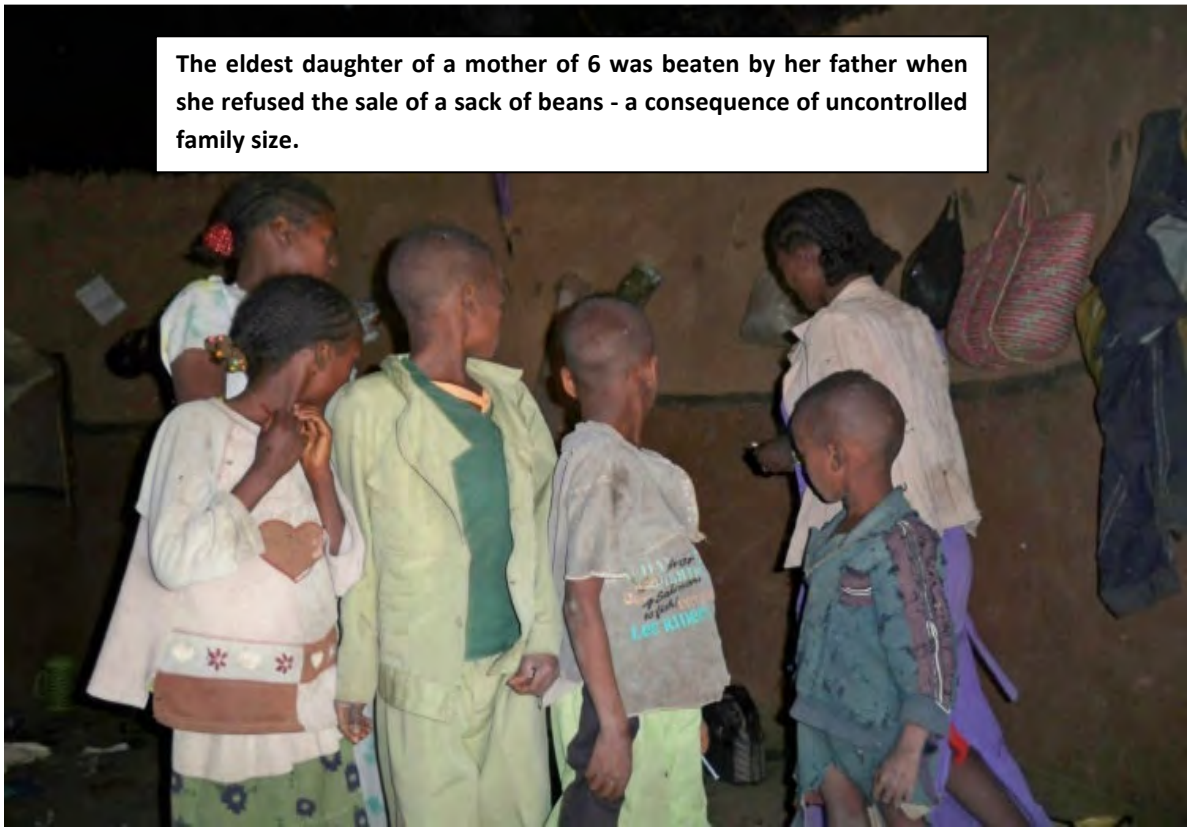

Dissertation for the Degree of Doctor of Philosophy (PhD) in Public Health
School of Public Health
Addis Ababa University, Ethiopia
June 2012

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

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A Dissertation submitted to the School of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy (PhD) in Public Health

By

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June 2012

DISSERTATION APPROVAL
ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

THE INTERRELATIONSHIP BETWEEN POPULATION DYNAMICS AND CHILDHOOD MORTALITY IN BUTAJIRA DISTRICT, SOUTH CENTRAL ETHIOPIA

BY

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Dedication

This thesis is dedicated to my late father, Aba Mekonnen Ayele Alamineh, and my late brothers, Teacher Yibeltal Mekonnen and Teacher Temesgen Mekonnen, whom I lost within eight months just before this study began. May their souls rest in the Heavens. Dear father and brothers, your memories are always fresh with me.

List of Original Papers

I. Mekonnen, W., Worku, A. Determinants of fertility in rural Ethiopia: The case of Butajira Demographic Surveillance System (DSS). *BMC Public Health* 2011 11:782. doi:10.1186/1471-2458-11-782

II. Mekonnen, W., Worku, A. Determinants of low family planning use and high unmet need in Butajira District, South Central Ethiopia. *Reproductive Health* 2011 8:37 doi:10.1186/1742-4755-8-37

III. Mekonnen, W., Worku, A. Levels and Proximate Determinants of Fertility in Butajira District, South Central Ethiopia. Ethiop. *J Health Dev* 2011 25(3) pp.184-191

IV. Mekonnen, W., Worku, A. The young, educated, minorities and the poor move out from south central Ethiopia. Submitted to *Journal of International Migration.*

Acronyms

AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
BRHP	Butajira Rural Health Program
CI	Confidence Interval
CPR	Contraception Prevalence Rate
DHS	Demographic and Health Survey
DSA	Demographic Surveillance Area
DSS	Demographic Surveillance System
EPI INFO	A software developed by Center for Disease Control to Manage Epidemiologic Data
FGDs	Focus Group Discussions
HEP	Health Extension Program
HEWs	Health Extension Workers
HIV	Human Immunodeficiency Virus
INDEPTH	International Network for the Demographic Evaluation of Populations and Their Health
IRR	Incidence Rate Ratio
MDGs	Millennium Development Goals
NA	Not Applicable
OR	Odds Ratio
PPI	Postpartum Infecundability
SNNPR	Southern Nations, Nationalities and People's Region
STATA	Statistical Software
STATCALC	Statistics Calculation
USD	United States Dollar

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Abstract

Background

The population of Ethiopia is still growing by 2.6% per annum mainly due to high fertility of 4.8 children per woman. Though increasing in the current decade, only about a quarter of married women used family planning methods in 2011. Though early childhood mortality diminished in recent years, this decline was not statistically significant in infant mortality. Levels and extent of reductions in the three components of population change and their relationships varied across different regions and by urban-rural setting in the country.

Previous studies elsewhere showed relationship between population dynamics and health. Studies also revealed that intervention in one component of population change affects another component. A body of literature on insurance and replacement fertility response of childhood mortality were documented in least developing countries. Moreover, selection, disruption, adaptation, environmental theories had also documented the relationship between migration with fertility and under-five mortality. Migration might select people with different fertility behavior and childhood mortality experience compared to those without such behavior. If those with less number of children migrate, the fertility and child mortality of non-migrants in the place of origin would be inflated compared to those of the migrants. Among the latter group, the disruption due to migration might contribute to reduction in fertility or increase in early childhood mortality. Besides, the group might adapt the fertility behavior of the population in the area of destination.

In this regard, this thesis aimed at measuring levels of and assessing relationships between fertility, contraception, under-five mortality and migration in the designated area of the study. It

also tried to identify main proximate and distal factors of each of these components of population change in the context of the recently introduced village-based health extension program, reproductive health strategy and population policy in the densely populated Butajira District of South Central Ethiopia.

Methods

The study was hosted by the Butajira Demographic Surveillance System which is located about 135 kms from Addis Ababa in the southern direction. Qualitative and quantitative methods were employed in this study. The quantitative research used two data sources. The longitudinal surveillance database up to the end of 2008 was extracted to recruit study women of reproductive age for the cross-sectional study which aimed at measuring levels and identifying determinants of fertility, contraception and the unmet need of family planning. The database was also used to have a detailed insight into early childhood mortality and out-migration in the district. Standard data collection instruments of the INDEPTH-Network and Measure DHS were contextually adapted for the longitudinal database and the cross-sectional survey respectively. A priori focus group discussions were held to incorporate the community's terminologies and opinions. A total of 11,133 women of reproductive age were recruited from the surveillance database and 9,996 of them responded positively.

Especially trained and experienced field staff collected the data. There was rigorous supervision. Data sources were managed by softwares having internal consistency checking mechanisms. Cleaning was done at desk. Serious anomalies were taken back to the field for reconciliation, while others were rectified by imputing values from logical flows in the questionnaire.

Frequency distributions, cross-tabulations and graphical presentations were done. Event history analysis was used to calculate person time of exposure, incidence and prevalence rates using

longitudinal data. Odds ratio along with the 95% confidence interval in binary logistic regression was used to determine association between covariates and the binary outcome of interest. In the case of fertility, Bongaart's model to measure the inhibition effects of proximate determinants and the incidence rate ratio in Poisson regression along with the 95% confidence interval was used to measure the association between fertility and covariates. Poisson regression was also used to measure associations of background characteristics with out-migration and under-five mortality. Assumptions of all the statistical models used in this study were checked.

Results

The total fertility rate of 5.3 children per woman was high and comparable to the rest of Ethiopia with rural-urban disparity (Highland, TFR=5.7, Lowland, TFR=6.6 and Urban, TFR=3.3). Postpartum infecundability due to breastfeeding (C_i=0.68) significantly deducted fertility from its biological maximum. The contribution of contraception (C_{c-u}=0.57, C_{c-e}=0.43) and non-marriage (C_{m-u}=0.53, C_{m-e}=0.41) was important among urbanites and educated women. Abortion contributed a significant role to reduce fertility among school youth (C_a=0.76). The fertility incidence rate ratio was 1.38: 95% CI (1.27, 1.49) times higher among those married before their 15 birthday, 1.24: 95% CI (1.10, 1.39) times higher among uneducated, 1.95: 95% CI (1.84, 2.06) times higher among those families with large size, 1.67: 95% CI (1.59, 1.76) times higher with child death experience and 1.06: 95% CI (1.01, 1.13) times higher among women living in food-secured households compared to their counterparts. Against other findings, fertility was 1.09: 95% CI (1.04, 1.15) significantly higher among women with no child sex preference. Besides, migration status of women did not seem to predict their fertility levels (1.02: 95% CI (0.97, 1.07)).

The contraceptive prevalence rate of 25.4%: 95% CI (24.2, 26.5) in Butajira District was comparable though unmet need of 52.4%: 95% CI (51.1, 53.7) was very high compared to national and regional estimates. Full stock out and absence of methods' mix, religion, complaints related to providers and methods, assumption of having proper diet, and optimum workload when using family planning methods were barriers of contraceptive use mentioned by study women in the area. The odds of contraception was 2.3: 95% CI (1.66, 3.18) times higher among urbanites, 1.99: 95% CI (1.38, 2.88) times higher among those completed secondary level of education and 1.5: 95% CI (1.12, 2.01) times higher among women whose partners completed secondary plus level of education, 1.3: 95% CI (1.13, 1.5) times higher among women with no experience of child death, 2.21: (1.8, 2.7) times higher among couples who discussed on contraception and 2.59: 95% CI (2.11, 3.17) times higher among women whose partners' support family planning use compared to their counterparts.

Under-five mortality level of 29 per 1000: 95% CI (27.4, 31.8) in the District recorded over the 22 years of surveillance was low. The difference between infant mortality of 86.6 per 1000: 95% CI (77.4, 96.9) and child mortality of 19.2 per 1000: 95% CI (17.4, 21.3) was higher. Compared to their counterparts, the study also showed 0.85: 95% CI (0.79, 0.80) times lower under-five mortality among female children, 1.14: 95% CI (1.03, 1.25) times higher under five mortality among Muslim and 15.24: 95% CI (13.75, 16.89) times higher among minority Christian families, 1.31: 95% CI (1.04, 1.66) and 2.02: 95% CI (1.58, 2.59) times higher among rural highlanders and rural lowlanders respectively, 1.54: (1.43, 1.67) times higher among families owning oxen, and 1.92: 95% CI (1.66, 2.22) times higher among families owning houses and 2.4: 95% CI (1.89, 2.06) times higher among those living in rented houses and 2.13: 95% CI (1.79, 2.53) times higher in children living in houses roofed with thatched grass, and 1.46: 95%

CI (1.26, 1.69) times higher among those living in the neighborhoods located 5-9 kilometers away from Butajira zonal hospital.

The study also revealed high out-migration of 3.97 per 100 person years (3.93, 4.01) in the district. The risk of out-migration was 0.94: 95% CI (0.92, 0.96) times lower among females, 1.9: 95% CI (1.85, 1.96), 1.77: 95% CI (1.71, 1.82), 1.55: 95% CI (1.49, 1.62), 1.23: 95% CI (1.17, 1.29) or 2.82: 95% CI (2.66, 2.98), 1.29: 95% CI (1.26, 1.32), 4.71: 95% CI (4.56, 4.87), 1.18: 95% CI (1.15, 1.22), 1.58: 95% CI (1.52, 1.64) and 2.11: 95% (2.04, 2.18) times higher among teenagers, the youth, unmarried, primary school completes or above, Orthodox and minority Christians, urbanites, and those living in rented houses and owned by others compared to their respective counterparts.

Some relationship between the three components of population change was also observed. There was statistically significant association between early childhood mortality and fertility (6.07: 95% CI (5.36, 6.87)). However, the association between fertility and migration status was not statistically significant (1.05: 95% CI (0.92, 1.19)). Neither was the association between under-five mortality and migration statistically significant (1.04: 95% CI (0.92, 1.19)).

Conclusions and Recommendations

Fertility was still high in the study community with high rural urban disparity. The most effective proximate determinant to deduct fertility from its biological maximum level was non-marriage due to disruption of marriage through migration of one of the partners. The contribution of contraception and non-marriage was also important among urbanites and educated women. Postpartum infecundability also significantly reduced fertility from its biological maximum in rural areas and among uneducated women. Abortion had also played an important role in

reducing fertility among in-school youth. Delayed marriage, higher education, smaller family size, absence of child death in the family, and living in food-secured households were also significantly associated with small number of children. Besides, fertility was significantly higher among women with no child sex preference. However, migration status of women was not statistically significant.

The contraceptive prevalence rate in Butajira District was still low, though unmet need was very high. Barrier to contraception in the area included, stock out and absence of preferred family planning methods, religion, complaints related to providers and methods, assumption of having proper diet, and optimum workload when using family planning methods. Significant predictors of contraception in the district included urban residence, women's and their partners' educational status, child death experience, couple's discussion on contraception, and partners' support.

The magnitude of overall early childhood mortality levels in the district recorded over the 22 years of surveillance, though low compared to the national and regional level was still high. Infant mortality was higher than child mortality in the district. Under-five mortality was significantly higher among male children, families confessing Muslim and non-Orthodox Christian denominations, rural residents, families owning oxen, those having their own houses, families living in rent-free houses, households living in houses with roofs of thatched grass, and families living in neighborhoods located between 5-9 kilometers from the zonal hospital as compared with their counterparts.

A high incidence of out-migration was observed in the district with higher level among males, teenagers, the youth, primary and secondary education or above completes, those not in marital

unions, Christians, urbanites, and families in rented and owed houses compared to those in owned ones.

This study had also showed statistically significant association between early childhood mortality and fertility. The association between fertility and migration was not statistically significant. Neither was the case between early childhood mortality and migration in the study area.

We recommend that the ills of fast population growth and its consequences should be intensively informed to the public. Women must be encouraged to sustain the practice of extended breastfeeding. Efforts should also be exerted to increase contraceptive use in rural communities. Besides, in-school youth should be aware of post-abortion complications and youth friendly family planning methods to reduce fertility, maternal mortality and childhood mortality in the community. Longer years of women's education should be scaled up. Health systems in Butajira District and the capacity of staff should be strengthened. The Government should avail family planning methods with appropriate method mix and increase competence of providers on managing temporary side effects. More rigorous child and maternal health education should be channeled through village-based health extension workers. Household hygiene, antenatal care, immunization and facility based delivery in the district should be scaled up. More efforts should also be exerted to improve the quality of residential houses. An insurance scheme to care for the elderly should be put in place to bring about change in the behavior of families towards small family size. We suggest that local authorities need to facilitate local employment and housing opportunities for retaining young and educated people in their own areas, to safeguard the future well-being of the entire population.

1. Introduction

1.1 Statement of the Problem

There is a huge gap between population growth and available resources in Ethiopia (1). The population was growing at a rate of 2.6% per annum while the economy has been largely agrarian (2, 3). Though the economy is growing in recent years, the country is facing multifaceted problems including recurrent drought, double burden of diseases with high prevalence of infectious diseases such as tuberculosis, HIV/AIDS and malaria (4-6).

Ethiopia has a young population, of whom about 45% were below the age of 15 years and 84%, including pastoralist communities, lived in rural areas in 2007 (2). Fertility rate declined by about an average of 0.5 child per woman every 5 years - from 5.9 to 4.8 children per woman between 2000 and 2011 (7-9). The country's total fertility rate is still high compared to most sub-Saharan African countries (10). Besides, there was a significant difference in the levels of fertility between urban and rural areas and different regions in the country. Total fertility rate went down from 6.4 to 5.5 children per woman between 2000 and 2011, in rural areas while the decline was from 3.3 to 2.6 in urban areas (7, 9). An effort was made to check the high fertility rate with parity specific controls. By the same token, encouraging results have been gained in family planning use in recent years since it increased from barely non-existent level of 8% in 2000 to about 28.6% in 2011 among married women (7, 9). The level of contraception has also been variable across rural-urban residence and major regions of the country with relatively higher magnitude in urban areas mainly due to better physical access of services in urban areas. The level of contraception among married urbanite women increased from 35.6% to 52.5% between 2000 and 2011 though the increase was from 4.3% to 23.4% in rural areas in the same

period (7, 9). Except for Addis Ababa, which is the political and economic center of the country, the contraception level in Ethiopia is not, however, sufficient enough to reduce the population of the country below replacement level (11).

Although the country has initiated household level family planning delivery to rural communities through a village-based female community health workers and a reproductive health strategy drafted for the years 2006-2015 to significantly increase the level of contraception in the project period (12, 13), about a quarter of married women had unmet need of contraception. Again, a pronounced differential of unmet need of contraception has been recorded across regional states and residence types in the country. The unmet need of contraception declined from a third to a quarter among married women between 2005 and 2011, while the met need increased from about 15% to 25.3% in the same period indicating that the total demand for family planning did not significantly increase over the 5 years (48.7% to 53.9%).

Childhood mortality is not only a measure of health, but also an indicator of social and economic development (14). The under-five mortality rate was 166.2, 123 and 88 children deaths per 1000 live births in 2000, 2005 and 2011 respectively, while infant mortality was 97, 77 and 59 deaths of children before their first birthday among 1000 children born alive in a calendar year between 2000 and 2011. There was an eight percent decline in under-five mortality per annum in Ethiopia in the past 11 years (7-9). Although the decline from its initially unacceptable highest level of childhood mortality was statistically significant, it is still one of the highest in the world (10). In fact, it is believed that the country will meet the requirement of Millennium Development Goal related to childhood mortality, since under-five mortality consistently declined by more than 4.4% per annum over the past two decades (15, 16). This might not be the possible maximum reduction and the indicator is still at higher level.

There was a net out-migration rate of 1 per 1000 mid-year population in 2011 in Ethiopia (10). Ethiopia's emigration data revealed higher incidence of out-migration rates in favor of females destined to oil based economy in the Middle East countries to engage in domestic chores (17). Simple observation of the demographics of the country revealed that migration was higher among the youth, educated and unmarried. Moreover, Ethiopia has an excessive rural to urban migration mainly due to high population pressure in rural areas since the arable land was degraded and subsistence farming, which is the major livelihood for rural families, could not adequately support the rural population and the service sector is expanding in urban areas of the country (18).

Relations between the three components of population change and their interaction to affect the size and structure of the population is evident. Understanding such relationships in Ethiopia, which is at the second stage of demographic transition, helps in designing appropriate policies and programs for population and health. According to the traditional demographic transition theory, countries at the first stage of transition have highest birth and death rates with low natural increase. Mortality decline is followed by fertility decline in the second stage in which case the natural increase would be relatively higher compared to the first stage of transition (19). In developing countries including Ethiopia, the gap between birth and death rates has been pronounced and this gives rise to the highest growth rate compared to the level observed in developed countries that need longer years of doubling time (20). In Ethiopia, mortality has been declining consistently due to relative increase in health service coverage and basic services such as childhood immunization (9). However, in the context of an economy based on household subsistence farming and mortality dividends in rural communities creating a scenario to aspire for many children raised total fertility rate in the country. Higher fertility could also raise

competition for resource among sibling children and high population pressure gives rise to higher mortality and migration. Studies in Ethiopia indicated that childhood mortality has been consistently and significantly positively associated with fertility (21-25). In drought prone areas in the country, there were differentials of childhood mortality among migrant groups in the country (26). The effects of coming from a high to a low disease risk area or vice versa, or moving from a rural to an urban area are associated with the health outcome of individuals (27). The same study indicated that there is a difference in the use of health services among the various age and sex groups both in permanent and temporary migrants before and after the move in the four bigger regions of Ethiopia including Oromia, Amhara, SNNPR and Tigray.

Hostile environment at the place of origin forces people to move out, while conducive environments at the place of destination attract them (28, 29). Migrants choose the place of destination by comparing it with other possible destination areas. Migrants intend to improve personal development, life style or physical health (28). However, the migration process can sometimes be stressful and hazardous. Migrants could thus adjust to new lifestyles that may require changes in behavior that may compromise health. In the advent of recurrent drought and high population pressure, people move out from their usual place of residence in search of better life opportunities at the place of destination (26, 30, 31). The youth, unmarried, uneducated, minorities, those who do not have assets and live in drought prone arid areas were more likely to move out from their usual place of residence compared to their counterparts in Ethiopia (27, 32).

In the context of high mortality, people liked to have many children to insure that at least some would survive (33-35). Empirical evidence on fertility responses to childhood mortality focuses on insurance effect that arises from the tendency of couples in high mortality settings to anticipate mortality risks and replacement effect in which parents experiencing the death of a

child adjust their subsequent reproductive preferences and behavior (36). Replacement has a biological component associated with the death of breastfeeding infants which in turn leads to the truncation of lactational amenorrhea and a volitional component that arises from parental decisions to have additional children to replace the lost ones (34). Childhood mortality contributes to parental desires to have many children and conversely, declining childhood mortality increases the number of surviving children, leading couples to compensate with fertility control. When families face death of children, they replace them by having more. The converse could also be true in the presence of wider health service coverage staffed with skilled health personnel which gives the public confidence of longevity. The volitional effect of child death facilitates pregnancy of women. Child mortality was significantly and positively associated with fertility (37).

Higher fertility is instrumental for population pressure that might be revealed in the form of excessive mortality and migration. Three main hypotheses are of particular interest in the relation between fertility and migration including selection, disruption and adaptation (38, 39). Selection hypothesis explains that migrants are distinct from those who do not move in terms of education, age, marital status and family size preferences (40, 41). Disruption suggests that migrants' fertility is interrupted and temporarily postponed because of the separation of spouses (42). Adaptation theory explains that migrants change their behavior to fit their new destination environments and that new social networks will give them new ideas about fertility and family size (43).

The decline of urban childhood mortality by 4% per annum to achieve millennium development goals even in sub-Saharan Africa is yet to be achieved in only five of the 22 countries which conducted Demographic and Health Survey, while five others revealed an increase in child mortality and 12 showed a slight decline (44). Childhood mortality has been showing differentials across migration status of communities. Individual and community contexts are more likely to affect health outcomes and service uptake among migrant groups through the traditional migration perspectives. Individual-level characteristics such as migrant disruption, selectivity, and adaptation as well as community level characteristics were important in explaining differentials among children's immunization (45). In a slum area of Nairobi, the risk of child mortality was higher among those born to mothers who have stayed in the slum for a long time, although it was the highest among mothers who came to the slums while they were pregnant (46). Findings also suggested lower rates of infant mortality among Mexican communities when remittances are high and decrease as migration to the United States becomes increasingly salient to livelihoods of communities (47).

In summary, the levels of fertility, childhood mortality and migration were high and they were significantly associated with one another in traditional societies including Ethiopia (22, 23, 27). They affect the size and structure of the population at the second stage of demographic transition which requires detailed analysis of the relationships in rural communities with an experience of high population pressure. Such an analysis would inform policy makers and programs to design effective strategies to alleviate problems related to population and health and evaluate successful implementation of already existing ones such as the national population policy, the health extension program and the reproductive health strategy in the country.

1.2 Rationale of the Study

In addition to drafting a population policy in 1993, the Government of Ethiopia has revised the family code to raise the legal age at first marriage. This has great implications in a country where marriage is universa1 (1, 48). It also drafted a reproductive health strategy and instituted nationwide household level reproductive health service delivery using two female community health workers for every ***kebele***/village (13, 49). However, the impacts of such policies and programs on the relationship between demographic variables and health in the context of high population pressure and periodic droughts were not assessed. Moreover, in a country where the population is growing with a doubling time of less than one generation and the resource being very limited, measuring levels and determinants of the three components of population change and their relationships warrants a detailed study. Population and health related issues are related to one another and may require an integrated approach to solve it from policy perspective (50). No sector stands by its own; especially health is multi-sectoral (51). Social sectors including health are highly related to one another and they require an integrated approach to bring about perceived status change (52). One demographic or health related population characteristic is a proximate determinant of another which requires immediate attention (21, 22). For instance, we know that family planning use is a parity specific control which also improves maternal and child health in addition to economic empowerment (53). Women empowerment and child and maternal health enhancement have direct impact on other components of population change including fertility and mortality. Measuring impacts of proximate determinants such as family planning that have been associated with most of the components of population change would guarantee the success of programs designed to alleviate multifaceted problems.

Assessment of the degree of relationship between components of population change facilitates the understanding of the extent of demographic transition the community has undergone in relation to the achievement of the economic development in a defined population. Such a study would have a profound impact if conducted in the context of recent interventions such as the nationwide health extension program and adoption of reproductive health strategy under the umbrellas of the national population and health policies.

1.3 Thesis Theoretical and Conceptual Frameworks

Literature reveals that demographic, social, economic and cultural factors influence the three components of population change (54). Components of population change do also interact with one another. The classic theory of demographic transition documents that mortality would first decline followed by fertility (19). Due to the advent of modern medicine and increase in health service coverage, decline in mortality has been observed in most African communities, although reversal of the achievement was observed in the era of HIV/AIDS (55, 56). Recent studies have also shown decline in fertility in the general population of sub-Saharan African countries. However, replacement level fertility decline is less evident in the general population of African countries, with the exception of South Africa, central Kenya in the 1990s and Zimbabwean general population (57, 58). Urban replacement level fertility was also observed in many sub-Saharan Africa metropolitan areas, including Addis Ababa (11). Demographic, economic, social, and administrative changes have all had a role in fertility transition (54). Change in the value of children contributed to the decline of fertility in urban Africa (59). Household livelihood changes from agrarian to non-agrarian required relatively fewer children to involve in families' production or service provision firms which may require introduction of parity specific control. Against the history of South Asian and European countries, replacement level fertility decline in

sub-Saharan Africa happened through the use of hormonal contraceptives (60). Contraception, rising age at first marriage and marital stability, induced abortion, length of postpartum non-susceptibility, which is principally due to breastfeeding, and variations in the extent of infertility and sub-fertility are considered to be the main determinants of fertility (61). Unmet need, which is the failure of individuals to use contraception when they would like to forgo childbearing, was significantly higher among young women 15-19 years of age, rural residents, Oromos, non-migrants, and uneducated. The same was also true with families who lost at least one child, women who never discussed family planning with health workers or their husbands, or disapproved of family planning and believed their husbands held the same view (62). The complements of these individual and household characteristics have also been associated with the met need of contraception. Women's age, socio-economic changes including their educational and occupational status and that of their partners, desire for more children, household or individual income, asset ownership including land and house, type of residential area and region, marital and migration statuses were found to be significantly associated with fertility in low income countries (40, 42, 43, 53, 61, 63-72).

Though mortality declined significantly in the past few decades due to expansion of health service delivery to rural communities in Ethiopia, significant reduction in fertility could not be observed in the general population of Africa including Ethiopia, except in recent years (7-9). In Ethiopia, however, there were also differentials of decline in fertility between rural and urban communities with pronounced level in the latter compared to the former. Regional disparities in mortality and fertility reduction have also been witnessed. The recent fertility decline could mainly be associated with the policy and programmatic changes in family planning service provision through health extension program, delay in age of first marriage due to the revised

legal age, and increase in girls' school enrollment due to the widespread expansion of education service in the country (8, 9, 48, 49, 73). Further, fertility has been significantly lower among those who lived in the urban areas, were more educated, married late, breastfed for a longer time, did not have experience of child death, and migrated (11, 22, 23, 74, 75).

On the other hand, under-five mortality does not only affect fertility but also shows the socio-economic development in developing countries. It is used as a measure of progress in health and well-being as documented in the Millennium Development Goals (44). Infant mortality rate measures the coverage of delivery service and skills of health care service providers whereas child mortality rates scales nutritional and environmental factors that contribute to the survival of children. Under-five survival depends on proximate and distal determinants (76). Proximate determinants typically involve the interaction of malnutrition, infectious diseases and adverse reproductive characteristics of mothers that are directly related to infant and child death. Distal determinants include social, cultural, economic and political conditions.

Socio-economic status of parents including, ethnicity, education, sanitation and access to safe drinking water, radio ownership, residence type and bio-demographic factors like, sex of the child, birth spacing, length of breastfeeding, and age at birth were found to be significant determinants of infant and child survival (77-80). Particularly, association of maternal education and paternal occupation with infant mortality have been well studied in many developing countries (81). Moreover, many studies have indicated that childhood mortality is associated with fertility and vice versa (23, 33, 36, 82-90).

The other component of population change, migration, has been found to be selective of certain population characteristics including, age, sex, education, occupation, income and marital status. A study in four major regions of Ethiopia indicated that permanent migrants were higher in the oldest age bracket (27). Females aged 15-19 years showed the highest concentration of temporary migrants. Urban areas had twice the proportion of permanent and temporary migrants compared with rural areas. Among the permanent out-migrants from households, most were females concentrated highly in adolescent years. Meanwhile, the majority of temporary male migrants were less educated. Migration of least educated females was highest among permanent rural migrants. Marital formation and dissolution was found to be one of the key factors leading female household members to migration. Less educated female migrants had a higher risk of becoming involved in commercial sex, and they have little power to defend themselves from any risky behavior that will expose them to HIV infection (91). Migration has been a catalyst in the spread of HIV in southern African countries. The spread of infectious diseases that are transmitted from person to person will follow the movement of people (92). On the other hand, other studies have also shown a net incidence of migration into the urban area, particularly among young adults. Mortality was higher among permanent residents compared with in-migrants (32, 93).

The theoretical basis for this research to study the relationship between migration with fertility and under five mortality was founded on the premise of the work done by Goldstein and Goldstein in 1983 which extensively dealt with selection, adaptation and disruption hypotheses (94).

Migration researchers have been interested in the relationship between migration and fertility in the context of the current rural-urban migration and urban growth in developing countries (38). Three main hypotheses are of particular interest: selection, disruption and adaptation. Selection hypothesis explains that migrants are distinct from those who do not move in terms of education, age, marital status and family size preferences (30, 35, 41). Migrants from rural areas might have lower fertility before and after the move than those who stayed in rural areas, and their out-movement from rural areas might inflate fertility in rural areas. Disruption suggests that migrants' fertility is interrupted and temporarily postponed because of the separation of spouses. Adaptation theory explains that migrants change their behavior to fit their new urban environments and that new social networks will give them new ideas about fertility and family size. One might expect that migration to urban areas would help migrants to adopt new social norms associated with delayed or reduced fertility. Studies indicated that there is a high probability of migration for more educated, non-married, urban residents, and previous migrants. Where evidence of selection processes could be observed, having children and being in employment or in school deter migration (39, 72, 95).

Theories explaining the relation between under-five mortality and migration in sub-Saharan Africa relate to disruption, selection or environment (39). Disruption explains that migration disrupts jobs, family and community attachments and may enhance child survival (through economic empowerment or by availing more time for childcare) or lead to harsh living conditions that will negatively affect child survival (when income is depleted or the living environment is changed due to migration). On the other hand, selection theory argues that migrants are more often well educated, posses better occupational skills, have considerable

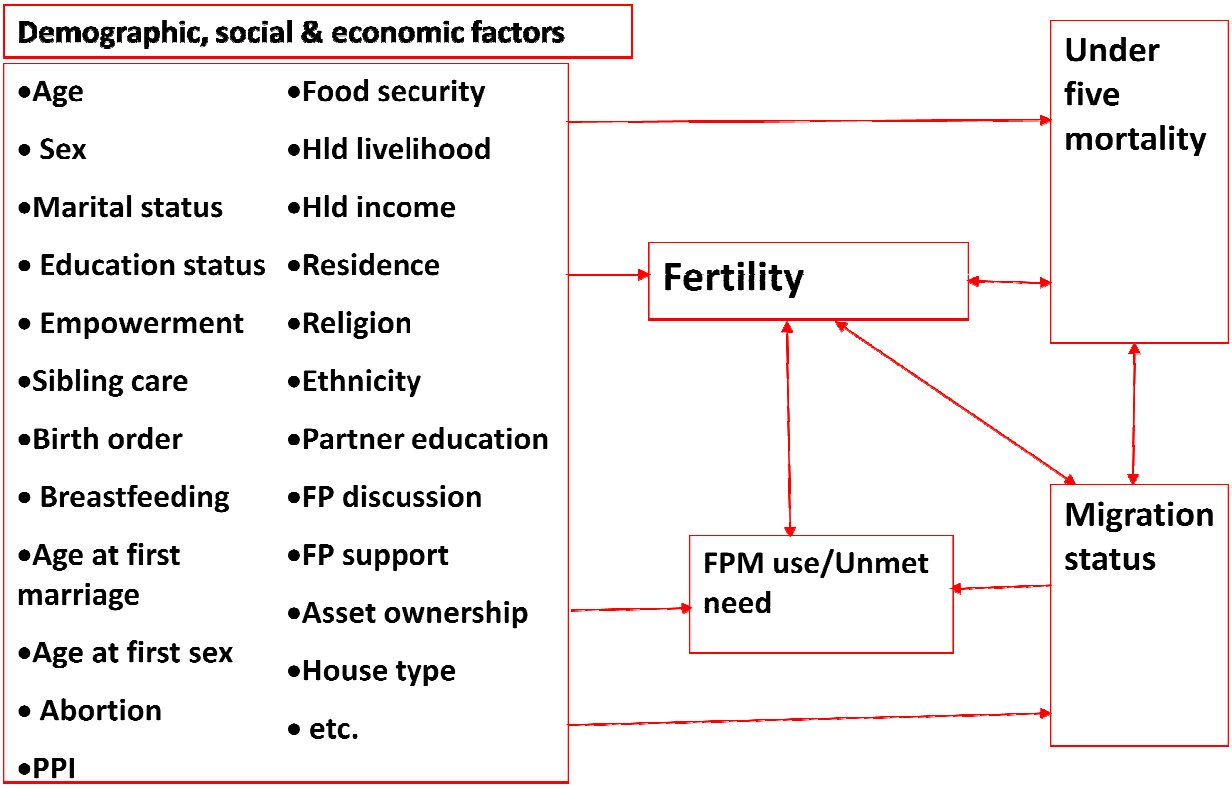
wealth, and are mostly young compared to non-migrants in which case better child survival was documented (96). The environmental approach explains that contact with the urban environment through social interaction and increased exposure to new ideas may lead to changes in attitudes, life style, and motivation which would increase child survival. Previous studies revealed the disruption, selection, environment or adaptation perspective of migration in child survival in least developing countries (42, 46, 91, 92, 97, 98).

Empirical evidence on the interrelationship of reproductive behavior and childhood mortality has focused on two specific domains of fertility responses to childhood mortality: an insurance effect that arises from the tendency of couples in high mortality settings to anticipate mortality risks and a replacement effect in which parents experiencing the death of a child adjust their subsequent reproductive preferences and behavior (36). Replacement has two components: a biological component associated with the death of breastfeeding infants that leads to the truncation of lactational amenorrhea and a volitional component that arises from parental decisions to try to have an additional child to replace the lost one. Various studies indicated that childhood mortality contributes to parental desires to have many children and conversely, declining childhood mortality increases the number of surviving children, leading couples to compensate with fertility control (21, 23, 85-87, 99).

In addition to this, a number of studies showed that demographic, social, economic, cultural, programmatic and policy environments have also been associated with each of the three components of population change. For instance, education is one of such variables associated with all of the three components of population change (21, 22, 66, 74, 100-106). The degree of

educational attainment was associated with socio-economic status via acquisition of new values important for social change. Many studies revealed that maternal education has an inverse relationship with child mortality and fertility levels. Age and sex differentials of migration, mortality and family planning use have also been documented (99, 107-109). Studies have further indicated that socio-economic and cultural characteristics are significant predictors of fertility, family planning use, under five mortality and migration (4, 22, 64, 110-112). For instance, studies showed that the young, educated and unmarried were less likely to have many children, more likely to use family planning methods, have better survival of their children and more likely to move out from their birth place compared to their respective counterparts. Other demographic, social and economic variables were also associated with fertility, family planning use, under five mortality and migration though the direction and degree of association could be different. The association of background characteristics and interrelationships between the three components of population change can, therefore, be depicted using the following study framework.

Figure 1: Study framework showing the relationship between fertility, under-five mortality and migration



1.4 Research Questions

Reviewing extant literature on population dynamics and under five mortality in Ethiopia and other developing countries helped to draw the following research questions for the dissertation:

- How were the magnitudes of fertility, contraception, unmet need of contraception, under five mortality and migration in Butajira District compared to the findings of similar studies in Ethiopia?
- Which were the main individual and household characteristics that were correlated to each of fertility, family planning use, under five mortality and migration in the study District?
- How were fertility, migration and under five mortality related to one another after main individual and household characteristics were controlled?

2. Aims of the Study

The main objective of the study was to assess the interrelationship between the three components of population change and how each is influenced by some proximate and distal factors in Butajira District, south central Ethiopia.

The specific objectives of this study are to:

- determine the level and determinants of fertility
- measure the magnitude of contraception and unmet need for family planning among married women and identify their determinants
- measure the under-five mortality level and identify its determinants
- determine the rate of out-migration and its determinants in Butajira District
- explore the association between fertility, contraception, under-five mortality and migration in the study area.

3. Materials and Methods

3.1 The Setting, Study Area and Population

The study district is located in the Guraghe Zone of Southern Nations, Nationalities and People's Region (SNNPR) in South Central Ethiopia. The study district was bordered with Oromia region and Hadiya, Kembata and Tembaro zones in SNNPR, all of which suffer from population pressure (2). The District capital, Butajira town, is 135 kilometers away from Addis Ababa. The district lies between lowland, intermediate and highland geographical and ecological zones. It is one of the most densely populated areas inhabited predominantly by ***Guraghes*** who belong to the Semitic groups of Ethiopians (89). The study area was also inhabited by ***Siltis, Marekos, Oromos, Amharas*** and other ethnic groups in the country. The district had 82 rural and four urban ***kebele***s. The population in the study area has been growing (113). According to the 2007 Ethiopian National Census, the district had a population of more than 430,949 (213,649 males and 217,300 females) (2). There was high population pressure coupled with excessive migration and mortality which resulted in epidemiologic transition (6, 107, 114). About two-third of the population of the District were Muslims. The former district of Meskan and Mareko in the Silti and Guraghe Zones has been restructured into four districts namely, Meskan, Mareko, Silti and Butajira Town.

The livelihood of the population inhabiting the area is subsistence farming mixed with petty trade that has mainly been run by women. The trading takes place in open markets and require the movement of these women from one market place to the other almost seven days in a week. ***Enset*** (false banana) is the staple crop in the highland Guraghe area whereas cereals grow in the lowland area. ***Khat*** (***Chat,*** 'Catha edulis' is the scientific name) is grown and chewed by most

men in the productive age group. ***Khat*** and red pepper are cash crops in highland and lowland Guraghe areas respectively.

The present study was conducted in the Demographic Surveillance Area (DSA) of the Butajira Demographic Surveillance System (DSS). The Butajira DSS was established as a collaborative project between School of Public Health, Addis Ababa University and Department of Epidemiology and Clinical Medicine in Umea University in 1987(115). The DSA covers ten villages (Kebeles), one urban and 9 rural in the former Meskan and Mareko district. Demographic Surveillance Area (DSA) of one urban and nine rural ***kebele***s selected on the basis of sampling proportionate to size technique. These ***kebele***s cover highland, lowland and midland ecological zones. The baseline population of the Demographic Surveillance Area was 28,780 people in 1987. This increased to more than 70,000 in 2011 (89, 113).

There are two hospitals, one health center, two emerging health centers, more than 10 private clinics and 10 health posts in the DSA. Basic amenities including electricity, potable water, Television coverage, etc. are available only in Butajira town. The economy is largely subsistence farming complemented with petty trade.

3.2 Study Design

Quantitative and qualitative research methods were employed. A priori focus group discussions (FGDs) were conducted to explore the perceptions of the community with regard to fertility, under-five mortality, migration and contraceptive use and their interrelationships. The qualitative study was mainly used to refine study instruments by way of including important variables and re-phrasing questions in data collection instruments to make them culturally and linguistically appropriate for the community on which the study was conducted. The findings of FGDs were not however used in this report since there is a plan to have Indepth Interviews (IDIs) which is appropriate to obtain detailed information on sensitive issues such as induced abortion and neonatal death from rural communities in the study area to have a detailed understanding of community perception, attitudes and contexts with regards to the three components of population change, which would be reported separately.

The longitudinal Butajira DSS database was used as a frame of reference to recruit participants for the cross-sectional study. This data source extracted for the period between 1987 and 2008 was also used to measure levels of childhood mortality, migration and their determinants. On the other hand, levels of fertility, contraception, unmet need for family planning and their determinants were measured using a cross-sectional data gathered between October and December 2009.

3.3 Source and Study Population

The source population comprised individuals residing in the former Meskan and Mareko District in Guraghe and Silti Zones of the SNNPR. People in Butajira DSA *Kebele*s made up the study population.

3.4 Eligibility Criteria of Respondents

Women considered as eligible for the quantitative cross-sectional study were those in the reproductive age group and had stayed in surveillance *kebele*s for at least 6 months prior to the study. Further, at the time of the study, they did not have any hearing problems, mental illness or any other disease which could have affected their power of thinking. As far as research ethics is concerned, the objectives and procedures of the study were clearly explained to them and all gave oral consent to participate in the research. Individuals who had any episode of exposure in the longitudinal surveillance system were also considered as eligible participants of the study.

3.5 Sample Size and Sampling Method

The number of focus group discussions was determined by saturation of ideas - until a point where no more new idea emerged. FGDs were conducted employing the maximum variation sampling procedure to select the groups and discussants in each group. Two FGDs on each of the rural/urban, highland/lowland, educated/uneducated and employed/unemployed study groups were conducted. A total of 16 FGDs, each with 8-12 discussants having similar socio-demographic characteristics, were conducted in August 2009.

Since the cross-sectional study had multiple purposes of measuring levels and determinants of fertility, contraception, and unmet need of family planning use, all the ten *kebeles* of the Butajira Rural Health Program (BRHP) were used in this study. The first intention was to employ a comparative cross-sectional study design. Case and comparative groups were identified for each outcome variable considered for this study. Sample size for each of the outcome variables were calculated considering at least the most prominent socio-demographic variables having significant association. The maximum of the sample sizes calculated for each of the outcome variables mentioned above were considered as a sample size for the comprehensive cross-

sectional study. EPI INFO, STATCALC software program was used to calculate sample size for the cross-sectional study. Prevalence rates taken from various national studies done in Butajira and elsewhere in Ethiopia were considered taking different socio-economic covariates as basic determinants of fertility, under-five mortality and contraception. The assumptions used to calculate the sample size included a design effect of 1.5, 5% level of significance, a difference of 10% depending on the magnitude of the condition under consideration and 10% non-response rate was considered. The high non-response rate of 10% was assumed since some events like neonatal deaths could be underreported as there has never been pregnancy status and outcome registration follow-up in the database. Then, the maximum value of the sample sizes (n) after looking at all possible scenarios was considered as the sample size for the cross-sectional study. Major covariates such as educational level, large family size (5+ children ever born), farming occupation, incidence of child death, history of migration, urban residence, being teenage mother, lowest income quintile, discussion with a partner about family planning, and knowledge of the source of contraception assumed to relate to fertility, child mortality and contraception were considered in order in the calculation of the sample size.

The largest sample size calculated in this way (11104) was, however, almost the same as the then size of women in the reproductive age group of the ten surveillance ***Kebeles*** (11133). We, therefore, decided to interview all women of reproductive age group residing in the DSA of the Butajira DSS (see Table 1 below).

Table 1: Sample size Calculation and its assumptions

Objectives	Covariates	Assumption	Sample size (with 10% non-response rate)	Final sample size
1.Fertility determinants • Cases are women with CEB≥4 and -Comparison groups are women with CEB<4; • Case-comparison group ratio 1:1; --α=5%, β=10%; Deff =1.5; non-response rate=10% • Study design: Comparative cross-sectional study • Study population: Women in the reproductive age group	Educational level	15% of cases 20% of controls are literate	Cases=2085 Comparisons=2085 Total=4170	4170
	Migration history	55% of cases and 48% of controls have experience of migration	Cases=1830 Comparisons=1830 Total=3660	3660
	Large family size (5+)	60% of cases and 50 of controls have a large family size	Cases=897 Comparisons=897 Total=1794	1794
	Farmers	60% cases and 51.5% of controls are farmers	Cases=1232 Comparisons=1232 Total=2464	2464
	Urban residence	35% of cases and 25% of controls are urbanites	Cases=765 Comparisons=765 Total=1530	1530
	Incidence of child death	18% of cases and 12% of controls have an incidence of child death	Cases=1292 Comparisons=1292 Total=2584	2584
2. Under five mortality determinants • Cases are women who have an experience of child death and comparison groups are women who have not. • Comparative cross-sectional ratio 1:1; α=5%, β=10%; Deff =1.5; non-response rate=10% • Study design: Comparative cross-sectional study • Study population: Women in the reproductive age group	Education level	15% of cases and 25% of controls are literate	Cases=590 Comparisons=590 Total=1180	1180
	Decision making score	30% of cases and 10% of controls are members of families with low decision making score	Cases=153 Comparisons=153 Total=306	306
	Teen ager mother	15% of cases and 10% of controls are teenager mothers	Cases=1595 Comparisons=1595 Total=3190	3190
	Lowest income quintile	16% of cases and 10% of controls are in the lowest income quintile	Cases=1152 Comparisons=1152 Total=2304	8113
3. Contraception/Unmet need determinants • Women who are currently using contraceptives are cases and comparison groups are not using it. • Comparative cross-sectional ratio 1:1; α=5%, β=10%; Deff =1.5;non-response rate=10% • Study design: Comparative cross-sectional study • Study population: Women in the reproductive age group	Educational level	32.4% of cases and 22.4% of controls are literate	Cases=727 Comparisons=727 Total=1454	6110
	Discussion with partner	21.15% of cases and 18% of controls had discussion with about family planning with their partners	Cases=5602 Comparisons=5602 Total=11104	11104*
	Knowledge of contraception SDP	50% of cases and 40% of controls knows where contraceptives can be found	Cases=897 Comparisons=897 Total=1794	7537
	Lowest wealth quintile	19% of cases and 15.8% of controls are in the lowest income quintile.	Cases=4967 Comparisons=4967 Total=9934	9934
4. Out-migration determinants Longitudinal study design Study population: Residents within the 10 study Kebeles.	Socio-demographic variables included in the surveillance	The longitudinal data have no serious quality problem	More than 57,000 population	women in RH group

*Selected sample, CEB=Children ever born, BRHP=Butajira Rural Health Program, SDP = Service Delivery Point, Deff=Design effect, α=level of significance, 1- β=power

3.6 Selection of Study Participants

Besides data on the levels and determinants of under-five mortality and out-migration, the Butajira DSS database was used as a sampling frame for the cross-sectional study. A sample of women who could meet the eligibility criteria mentioned in 3.4 above was extracted from the Butajira database. Geographical identification particulars in the database were used to locate participants recruited for the study. Then, the Butajira DSS field staffs were used to identify the physical location of each selected woman in the surveillance *kebele*s. FGD discussants were identified in consultation with community leaders.

3.7 Training of Field Staffs and Data Collection

The Butajira DSS database was collected by specially trained village-based data collectors checked frequently by field supervisors each of who were assigned for two enumerators. In addition to that, research assistants and senior researchers supervised the whole data collection and management exercise.

To avoid workload, each village (*kebele*) was equally divided into eight parts. In order to cover one octaplate ($1/8^{th}$) of a *kebele* per data collection week, each enumerator had to do data collection for eight weeks of the three months. The remaining four weeks had been used for other add-on studies into the surveillance system. Major events that had been recorded include birth, in-migration, internal move, out-migration, death, changes in marital status and formation of new households.

Meanwhile, the cross-sectional data was collected using 20 enumerators who had the experience in data collection, clinical nurses by profession, and could speak the local language using face to face interviews. Training was given to them for 5 days on interviewing, principles of data

collection and on how to complete the study instruments. Special emphasis was given to maintaining privacy of respondents during interview and confidentiality throughout the study. Issues of skipping rules and consistency checks in the questionnaire meant for the cross-sectional data were dealt with at a greater depth. Methods used for training included lecturing, mock-interviews and actual field practices.

After the completion of the training, pre-test of study instruments and data collection methods was done for a day in a village outside the surveillance area. Problems identified during the pre-test were discussed on another day and interviewers developed a practical hands-on on how to complete the data collection instrument. Five supervisors with many years of experience on health related data collection and supervision were recruited. They were then trained for an extra day on how to supervise and check completeness, consistency and accuracy of data, how to edit and code the survey questionnaire and handle problems encountered during data collection.

Focus group discussions were moderated by the principal investigator, assisted by a note taker who recorded the speeches of each participant. The moderator and note taker introduced themselves to the discussants and asked them to do the same. Then the purpose of the study was highlighted to them by the moderator. Their willingness to participate in the discussion was ensured. Each discussant was given a chance to speak. Tactical intervention was made to downplay the role of the dominant speakers among discussants. Probing questions were forwarded in some instances where participants were hesitant to discuss sensitive issues such as abortion. They were informed to raise issues related to the objectives of the study, community concerns and opinions.

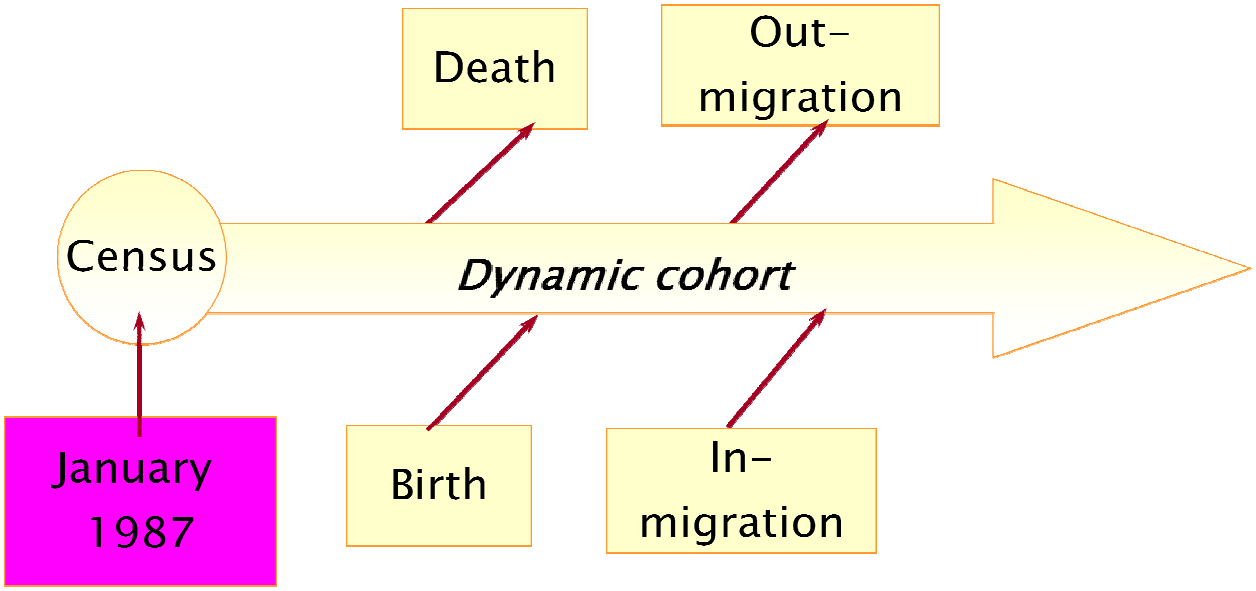
3.8 Data Management and cleaning

Longitudinal data have been captured by relational database software developed for the purpose in a DBASE IV platform. The software had an internal consistency check mechanism. Each individual and household had a unique identifier through which it had been followed from the time of entry (which can happen through baseline enumeration, birth and in-migration) to the time of exit (that could happen through out-migration, death and administrative censoring on 31 December 2008) (See Figure 2 Panel 1). Unique individual and household identifiers had been generated by the software. The chronological order of events was checked by the data entry software. For instance, a mother should be recorded in the database before her pregnancy outcomes (birth and stillbirth) were recorded; a person should also be a member of the database before his/her death was captured by the software. When such inconsistencies occurred, field supervisors had to rectify them by visiting respective households and interviewing a legible respondent.

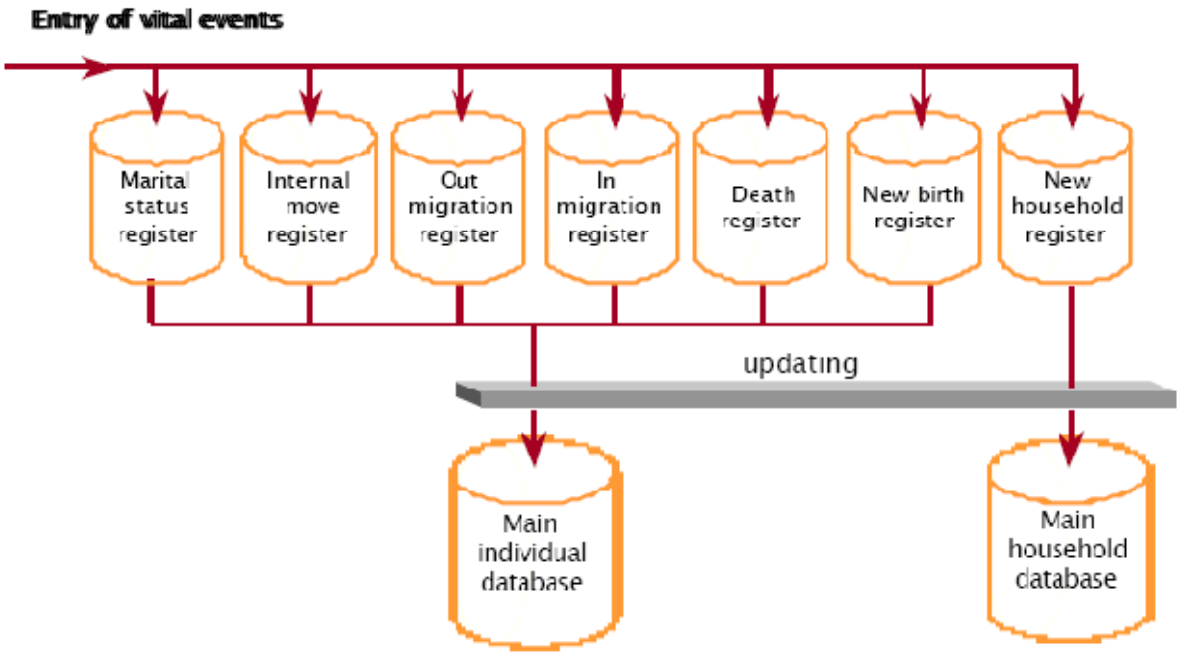
Recorded events had been stored in transaction files created for each event. They were then related to form individual and household database files (See Figure 2 Panel 2). The following figure schematically summarizes the data management in Butajira DSS.

Figure 2: Event tracking in Butajira Demographic Surveillance System

Panel 1



Panel 2



As part of the data cleaning, the Butajira DSS longitudinal database for the period of 1987 to 2008 was exported to STATA version 11 software. Data were reshaped into long format to ease analysis. Each episode of exposure was measured for every individual included in the analysis. Data consistency check was done until a tolerable quality of less than 5% error was achieved. A variable was created to record the occurrence of demographic events such as baseline enumeration, birth, in-migration, internal moves (exit from the household and entry into the household), out-migration, death, and membership residence status of each individual under surveillance. Besides, a residency variable was generated to delineate whether or not events of particular interest happened to individuals within the DSA during the follow-up years of the DSS. Further, it was checked if such events were correctly recorded in the right chronology in the Butajira DSS database. Similarly, a variable on following-event was generated based on the prior event and a cross-tabulation of event and following-event revealed the logical chronological order of the events. For instance, an individual enumerated at the baseline census in 1987 could only exit from the household and reside in another within the DSA, out-migrate or die. S/he could not enter the same household again before exiting.

Regarding the cross-sectional study, data entry was done using EPI INFO software. Fifty percent of the electronic data was checked against the hard copy by the principal investigator. On completion of data entry, the principal investigator also cleaned the data using both EPI INFO and STATA version 11 statistical packages.

3.9 Study Instruments

The longitudinal data were collected using questionnaires developed according to the recommendation of the International Network for the Demographic Evaluation of Populations and Their Health (INDEPTH), which is a network of demographic surveillance systems across developing countries in Africa and Asia (www.inepth-network.org). Each demographic event was recorded using a special format prepared to capture the particular event from the field. On each event registration form, data related to the event and individual and household background characteristics were recorded.

A structured DHS type questionnaire (www.measuredhs.com) adapted by the investigator for measuring fertility, contraception, unmet need and their determinants was used for the cross-sectional study. Fertility history of all mothers in the reproductive age group was recorded. In addition, the number of survivors and possible factors for the dynamics of population were also collected.

In the case of the qualitative study, a guide was developed to help conduct the discussion. Then, after choosing a convenient place for the discussion, we invited discussants to convene.

3.10 Data Quality Assurance

The quality assurance mechanism put in place for the longitudinal data was detailed in many literatures (21, 89, 115). In a nutshell, it included fair distribution of workload, frequent field supervision, use of relational database software with internal consistency check mechanisms and utilization of other data sources such as periodic censuses to update individual and household characteristics, among others.

For the cross-sectional data, quality assurance schemes were introduced both at the fieldwork and data entry levels. Quality control at field level included assigning enough enumerators at each data collection village, allocating supervisors who frequently oversaw the data collection process, controlling each activity during the field work, editing questionnaires everyday and giving feedback to data collectors and supervisors as soon as errors were noted. Every morning, experiences obtained during data collection were shared to make the field staff learn from good practices of others before going out for another day of data collection. Supervisors re-interviewed five percent of the women interviewees.

Data entry software designed on EPI INFO interface with a CHECK program for internal consistency checks was developed. Rigorous data cleaning was done for each record in the dataset.

Study instruments were first developed in English and then translated into the local language. They were back translated into English by a different person to check for their consistency.

3.11 Data Analysis

Both univariate and multivariate analysis were employed to assess the relationship between independent and dependent variables. Descriptive analyses including frequency distribution and cross tabulation with outcome variables were done. Total fertility rate, total marital fertility rate, mean children ever born, and parity progression ratio which is the conditional probability of having the next parity given that the women had already a certain parity level were computed to measure the fertility level in the community. Bonagaarts' framework for estimating the proximate determinants of fertility was used to estimate the fertility inhibition effects of non-

marriage, contraception, postpartum infecundability and abortion (61). Ever and current contraceptive prevalence rates were computed. Besides, using the longitudinal database, under-five and out-migration incidence rate ratios were computed along with their confidence intervals to measure the under-five and out-migration levels in the district. Life table survival duration and smoothed hazard curves were used to reveal level and differentials of migration and childhood mortality. Poisson regression model with fertility incidence rate ratio (IRR) along with the 95% confidence interval was used to show association between background characteristics of study women and fertility since the outcome variable - children ever born to women - is a count variable used to measure fertility level in this study. On the other hand, since using current family planning use is binary in nature, odds ratio in binary logistic regression along with the 95% confidence interval was used to measure associations between current family planning use and background characteristics of women of reproductive age group in the study. Moreover, incidence rate ratio in Poisson regression along with 95% confidence interval was used to ascertain association between various background characteristics with out-migration and childhood mortality in Butajira District.

In the qualitative study, participants' audio information was translated and transcribed the same day on which the data collection was conducted. Content analysis of the qualitative data was employed to analyze the qualitative data. Data from the qualitative study were mainly used to refine quantitative study instruments used for the cross-sectional study. Wordings and in some instances, categories of certain variables were modified based on the findings of the qualitative study.

3.12 Operational Definitions

Main concepts used in the study are defined as follows.

Fertility is the ability of a woman to give birth to a child. It was measured using total fertility rate (which is the average number of children a woman might have if she survives her reproductive age exposed to the current schedule of fertility) and children ever born.

Level refers to the magnitude of fertility, under-five mortality, contraception, unmet need of contraception and migration.

Volume of migration is the total number of in and out-migrants at a specified time in a defined population.

Under-five mortality is defined as the measurement of mortality under the age of five years. It is used interchangeably with early childhood mortality. Under-five mortality is measured by dividing the number of deaths of children before they celebrated their 5^{th} birthday by the person-years contributed by under-five children.

Current use of contraception refers to the use of modern and/or traditional family planning methods to space and/or limit childbirth during the time of interview.

Unmet need for family planning is defined as the proportion of married women in a sexual union desiring to space or limit childbearing but is not using contraception.

An in-migrant to the DSA is a person who came in to live there or who stayed in the area for 6 months or longer.

Ecology is defined as urban, rural lowland (between 1500-2000m above sea level) and rural highland (more than 2000m above sea level) in this study.

4. Ethical Considerations

The study was carried out after getting written permission from the Research and Ethics Committee of the School of Public Health and Institutional Review Board of the College of Health Sciences, Addis Ababa University. The two committees gave clearance after they reviewed the proposal and made sure that all ethical requirements were met. In addition, consents of officials and senior researchers coordinating the Butajira Rural Health Program were sought. Government officials and elderly people responsible for such issues in the district were also consulted. The basic ethical principles of autonomy, confidentiality, benefits and no harms were thoroughly examined. To safeguard the autonomy of study participants, objectives of the research were clearly communicated to them and verbal consents were obtained. With regard to maintaining anonymity and confidentiality, names of participants were not required on the questionnaires and there was no way of identifying anyone by name, except by research team. Privacy of study participants were maintained during the interview. No person had access to the information collected from any participant. Furthermore, participants had the right to refuse taking part in the study or discontinue at any stage of the interview. Women involved in this study were offered valuable information on how, where and when to get contraceptives and the side effects and uses of each of them. Those who decided to use contraceptives were referred to the nearby health service providers. Moreover, information obtained from the International Office of Migration (IOM) on the risks of illegal out-migration to oil economies in the Middle East was shared with study participants. The study did no harm that should be declared, except for consuming the participants' valuable time.

5. Results

5.1 Levels and Determinants of Fertility

At the time of the study, a total of 11,133 women were captured by the Butajira Demographic Surveillance System database. Of these, 10,003 were actually available in the study area and they were all interviewed. Of the completed copies of the questionnaire, seven were found to be grossly incomplete and, therefore, discarded. This meant that 9,996 were ready for analysis which gave a response rate of 89.9 %.

Study participants differed in demographic, social, economic, environmental and cultural characteristics as depicted in Table 2. Majority of the women (79.2%) were aged less than 35 years with mean age of 25.9 years (SD=9.1). More than 36% of the participants got married before they reached puberty whereas only 2% married after 25 years of age. The median age of first marriage was estimated to be 16 years, while the mean was 16.9 (SD=2.4). Nearly half of the women had no formal education while more than 64% of their partners had never been to a formal school. Majority of the women (57.5%) had been in current marital union. Ethnically, more than half belonged to the Meskan ethnic group and religion wise, three quarters were Muslims. Furthermore, they were fairly distributed in different ecological zones. More than 65% of them belonged to households whose main livelihood depended on farming. About 70% of them had their partners' engaged in farming. Over 30% of the women were house makers. The average household annual income at the time of the study was estimated to be 12,526.63 Ethiopian birr (SD=31176.11) which was equivalent to 963 USD while the median was estimated at 5,950 birr (about 458 USD). Large family size was found to be the norm as nearly 59 % of the participants were living in a household with more than four members. The average household size was around 5.2 persons (SD=2.2). About 65% of husbands to respondents had no formal education. Besides, 65% of respondents relied on farming as a means of livelihood.

About 28% lived in households which faced food shortage within a year prior to the interview. Sixty five percent were born in surveillance villages. Altogether, only one-fifth of the women were born in an urban center.

Table 2: Distribution of study participants by demographic, social, economic, environmental and cultural characteristics in Butajira, 2009 (N=9996)

Characteristics	Number	Percent
Age group:		
15-19	3284	32.9
20-24	1728	17.3
25-29	1630	16.3
30-34	1274	12.8
35-39	1012	10.1
40-44	699	7.0
45-49	369	3.7
Age at first marriage:		
< 15	2296	36.5
15-19	3155	50.2
20-24	714	11.4
25 and over	124	2.0
Educational status:		
Illiterate	4918	49.2
Primary	3906	39.1
Secondary	1024	10.2
Post secondary	148	1.5
Marital status:		
Married	5476	57.5
Single	3707	37.1
Separated	179	1.8
Divorced	116	1.2
Widowed	248	2.5
Ethnicity:		
Other Guraghes*	1465	14.7
Meskan	5071	50.7
Mareko	1038	10.4
Silti	1773	17.7
Others**	649	6.5
Religion:		
Orthodox	1843	18.4
Other Christians	689	6.9
Muslims	7464	74.7
Ecology:	3404	34.1
Rural highland	2999	30.0
Rural lowland	3593	35.9
Urban		

Other Guraghes* includes Sodos, Sebatbet Guraghes, Welenes and Sodo clans of the Guraghe family
Others** includes other nations and nationalities other than the Guraghe

Table 2: Continued

Characteristics	Number	Percent
Occupation:		
Employed*	3664	36.7
House maker	3040	30.4
Student	3292	32.9
Income quintile:		
1st	1946	19.5
2nd	2040	20.4
3rd	2009	20.1
4th	1999	20.0
5th	2000	20.0
Household size:		
Large (> 4)	5930	59.3
Small (≤ 4)	4065	40.7
Husband's education:		
Illiterate	6454	64.6
Primary	2964	29.7
Secondary	375	3.8
Post secondary	203	2.0
Husband's occupation:		
Farmer	4035	70.0
Trader	627	10.9
Employees	916	15.9
Others	184	3.2
Household livelihood:		
Farming	6503	65.1
Trade/Service	1606	16.1
Employees	463	4.6
Other	1424	14.3
Food shortage:		
Yes	2809	28.1
No	7185	71.9
Birth place:		
Study site	6498	65.0
Elsewhere (In-migrant)	3496	35.0
Birth Place type:		
Rural	7997	80.0
Urban	1999	20.0

On the other hand, women who participated in this study varied in their reproductive health characteristics. Nearly 60% of them gave birth to at least a child and 28% had more than four children at the time of the interview (see Table 3). More than 43% had experiences of child death or stillbirth. About 64% knew the correct time of pregnancy if they had sex. A little more than 5% had abortion in the past five years. Eighty percent wanted to have a child or have more if they already had one. Only about 16% of those in reproductive health age group and a quarter of

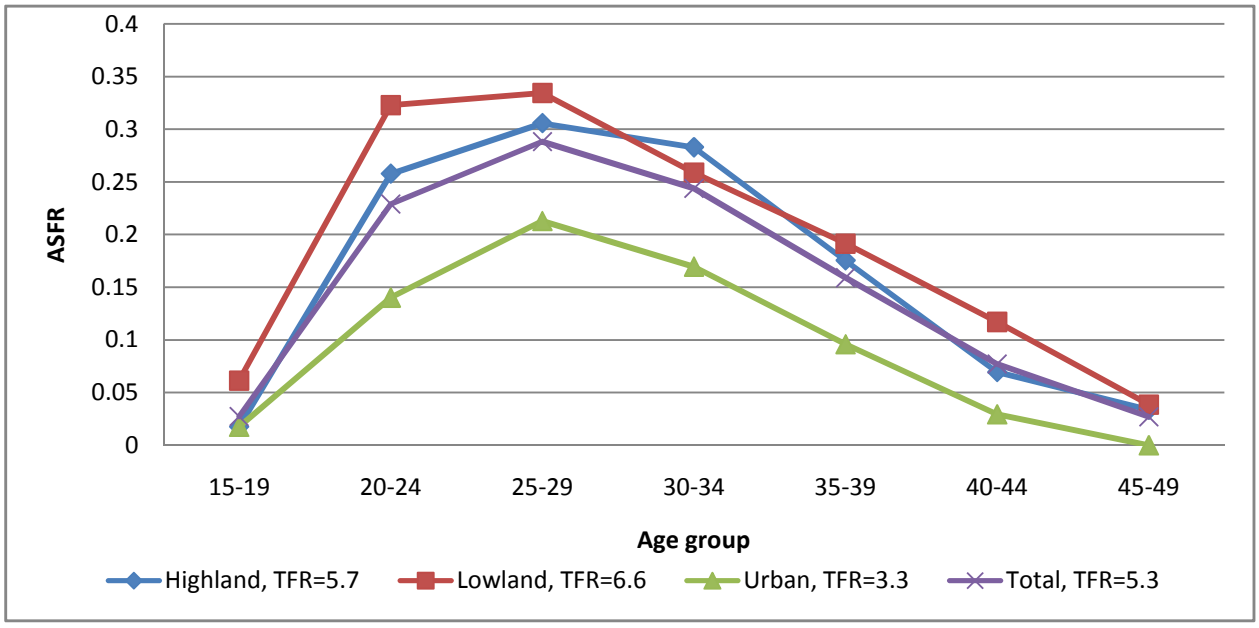
married women were using contraceptive methods at the time of the study, although more than 90% of the women and 68% of their partners supported the use of family planning methods. Sixty six percent of women had discussion on family planning use with their partners. On the other hand, nearly 69% of women in this study had given birth to more than 4 children in their life time.

Table 3: Distribution of study participants by reproductive health characteristics in Butajira, 2009 (N=9996)

Characteristics	Number	Percent
Gave birth to a child		
Yes	5934	59.4
No	4060	40.6
Number of children ever born:		
< 2	5674	56.8
3-4 children	1522	15.2
Greater than 4	2800	28.0
Experienced child death /stillbirth (N=5929)):		
Yes	2571	43.4
No	3358	56.6
Knew pregnancy time (N=4007):		
Yes	2548	63.6
No	1459	36.4
Abortion in the past 5 years:		
Yes	515	5.2
No	9479	94.8
Wanted (more) child:		
Yes	8083	80.9
No	1256	12.6
Infertile	589	5.9
Undecided	66	0.7
Currently used contraception:		
Yes	1586	15.9
No	8406	84.1
Currently used contraception (among married women) (N=5743):	5743	100.0
Yes	1456	25.4
No	4287	74.6
Supported contraception:		
Yes	9038	90.4
No	955	9.6
Partner supported contraception : (N=6233)		
Yes	4287	68.8
No	1946	31.2
Discussion with partner on contraception: (N=6414)		
Yes	4250	66.3
No	2164	33.7
Children ever born:		
≤ 4	3134	31.4
> 4	6862	68.6

The mean children ever born to women in Butajira District was found to be 4.5 children per woman (SD=2.6) whereas it was 8 children (SD=2.2) for women in the older reproductive age group (45-49 years). The total fertility rate (TFR) was estimated to be 5.3 children per woman, but the total marital fertility rate per woman was close to 7.8 if a married woman was exposed to the then schedule of fertility and survived all her reproductive ages. The age pattern of fertility was lower among teenagers and increased in the prime ages of reproduction (20-29 years) and decreased thereafter until it got to the lowest level in the age group of 45-49. The age specific fertility rate was, however, reasonably higher in the older reproductive age group as shown in Figure 3. Moreover, highest fertility was documented in rural lowland areas (6.6) while the lowest was observed in Butajira Town (3.3). The peak age group of fertility was 25-29 years.

Figure 3: Age Specific Fertility Rates in different residential ecological zones in Butajira in 2009 (N=9996)



The parity progression ratio revealed that desired fertility level was higher in the study area. For instance, women of parity four had 79.1% chance of having the 5th child in the study community.

Table 4 revealed the contribution of the main proximate determinants of fertility including non-marriage, contraception, induced abortion and postpartum infecundability to deduct natural fertility in the study district. Non-marriage reduced fertility from its biological maximum by 34% in Butajira District whereas the reduction was by 47% among urbanites. Among women with secondary education or above, the reduction was by about 59%. Non-marriage reduced fertility from its natural level by 43% among Orthodox Christians. It also revealed a high fertility inhibition effect of 39% among Guraghes other than the Meskan clan. Among girls who were then in their formal schooling, natural fertility reduced by 74%.

On the other hand, contraception reduced fertility from the biological maximum by only about 23% in the study area (Table 4). A detailed analysis of contraception by various socio-economic characteristics showed that contraception reduced natural fertility by about 43% in urban Butajira. Among women who completed secondary education or above, the reduction was by about 57% whereas this was by a maximum of 31% among Christians of both denominations. The reduction among in-migrant ethnic groups and Guraghes other than the majority Meskan was 33% and 32% respectively. Moreover, contraception reduced natural fertility by 42% among students and by about 47% among women married to husbands with secondary education or above. With regard to income, the effect of contraception increased from 15% to 36% as the income quintile increased from 1^{st} to 5^{th} quintile.

The overall contribution of abortion to reduce fertility from its natural level was only four percent (Table 4). However, abortion reduced natural fertility by a similar level of seven percent among urbanites and those who attained secondary education or above. The reduction was by

about six percent among women who followed Orthodox Christianity. Among major ethnic groups, the figure varied from three to five percent. Abortion had the highest fertility inhibition effect of 24% among students in the formal schools. Nevertheless, the effect was just about five percent among women married to partners with education above secondary level. No visible difference on the effect of abortion to reduce natural fertility on women from food-deficient and sufficient households.

The overall postpartum infecundability (PPI) index of 0.68 reduced natural fertility from its biological maximum by about 32% (Table 4). PPI brought down the biological maximum of fertility by about 37% in highland rural Butajira and by about 20% in Butajira Town. The fertility inhibition effect of PPI decreased from 35% to 14% as educational status increased from illiteracy to secondary plus. No significant differences were observed across the various religious groups though the effect was slightly higher among Muslims. PPI had higher inhibition effect of 34% among the Silti nationals. Among students the effect was only 22% while it was 32% among house makers and employed mothers. PPI's effect decreased from 36% to 20% as partner's education went up from no formal education to secondary plus. Among women from food-deficient households, the effect was 35% while it was only 25% among those from food-sufficient households. The fertility inhibition effect of PPI decreased from 34% to 26% as income quintile increased from the lowest to the highest.

Table 4: Indices of the proximate determinants of fertility in Butajira District, Ethiopia, 2009 (N=9996)

Factors	Indices of Proximate Determinants				Observed TFR	Predicted TFR
	C_m**	C_c**	C_a**	C_i**		
All women	0.66	0.77	0.96	0.68	5.3	5.1
Ecology:						
Highland	0.75	0.85	0.97	0.63	5.7	5.9
Lowland	0.72	0.82	0.96	0.66	6.6	5.7
Urban	0.53	0.57	0.93	0.80	3.3	3.5
Women's education:						
illiterate	0.78	0.82	0.97	0.65	6.3	6.1
Primary	0.61	0.66	0.94	0.75	4.6	4.4
Secondary plus	0.41	0.43	0.93	0.86	2.3	2.2
Religion:						
Orthodox	0.57	0.69	0.94	0.71	4.2	4.0
Other Christians	0.63	0.69	0.96	0.71	5.5	4.6
Muslims	0.69	0.79	0.96	0.68	5.5	5.4
Ethnicity:						
Other Guraghes*	0.61	0.68	0.95	0.71	4.9	4.3
Meskan	0.66	0.77	0.96	0.68	5.0	5.1
Mareko	0.72	0.83	0.97	0.68	7.0	6.0
Silti	0.69	0.98	0.96	0.66	7.9	6.6
Others	0.67	0.67	0.96	0.73	4.4	4.8
Occupation:						
Employed	0.69	0.76	0.96	0.68	5.1	5.2
House wife	0.92	0.78	0.96	0.68	8.0	7.2
Student	0.23	0.58	0.76	0.78	1.1	1.2
Partner's education:						
illiterate	0.47	0.86	0.96	0.64	4.0	3.8
Primary	0.99	0.74	0.96	0.70	8.1	7.6
Secondary plus	0.99	0.53	0.94	0.80	5.9	6.1
Household food shortage:						
Yes	0.64	0.82	0.96	0.65	5.7	5.0
No	0.67	0.74	0.96	0.75	5.1	5.0
Income quintile:						
First	0.73	0.85	0.96	0.66	6.4	5.4
Second	0.63	0.81	0.96	0.66	5.6	4.3
Third	0.65	0.81	0.96	0.66	4.5	4.3
Forth	0.67	0.72	0.96	0.70	5.1	4.0
Fifth	0.64	0.64	0.94	0.74	4.4	3.3

*Other Guraghes include Sebatbet, Dobi, Sodo and others

**$C_{m, i, c, a}$=indices of marriage, infecundability, contraception and abortion respectively

Analysis of distal determinants of fertility (the number of children ever born to mothers being an outcome variable) using Poisson regression Incidence Rate Ratio (IRR) along with 95% confidence interval showed age at first marriage as a significant predictor of fertility even after including other variables in the model (Table 5). Fertility was 1.38 times higher among women

married in their teens compared to those married after they celebrated their 20th birthday. Educational status of women had also been consistently and significantly found to be negatively associated with fertility. Women who had never been to any formal education had 1.24 times more children compared to those who completed secondary education and above.

Residential ecology comprised of altitude and residence type. The DSA covered lowland (below 1800 m.), midland (1800-2000 m.) and highland (over 2000 m. above sea level). Rural areas were in the lowland and highland areas, while Butajira Town was in the midland area. Residential ecology was significantly associated with fertility, although the direction of association changed when other covariates were included. The fertility of women who resided in lowland rural Butajira was 1.3 times higher compared to that of those who lived in the urban area. However, when other factors were included, women who lived in lowland rural Butajira had 12% lower fertility compared to urbanites. No fertility difference was observed among women residing in urban and highland rural Butajira when other important factors were included. On the other hand, the fertility of women who were members of a larger household (five plus) was about 2 times higher than those who belonged to smaller households after other factors were added into the model.

Other factors having been included into the model, the fertility of women from households that depended on trade or service as main source of income was found to be 14% lower compared to their counterparts who lived on farming. On the other hand, women from families whose household income was from employment in the civil service had lower fertility compared to those who made a living from farming although the difference was not statistically significant when other important variables were controlled. Women who were members of food-insecure

households had 6% higher fertility compared to those from food secure households. The fertility of in-migrant women in the demographic surveillance area was lower than those who were born there although the association was statistically not significant when the effect of other vital variables were controlled. Women with the experience of child death had a fertility rate of 1.7 times higher than those who never had the experience. Fertility was about 1.09 times higher in women who did not know the time they could be pregnant if they had sex. Similarly, the fertility of women having no preferred sex for their children was about 1.09 times higher compared to their counterparts after other main covariates were included.

Table 5: Crude and adjusted incidence risk ratio of the associations between maternal characteristics and fertility in Butajira, 2009 (N=9996)

Characteristics	Crude IRR (95%CI)	Adjusted IRR (95% CI)
Age at first marriage:		
20 and over	1.00	1.00
15-19	1.33 (1.27, 1.39)	1.11 (1.01, 1.20)*
Less than 15	1.83(1.75, 1.91)	1.38 (1.27, 1.49)*
Educational status:		
Secondary plus	1.00	1.00
Primary	1.34 (1.24, 1.44)*	1.14 (1.02, 1.27)*
Illiterate	1.83 (1.70, 1.97)*	1.24 (1.10, 1.39)*
Ecology:		
Urban	1.00	1.00
Rural Lowland	1.29 (1.25, 1.33)*	0.88 (0.79, 0.98)*
Rural highland	1.33 (1.29, 1.38)*	0.92 (0.83, 1.03)
Household size:		
Small (≤ 4)	1.00	1.00
Large (> 4)	2.08 (2.03, 2.15)*	1.95 (1.84, 2.06)*
Household livelihood:		
Farming	1.00	1.00
Trade/Service	0.79 (0.77, 0.82)*	0.86 (0.78, 0.96)*
Civil service	0.66 (0.62, 0.71)*	0.96 (0.83, 1.11)
Other	0.67 (0.64, 0.71)*	0.90 (0.80, 1.01)
Food shortage:		
No	1.00	1.00
Yes	1.16 (1.14, 1.19)*	1.06 (1.01, 1.13)*
Migration status:		
In-migrant	1.00	1.00
Non-migrant	1.04 (1.02, 1.08)*	1.02 (0.97, 1.07)
Child death experience:		
No	1.00	1.00
Yes	1.90 (1.86, 1.95)*	1.67 (1.59, 1.76)*
Knowledge of correct pregnancy time:		
Yes	1.00	1.00
No	1.35 (1,28, 1.41)*	1.09 (1.03, 1.15)*
Having sex preference:		
Yes	1.00	1.00
No	1.14 (1.11, 1.17)*	1.09 (1.04, 1.15)*

*Statistically significant at α =5%

5.2 Magnitude and Factors Associated with Contraception and Unmet Need for Family Planning

Altogether, a total of 5,746 married women were included in the analysis for contraception (See Table 6). These women were fairly distributed in ecologically varied residential areas. About 72% of them did not have any formal education. In the year before the study was conducted, food shortage had been common in a third of the households they come from. Some 43% of these married women had an experience of child death. About 51% of sexual partners of these women completed primary level of education. Nearly 38% of the women had a birth place other than the Demographic Surveillance Area (Table 6). Three-fourth of them belonged to a household whose main livelihood was based on farming. Majority were in the age bracket of 20-34 years with the mean age of 30.6 ($\pm$7.8 SD) years (result not shown).

Critical examination of married women by their reproductive health characteristics showed that about two-third of them discussed family planning with their partners. Furthermore, about 87% of them (result not shown) and only 68% of their partners supported the use of family planning.

Table 6: Frequency distribution of married women by background characteristics in Butajira, 2009 (N=5746)

Variable	Number	Frequency (%)
Ecology:		
Urban	1462	25.5
Lowland	2128	37.0
Highland	2156	37.5
Educational status:		
Illiterate	4153	72.3
Primary	1310	22.8
Secondary plus	283	4.9
Household food shortage:		
Yes	1951	34.0
No	3794	66.0
Child death experience:		
No	3084	57.0
Yes	2329	43.0
Partner's education:		
Illiterate	2128	38.6
Primary	2952	51.4
Secondary plus	576	10.0
Migration status:		
In-migrant	2165	37.7
Non-migrant	3580	62.3
Household livelihood:		
Farming	4296	74.8
Trade/service	805	14.0
Civil service	272	4.7
Other	373	6.5
Family planning discussion:		
Yes	3820	66.8
No	1895	33.2
Partner's support:		
Yes	3899	67.9
No	1844	32.1

About 99% of women in Butajira District knew at least one method of contraception, though some family planning methods were better known than others (Table 7). Depo-Provera and Pills were known by more than 97% of married women followed by male condom and Norplant respectively known by about 82% and 75% of the study participants. The least known modern contraceptive method was foam/jelly. Emergency contraceptive was also known by about 10%.

Women who knew traditional methods such as calendar method, Lactational Amenorrhea Method (LAM) and withdrawal comprised 21.3%, 31% and 20.2% respectively.

On the other hand, more than half of married women have ever practiced at least one of the family planning methods. The most favorite modern contraceptive ever practiced among married women was Depo-Provera (42.2%) and pills (24.7%). The least ever used was female condoms (0.4%). Emergency contraceptive has ever been used by 2% of married women in the study district. Nevertheless, calendar method, LAM and withdrawal have ever been practiced by 16.5%, 14.7% and 12.3% of the women respectively.

Table 7: Distribution of knowledge, ever and current use of Family Planning Methods by their type among married women in Butajira District, 2009 (N=5746)

FP Method type	Percentage of FP method Knowledge	FP Ever Used		FP in Current use (n=1586)
		Number	Percentage	
Tubal ligation	19.0	1089	2.9	1.9
Vasectomy	8.2	473	1.1	0.1
Pills	97.5	5598	24.7	10.4
Loop	13.1	754	3.3	0.7
Depo-Provera	97.8	5619	42.2	74.2
Norplant	74.4	4272	9.0	6.1
Condom	81.9	4707	1.7	0.6
Foam/Jelly	4.1	235	0.9	0.0
Calendar Method	21.3	1222	16.5	5.0
LAM	31.0	1778	14.7	1.4
Female Condom	26.6	1529	0.4	0.1
Withdrawal	20.2	1158	12.3	1.1
Emergency contraceptive	10.2	587	2.0	0.1
Total	99.1*	5746	51.3	25.4 (24.2, 26.5)

*****The total percentage refers to those who knew at least one method

On the other hand, about 25.4% (with 95% CI: 24.2, 26.5) of married women were using contraceptives in the study district in 2009 (See Table 8). Three-fourth of the women who used family planning method during the study time preferred to use Depo-Provera followed by about 10% and 6.1% who respectively chose pills and Norplant. No one used foam/jelly for any parity

specific control. Among the traditional methods, calendar method was in use by about 5% of women in Butajira District in 2009.

Disaggregation of knowledge of family planning methods by type of residential area showed that every woman in urban areas knew about contraceptives, while more than 97% of those in lowland or highland Butajira knew at least one method (result not shown). The level of ever and current use of family planning methods among married women by residential ecology was dissimilar. Ever use of family planning methods among married women was more than 77% in urban areas followed by about 45% and 40% in the lowland and highland areas respectively (Table 8). Meanwhile, current use of contraception was disaggregated at 46.9% (44.3, 49.4), 19.5% (17.9, 21.3) and 16.5% (15.0, 18.1) among urbanites, lowlanders and highlanders, respectively as shown in Table 8. There was no significant difference in the level of contraception use between rural lowlanders and highlanders in the district and the difference in unmet need for limiting was not statistically significant.

Table 8: Percentage distribution of ever and current contraceptive use and unmet need for family planning by residence type in Butajira District, 2009 (N=5746)

Residential Type	No.	% of women who ever and current used contraception (95% CI)		% of unmet need of contraception (95% CI)		
		Family Planning use				
		Ever	Current	Limiting	Spacing	Total
Urban	1462	77.4	46.9 (44.3, 49.4)	12.5	25.0 (22.8, 27.3)	37.5 (35.0, 40.0)
Rural lowland	2128	44.8	19.5 (17.9, 21.3)	12.7	44.3 (42.2,46.4)	57.0 (54.9, 59.2)
Rural highland	2156	40.1	16.5 (15.0, 18.1)	14.3	43.7 (41.6, 45.8)	58.0 (55.9, 60.1)
Total	5746	51.3	25.4 (24.2, 26.5)	13.2	39.2 (37.9, 40.4)	52.4 (51.1, 53.7)

The unmet need of contraception was estimated to be 52.4% as shown in Table 8. The unmet need for spacing was much higher as compared to limiting. The lowest unmet need for limiting was recorded for urban Butajira while the highest was for highland Butajira. Meanwhile unmet need for spacing was much higher in rural areas compared to urban Butajira. On the other hand, unmet need for spacing was about three-quarters of the total unmet need while the remaining percentage was attributed to limiting. Unmet need for spacing was more than 75% of the total in lowland and highland Butajira while it contributed to more than two-third of the overall unmet need in urban Butajira. There was a statistically significant difference in unmet need for spacing between rural and urban areas.

This study had also revealed that women's desire for children did not significantly decline with increasing size of surviving children. For instance about 70.8% of married women having four surviving children wanted more. Disaggregation of fertility desire by type of residence showed 62.9%, 73.7% and 71.0% of married women having 4 surviving children in urban, rural lowland and rural highland areas respectively wanted more children in the study district (result not shown).

Different reasons were mentioned for the unmet need of contraception by married women of reproductive age included in this study. Some were directly related to the unmet need while others were related to socio-cultural values and norms that deter the use of family planning in the community. The majority (43.1%) replied that they could not get the method they preferred in the nearby health facility unless they walk a long distance of up to 18 kilometers in some instances. On the other hand, about 22.2% of them feared rejections by religious leaders and their community for practicing it. Another 12.6% reported unavailability of any contraceptive or those they preferred in the nearby facilities. About 4.8% mentioned poor competence of service

providers whereas about 16.8% reported reasons related to side effects and contraindications of available contraceptive methods such as heart burn, excessive bleeding and their presumption of requirement of balanced diet and optimum workload.

Table 9 shows the bi-variate and multivariate association of various background characteristics of married women with the current use of family planning in the Butajira District. The odds of current use of family planning were 2.3 (95% CI: 1.66, 3.18) times higher among urbanites compared to highlanders. However, the statistical significance in the odds of contraception among highland and lowland residents compared to urban residents was eliminated when other background characteristics were included in the model. There was also a positive association between contraception and educational status of women. The odds of current contraceptive use among women with primary and secondary education were about 1.32 (95% CI: 1.12, 1.56) and 1.99 (95% CI: 1.38, 2.88) times higher compared to their uneducated counterparts. Besides, married women who were members of food-deficient households revealed about 1.58 (95% CI: 1.39, 1.81) times higher odds of using family planning compared to their counterparts in food-sufficient households though the association was statistically not significant when other variables were included.

Women with no experience of child death showed 1.3 (95% CI: 1.13, 1.50) times higher odds to use contraceptives compared to those with child death experience. Besides, there was a positive association between partner's educational status of women and contraception. The odds of contraception were 1.32 (95% CI: 1.13, 1.55) and 1.50 (95% CI: 1.12, 2.01) times higher among married women having partners with primary and secondary plus level of education respectively compared to those who had uneducated partners.

In-migrant women showed 1.38 (95% CI: 1.23, 1.56) times higher odds of using family planning compared to those born in the study district though the statistical significance vanished when other factors were included. Furthermore, civil servant, handicraft and merchant women were 6.2 (95% CI: 4.81, 7.99), 3.46 (95% CI: 2.78, 4.30) and 3.21 (95% CI: 2.73, 3.76) times respectively higher odds to use family planning compared to those whose livelihood were farming. However, the statistical significance disappeared when other factors were added into the model.

Discussion of use of family planning between married women and their partners was significantly associated with contraception. Married women who discussed contraception with their partners were 2.2 (95% CI: 1.8, 2.7) times higher odds to use family planning compared to those who did not. Nevertheless, the odds of contraception were about 2.59 (95% CI: 2.11, 3.17) times higher among married women whose partners support the use of family planning compared to their counterparts.

Table 9: Association of background characteristics of married women with current family planning use in Butajira District, 2009 (N=5746)

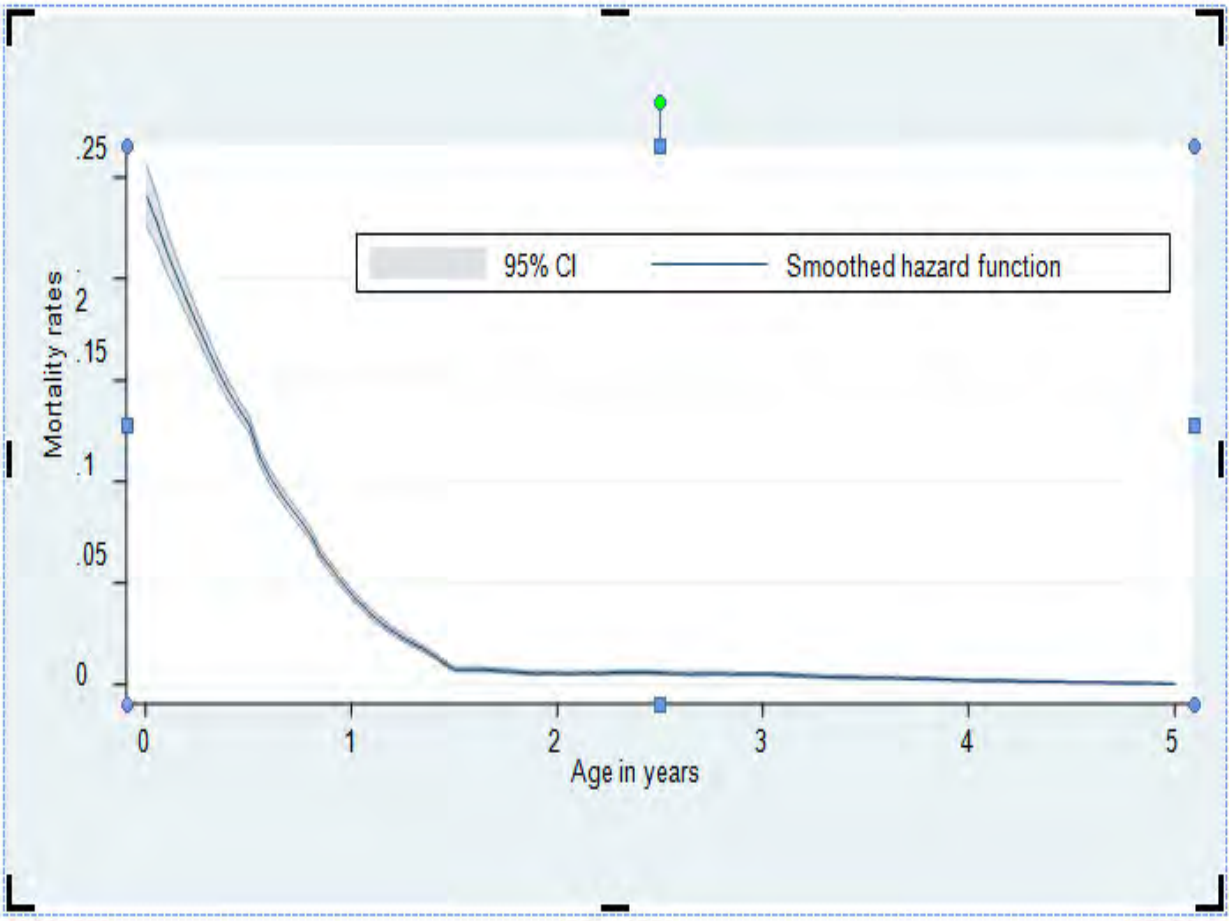
Background characteristics	Current Family Planning use among married women		Crude OR (95%CI)	Adjusted OR (95%CI)
	Yes	No		
Ecology:				
Highland	356	1800	1.00	1.00
Lowland	415	1710	1.23 (1.05, 1.43)*	1.14 (0.96, 1.35)
Urban	685	777	4.46 (3.82, 5.20)*	2.30 (1.66, 3.18)*
Educational status:				
Illiterate	800	108	1.00	1.00
Primary	481	829	2.43 (2.12, 2.78)*	1.32 (1.12, 1.56)*
Secondary plus	175	3350	6.79 (5.27, 8.73)*	1.99 (1.38, 2.88)*
Food shortage:				
Yes	387	1563	1.00	1.00
No	1069	2724	1.58 (1.39, 1.81)*	0.89 (0.76, 1.04)
Child death experience:				
Yes	429	1899	1.00	1.00
No	966	2117	2.02 (1.77, 2.30)*	1.30 (1.13, 1.50)*
Partner's education:				
Illiterate	336	1881	1.00	1.00
Primary	825	2126	2.17 (1.89, 2.50)*	1.32 (1.13, 1.55)*
Secondary plus	295	280	5.90 (4.83, 7.21)*	1.50 (1.12, 2.01)*
Migration:				
Non-migrant	823	2756	1.00	1.00
In-migrant	633	1531	1.38 (1.23, 1.56)*	1.01 (0.87, 1.16)
Livelihood:				
Farming	794	3499	1.00	1.00
Trade/service	339	466	3.21 (2.73, 3.76)*	1.13 (0.82, 1.56)
Civil servant	159	113	6.20 (4.81, 7.99)*	1.25 (0.79, 1.98)
Other	164	209	3.46 (2.78, 4.30)*	1.15 (0.80, 1.67)
Discussion:				
Yes	1283	2537	5.23 (4.40, 6.22)*	2.21 (1.80, 2.70)*
No	167	1728	1.00	1.00
Husband support:				
yes	1288	2610	4.92 (4.14, 5.85)*	2.59 (2.11, 3.17)*
No	168	1676	1.0	1.00

*9 5% confidence interval

5.3 Levels and Determinants of Under-five Mortality

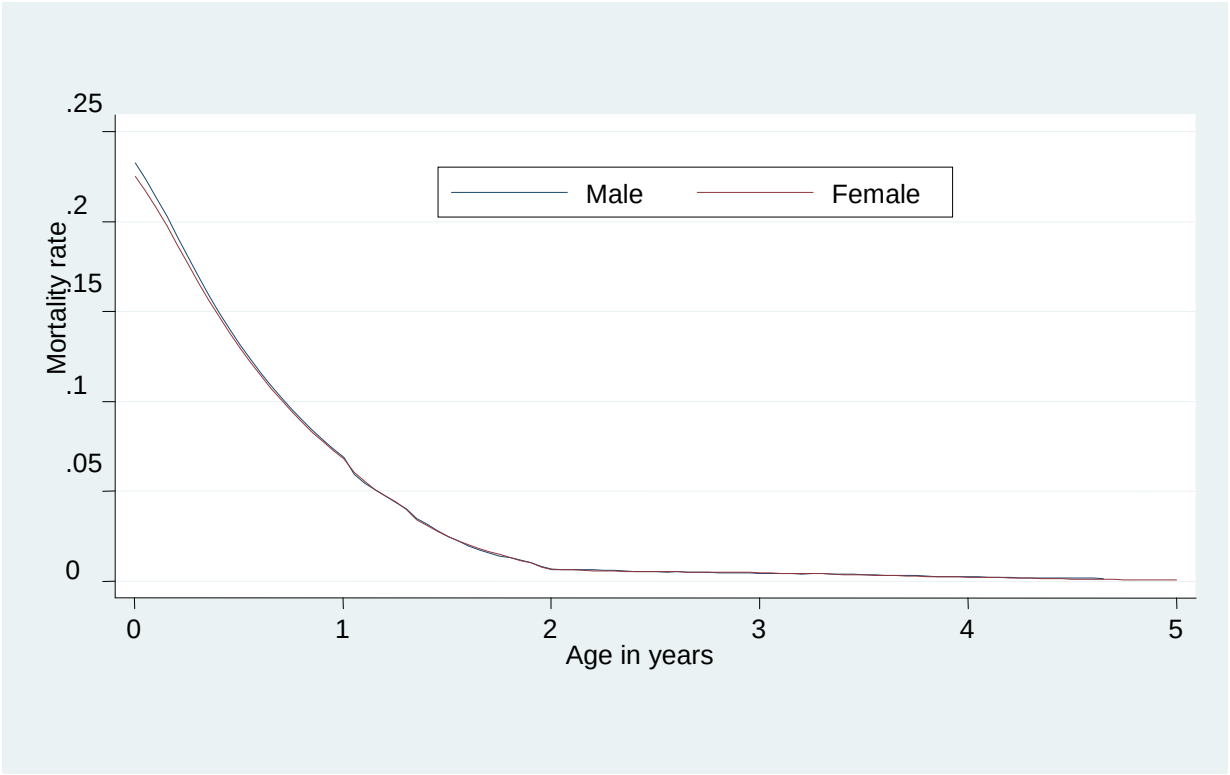
The Butajira DSS surveillance database between 1987 and 2008 was extracted to measure levels and determinants of early childhood mortality. Infant mortality was estimated at 86.6 infant deaths per 1000 person-years of observation, while child mortality was 19.2 deaths of children aged 1-4 years per 1000 person-years of observation as shown in Table 10. The incidence of under-five mortality was 29.5 deaths per 1000 person-years of observation. Figure 4 also showed a monotonic decline of early childhood mortality across sex in the age group of 0-4 years in the district.

Figure 4: Smoothed hazard under-five mortality estimate in Butajira between 1987 and 2008



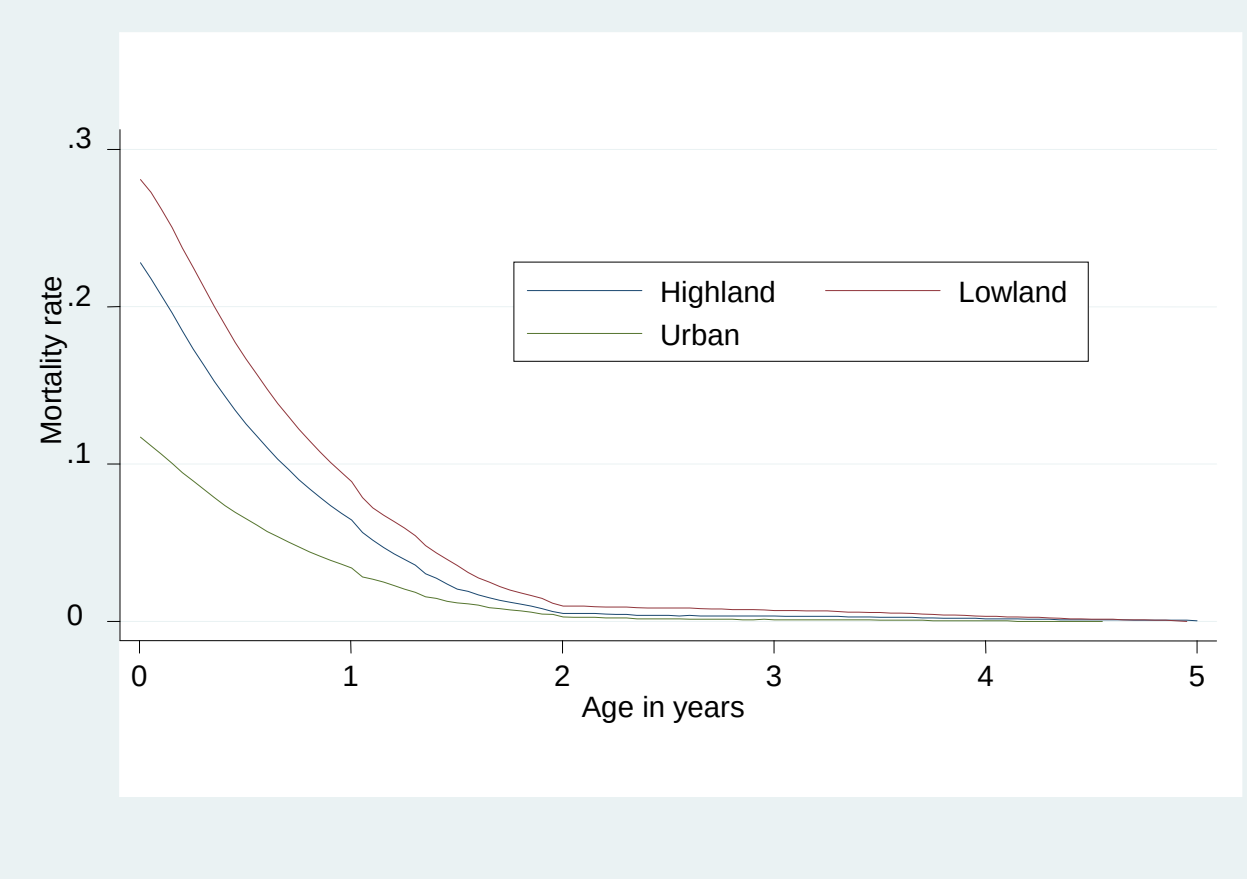
Besides, figure 5 shows differentials of under-five mortality age patterns by sex categories. Mortality was higher for males compared to female children in infancy though the level changed among children aged 1-4 years in the study district.

Figure 5: Smoothed hazard under-five mortality age-sex pattern in Butajira between 1987 and 2008



The age residential pattern of under-five mortality revealed consistently high rate in all ages between 0 and 4 years in arid lowland Butajira while it declined in urban Butajira as shown in Figure 6. The level of under-five mortality incidence in highland Butajira was in between the two ecological zones. The level of mortality around age 4 was, however, the same in all ecological zones of the district

Figure 6: Smoothed hazard under-five age ecology pattern in Butajira between 1987 and 2008



The pattern of infant, child and under-five mortality was not the same across various individuals and household background characteristics of children. There were more under-five mortality incidence rates among female children compared to males with a level of 30.5 and 28.7 incidents per 1000 person-years of observation respectively. Under-five mortality incidence rates were 16.1, 30.4 and 41.2 per 1000 person-years of observation in urban, highland and lowland Butajira respectively. The level of under-five mortality incidence rates differed across various religious groups in the district. Muslims and Orthodox Christians had similar level of under-five mortality incidence rates with 15.9 and 15.2 deaths per 1000 person-years while those confessing other sects of Christianity than Orthodox had the highest under-five mortality incidence rate of 88.4 deaths per 1000 person-years of observation. Under-five mortality incidence rate was

almost similar among families living in their own houses and in rent-free houses temporarily given by friends and relatives with a level of 31.2 and 32 respectively. The level of under-five mortality incidence was 13.4 deaths per 1000 person-years among those living in rented houses in Butajira District. The 34.6 under-five deaths per 1000 person-years of observation among households that used unprotected water source was higher compared to the level among those who used protected water sources. Under-five mortality incidence rate was 16.5, 35.4 and 32.1 among households located in the distance of less than 5kms, 5-9 kms and 10 or more kilometers away from the Butajira zonal hospital respectively. There was a differential under-five mortality incidence rate across roof types of houses in which conventional households resided. The rates were 13.1 and 34.5 among families that lived in houses with corrugated iron and thatched grass roofs respectively.

This study documented higher infant mortality rate compared to child mortality in Butajira District. Infant mortality incidence rate was also different across various individual demographic, socio-economic and household background characteristics of residents. The rate was higher among male children with a level of 88.4 infant deaths per 1000 person-years of observation compared to female children with a level of 84.7 deaths. Death rates per 1000 years of observation among children who had not celebrated their first birthday in urban, highland and lowland Butajira District were 45.7, 81.5 and 105.4 respectively. The highest infant mortality of 159.3 deaths was documented among minority denominations of Christianity other than the Orthodox group followed by 54.2 deaths among Muslims and 44.9 among Orthodox Christians. Infant mortality rates of 90, 85.7 and 48.5 were documented among those who had their own houses, lived in rent-free owed houses and rented houses respectively. Infant mortality incidence rate was variable across potable water source type. Respective death rates were 95.2 and 70.4 per

1000 person-years among households that fetched their potable water from unprotected and protected sources. Rate of death increased with increasing distance of each household from the Butajira zonal hospital. Incidence of mortality before the children celebrated their first birthday was 62.6, 89.6 and 96 deaths per 1000 person-years of observation among households located within 5 kms, 5-9 kms and 10 or more kms away from the hospital. Respective infant mortality rates were also estimated at 43.5 and 97.5 deaths among households with corrugated iron and thatched grass roofs.

Mortality of children between the ages of 1-4 years had also been variable across various background characteristics. The rate was higher among females compared to males with 20.6 and 17.9 deaths per 1000 person-years of observation respectively. Respective death rates among urbanites, highlanders and lowlanders of the study site were 9, 17.3 and 25.6 per 1000 person-years respectively. Among Muslims, Orthodox and minority Christians, respective rates of child death were 10.2, 11 and 63.5 per 1000. Families that lived in own houses, rented houses and those temporarily given by relatives or friends had child mortality rate of 20.4, 8.5 and 20.4 per 1000 person-years respectively. The figures were the same for those who lived in their own houses and those who resided in rent-free houses temporarily given by relatives. Consideration of water source as a variable showed that child mortality incidences were 12.4 and 23.2 per 1000 person-years of observation among households that secured potable water from protected and unprotected sources respectively. The level of child mortality did not consistently increase as distances of households from the hospital increased. Child mortality incidence was 9.3, 25.4 and 19.9 deaths of children between the ages of 1-4 years per 1000 person-years of observations among households located within 5kms, 5-9 kms and 10 or more kilometers away from the zonal hospital. Households that resided in houses roofed with corrugated iron had an estimated 8.4

children deaths while those with thatched grass had 22.6 children deaths per 1000 person-years of observation.

Table 10: Early childhood mortality rates per 1000 person years of observation in Butajira between 1987 and 2008

Background Characteristics	Infant Mortality Rate (CI)	Child Mortality Rate (CI)	Under-five Mortality Rate (CI)
Over all	86.6 (77.4, 96.9)	19.2 (17.4, 21.3)	29.5 (27.4, 31.8)
Sex:			
Male	88.4 (75.7, 103.3)	17.9 (15.5, 20.7)	28.7 (25.8, 31.9)
Female	84.7 (72.0, 99.6)	20.6 (17.9, 23.7)	30.5 (27.4, 33.9)
Ecology:			
Highland	81.5 (67.6, 98.2)	17.3 (14.6, 20.5)	30.4 (27.0, 34.3)
Lowland	105.4 (90.6, 122.6)	25.6 (22.4, 29.3)	41.2 (37.3, 45.4)
Urban	45.7 (31.1, 67.1)	9.0 (6.4, 12.6)	16.1 (12.7, 20.4)
Religion:			
Muslim	54.2 (44.5, 66.1)	10.2 (8.5, 12.2)	15.9 (13.9, 18.1)
Orthodox	44.9 (30.6, 65.9)	11.0 (8.2, 14.7)	15.2 (12.0, 19.2)
Other Christians	159.3 (137.7, 184.3)	63.5 (55.4, 72.8)	88.4 (80.0, 97.6)
House ownership:			
Owned	90.0 (80.0, 101.3)	20.4 (18.3, 22.7)	31.2 (28.8, 33.7)
Rented	48.5 (28.2, 83.6)	8.5 (5.2, 13.8)	13.4 (9.3, 19.3)
Rent free/owed	85.7 (54.0, 136.0)	20.4 (13.2, 31.7)	32.0 (23.3, 43.9)
Water source:			
Protected	70.4 (57.0, 87.0)	12.4 (10.1, 15.3)	20.8 (18.0, 24.1)
Unprotected	95.2 (83.4, 108.7)	23.2 (20.7, 26.1)	34.6 (31.7, 37.8)
Distance to hospital:			
<5km	62.6 (47.1, 83.4)	9.3 (7.0, 12.5)	16.5 (13.5, 20.3)
5-9 kms	89.6 (74.6, 107.7)	25.4 (21.9, 29.5)	35.4 (31.6, 39.8)
≥10kms	96.0 (81.6, 113.1)	19.9 (17.0, 23.2)	32.1 (28.7, 36.0)
Roof type:			
Iron sheets	43.5 (30.6, 61.8)	8.4 (6.2, 11.6)	13.1 (10.4, 16.6)
Thatched grass	97.5 (86.6, 109.8)	22.6 (20.3, 25.1)	34.5 (31.8, 37.3)

It has also been customary to measure the health status of the community with life expectancy at birth, which is the average number of years an infant would survive under the prevailing age schedules of mortality. Life expectancy at birth for both sexes in Butajira District was 56.2 (55.1, 57.4) years. However, it was 56.0 (54.4, 57.6) years for males and 56.4 (54.8, 58.0) years for females. The life expectancy of 66.8 (64.1, 69.6) years for urban Butajira was higher compared to 56.1 (54.4, 57.8) and 52.4 (50.6, 54.2) years for highland and lowland Butajira respectively. This is shown in Table 11 below.

Table 11: Life expectancy at birth by sex and residential ecology in Butajira, 2008

Background Characteristics	Life Expectancy at Birth (CI)
Sex:	
Male	56.0 (54.4, 57.6)
Female	56.4 (54.8, 58.0)
Both sexes	56.2 (55.1, 57.4)
Residence ecology:	
Highland	56.1 (54.4, 57.8)
Lowland	52.4 (50.6, 54.2)
Urban	66.8 (64.1, 69.6)

Further analysis of under-five mortality using Poisson regression showed significant association with many individual and household characteristics of children in the district (See Table 12). Having controlled residential ecology, religion, house and oxen ownership, roof type, source of potable water type, and distance of households from hospital, the risk of under five mortality was found to be about 15% significantly lower among female children compared with male children in the district. Respective under five mortality risks were about 1.14 (1.03, 1.25) and 15.24 (13.75, 16.89) times higher among Muslims and believers of minority Christian denominations compared to Orthodox Christians after other variables were included in the model. On the other

hand, after inclusion of other variables in the model, the under five mortality risks were found to be about 1.31 (1.04, 1.66) and 2.02 (1.58, 2.59) times higher among highlanders and lowlanders respectively compared to urbanites in the district. Oxen ownership was found to have a protective effect on under-five mortality. The risk of under five mortality was about 1.54 (1.43, 1.67) times higher among households who have oxen compared to their counterparts even after other background characteristics were included in the model. Ownership of houses did not seem to have a protective effect. Having included the main individual and household background characteristics of the child in the model, under-five mortality risk was found to be about 1.92 (1.66, 2.22) and 2.40 (1.89, 2.06) times higher among families with their own houses and those with rented houses respectively compared to those with houses temporarily given to them by relatives or friends. The crude under-five mortality incidence was higher among households who used potable water from unprotected sources compared to those who drank protected water though the direction of association was changed when other child background characteristics were controlled. Under-five mortality risk was 2.13 (1.79, 2.53) times higher among households living in houses roofed with thatched grass compared to those with corrugated iron sheets. As distance of households from the Butajira zonal hospital increased the risk of under-five mortality incidence increased though it was a bit reversed and the statistical significance vanished when other background characteristics were included in the model. The incidence of under five mortality was 1.46 (1.26, 1.69) and 1.15 (0.99, 1.35) times higher among households located between 5-9 kilometers and those found at 10 or more kilometers away from the hospital compared to those situated within five kilometers distance.

Table 12: Crude and adjusted under-five mortality incidence rate ratio along with their 95% confidence interval in Butajira District between 1987 and 2008

Background Characteristics	Person Years		Crude IRR (CI)	Adjusted IRR (CI)
	Under 5 death	No under 5 death		
Sex:				
male	10101.97	1803566	1.00	1.00
female	9818.598	1912667	0.88(0.82, 0.93)*	0.85(0.79, 0.80)*
Religion:				
Christian	2015.346	858151.4	1.00	1.00
Muslim	7626.122	2671994	1.18(1.07, 1.30)*	1.14(1.03, 1.25)*
Other Christians	10279.1	186087	16.58(15, 18.32)*	15.24(13.75, 16.89)*
Ecology:				
urban	1420.608	804940.7	1.00	1.00
highland	7796.756	1611620	2.38(2.12, 2.66)*	1.31(1.04, 1.66)*
lowland	10703.2	1299671	3.75(3.36, 4.19)*	2.02(1.58, 2.59)*
Oxen ownership:				
no	3469.739	1229379	1.00	1.00
Yes	16450.83	2486854	1.95(1.81, 2.11)*	1.54(1.43, 1.67)*
House ownership:				
owed	1123.918	148258.3	1.00	1.00
owned	643.3895	323358.9	0.75(0.66, 0.86)*	1.92(1.66, 2.22)*
rented	18153.26	3244615	0.32(0.27, 0.40)*	2. 04(1.89, 2.06)*
Water source:				
protected	4817.856	1259068	1.00	1.00
unprotected	15102.71	2457165	1.48(1.38, 1.58)*	0.96(0.88, 1.05)
Roof type:				
iron sheets	1690.883	926759.7	1.00	1.00
thatched grass	18229.68	2789473	3.17(2.86, 3.51)*	2.13(1.79, 2.53)*
Distance from hospital:				
<5 kms	2496.936	1070313	1.00	1.00
5-9 kms	8669.112	1310774	2.46(2.24, 2.70)*	1.46(1.26, 1.69)*
≥10 kms	8754.516	1335146	2.52(2.29, 2.76)*	1.15(0.99, 1.35)

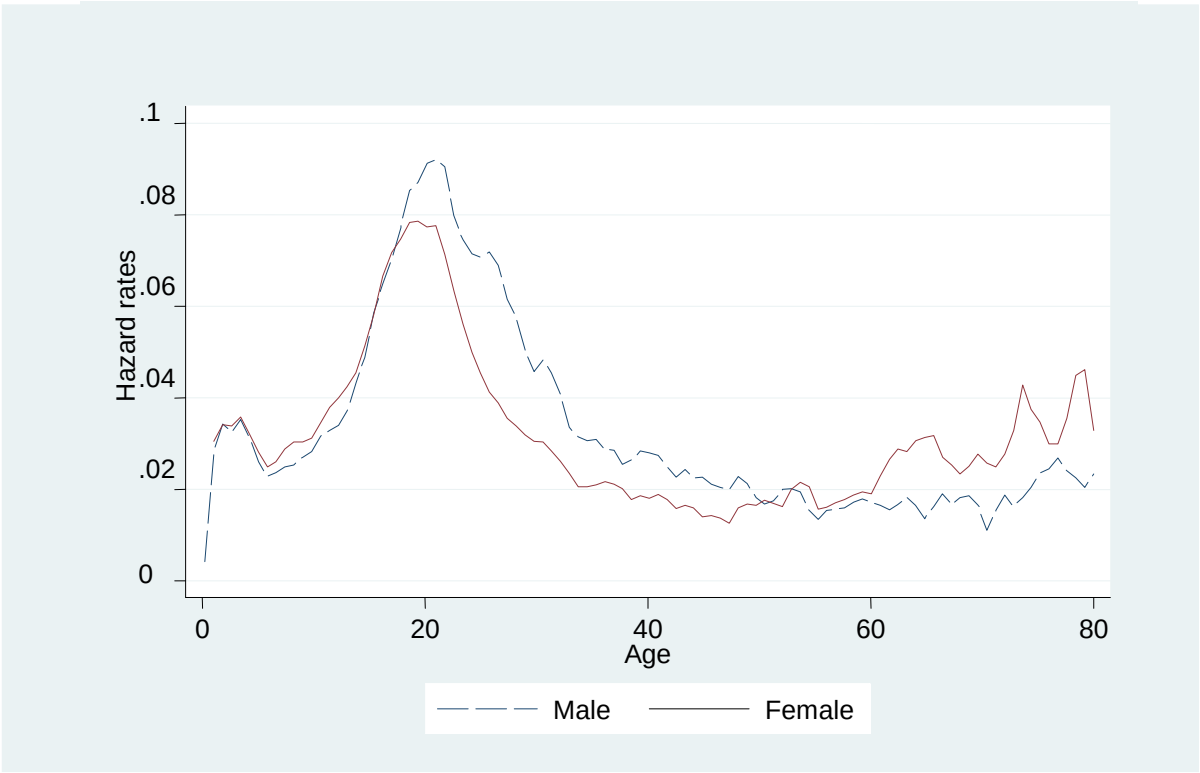
*Statistically significant at 5% level of significance

5.4 Levels and Determinants of Out-migration

There were a total of 39,679 out-migration episodes in a 999,025.97 person-years of observation which corresponds to 3.97 incidences of out-migration per 100 person-years with 95% CI of (3.93, 4.01) over the 22 years study period.

High out-migration was observed among the youth aged 15-19 and 20-29 years at an incidence rate of 7.25 (7.09, 7.40) and 6.26 (61.4, 6.38) per 100 person-years of observation respectively (See Table 13). On the other hand, the incidence rates of out-migration were only 1.94 (1.84, 2.05) and 2.08 (1.98, 2.18) among adults aged 40-49 years and 50 plus years per 100 person-years observation, respectively. The out-migration incidence rate had also shown sex disparity with a rate of 4.16 (4.10, 4.22) and 3.79 (3.74, 3.85) among males and females, respectively. A smoothed outmigration hazard estimate age pattern in Figure 7 also indicated consistently higher incidence rate of out-migration for males compared to females between the ages of 20 and 50 years though the pattern changed in the remaining age groups. The peak age of incidence of out-migration was recorded at around 20 years of age for both sexes.

Figure 7: Smoothed age pattern hazard estimates of out-migration by sex in Butajira between 1987 and 2008

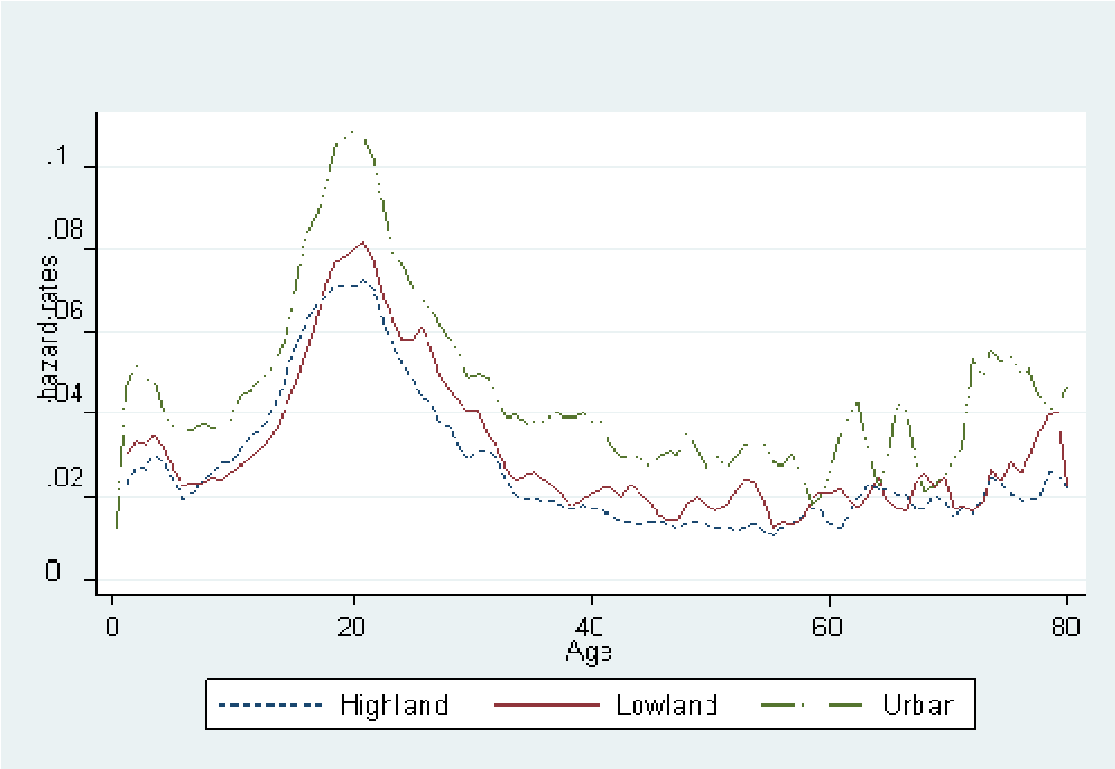


An examination of the incidence of out-migration by educational status revealed different levels across categories. Out-migration was far higher among more educated residents of Butajira District with an incidence rate of 10.92 out-migrations per 100 person-years of observation with a 95% CI of (10.42, 11.45) among those with secondary plus level of education. Higher out-migration was also estimated among people who had been too young to marry and singles with an incidence rate of 7.07 (6.97, .16) and 3.94 (3.87, 4.01) out-migrations per 100 person-years of observations respectively. The incidence was, however, very low among ever married residents with no statistically significant difference among currently married and formerly married ones. The respective out-migration levels were 1.41 (1.37, 1.46) and 1.44 (1.35, 1.54) per 100 person-years of observation. Among those whose religious denominations were recorded by the surveillance system, area-minority Christian

groups revealed higher out-migration incidence rate of 4.31 (4.23, 4.01) per 100 person-years of observation.

There was also statistically significant difference in the levels of out-migration across residential ecological areas. The incidence among urban Butajira residents was 5.58 (5.48, 5.68) and lower among highlanders 3.37 (3.32, 3.43) out-migrations per 100 person-years of observation. Moreover, a smoothed age pattern of the hazard of out-migration showed consistently higher incidence in urban Butajira (Figure 8). Comparison of out-migration incidence rate in the two rural residential ecological zones showed higher rate among highlanders up to the age of 20 years though the pattern afterwards was in favour of lowlanders.

Figure 8: Smoothed hazard estimates of out-migration by residence type in Butajira between 1987 and 2008



Out-migration rate was also distinct across asset ownership status. The incidence rate was higher among residents who did not have oxen to plough their farm plot with a rate of 3.61 out-migrations per 100 person-years of observations with a 95% CI of (3.54, 3.67). Out-migration rate was, however, lower among those who had the animal at a rate of 2.18 (2.14, 2.23) out-migrations per 100 person-years of observations. On the other hand, people living in houses obtained from relatives free of pay had the highest incidence of out-migration rate of 12.74 out-migrations (12.34, 13.15) per 100 person-years of observations. The next higher out-migration incidence rate was observed among those who lived in rented houses with a 6.52 out-migrations per 100 person-years of observations with 95% CI of (6.35, 6.69). People living in their own houses had the lowest out-migration incidence rate of 3.41 out-migrations (3.37, 3.45) per 100 person-years of observations.

Table 13: Differentials of out-migration incidence rate in Butajira between 1987 and 2008

Factors	Person-Time in Years	Out-migrations	Incidence Rate per 100 Person-Years (95% CI)
Age group:			
0-14	450045.91	14194	3.15 (3.10, 3.21)
15-19	118419.77	8583	7.25 (7.09, 7.40)
20-29	172960.01	10822	6.26 (6.14, 6.38)
30-39	110263.57	3114	2.82 (2.73, 2.93)
40-49	68614.197	1332	1.94 (1.84, 2.05)
50+	78722.507	1634	2.08 (1.98, 2.18)
Sex:			
Male	488830.69	20329	4.16 (4.10, 4.22)
Female	510195.27	19350	3.79 (3.74, 3.85)
Educational status:			
Illiterate	495774.23	10175	2.05 (2.01, 2.09)
Primary	52118.171	2253	4.32 (4.15, 4.50)
Secondary plus	15667.165	1711	10.92 (10.42, 11.45)
Pre-school age	435466.4	25540	5.86 (5.79, 5.94)
Marital status:			
Married	305644.04	4322	1.41 (1.37, 1.46)
Single	320484.29	12616	3.94 (3.87, 4.01)
Other (too young to marry)	308813.09	21818	7.07 (6.97, 7.16)
Formerly married	64084.55	923	1.44 (1.35, 1.54)
Religion:			
Muslim	727646.58	22431	3.08 (3.04, 3.12)
Orthodox Christian	233791.04	10090	4.31 (4.23, 4.01)
Other Christians	37588.35	7158	19.04 (18.61, 19.48)
Environment:			
Highland	430532.45	14519	3.37 (3.32, 3.43)
Lowland	351413.65	13042	3.71 (3.65, 3.78)
Urban	217079.86	12118	5.58 (5.48, 5.68)
Oxen ownership:			
No	315717.19	11389	3.61 (3.54, 3.67)
Yes	365647.09	7984	2.18 (2.14, 2.23)
Unknown	317661.69	20306	6.39 (6.31, 6.48)
House ownership:			
Owned	878258.46	29967	3.41 (3.37, 3.45)
Rented	91200.504	5945	6.52 (6.35, 6.69)
Rent free/owed	29567.003	3767	12.74 (12.34, 13.15)
Total	999025.97	39679	3.97 (3.93, 4.01)

Multivariate analyses of the association of individual and household characteristics with out-migration are shown in Table 14. The risk of out-migration was 1.9 (1.85, 1.96) and 1.77 (1.71, 1.82) times higher among teenagers (15-19 years) and young adults aged 20-29 years respectively compared to children under the age of 15 years. However, the risk was significantly lower among adults over the age of 30 years in reference to the other groups. Out-migration risk was about six percent lower among females compared to males with an IRR of 0.94 (0.92, 0.96).

Seen against educational status, the risk of out-migration was found to be pronounced as educational level increased. It was 1.23 (1.17, 1.29) and 2.82 (2.66, 2.98) times higher among those who attained primary and secondary plus levels respectively compared to those who had never been to formal education.

On the other hand, the risk of out-migration was 1.55 (1.49, 1.62) and 1.47 (1.37, 1.58) times higher among singles and those who were formerly married respectively compared to those in current marital union. Those who had social responsibility were less likely to move out of their place of usual abode. Children too young to marry (under 15) were 0.94 (0.90, 0.99) times less likely to move out compared to the married ones. Besides, the area-minority Orthodox Christians had an out-migration risk that was 1.29 (1.26, 1.32) times higher compared to the area-majority Muslims. The risk of out-migration was 4.71 (4.56, 4.87) times higher among Protestants/Catholics compared area majority Muslims in the study district.

Informed urbanites had the higher risk of out-migration compared to rural highland residents. The risk for the former was 1.47 (1.36, 1.58) times higher compared to the latter. Having

controlled other variables, however, there was no statistically significant difference in out-migration rate ratios between lowlanders and highlanders.

The association of oxen ownership and out-migration was marginally significant 1.03 (1.00, 1.06). The risk of out-migration was 1.58 (1.52, 1.64) and 2.11 (2.04, 2.18) times higher among residents who lived in a rented house and those who obtained rent-free houses from a relative compared to those who lived in their own houses.

Table 14: Association of socio-demographic factors with outmigration in Butajira between 1987 and 2008

Variable	Person-Times of Exposure in Years		Out-migration Incidence Rate Ratios (95% confidence interval)	
	Out-migrants	Non-migrants	Crude	Adjusted
Age group:				
0-14	25343.55	370570.8	1.00	1.00
15-19	11354.89	100831.4	2.14 (2.09, 2.19)	1.90 (1.85, 1.96)
20-29	16036.88	147814.6	1.97 (1.92, 2.02)	1.77 (1.71, 1.82)
30-39	4902.728	97972.48	0.89 (0.86, 0.93)	0.93 (0.89, 0.97)
40-49	2297.157	6745.73	0.53 (0.50, 0.56)	0.63 (0.60, 0.67)
50+	3531.126	90381.68	0.50 (0.47, 0.52)	0.58 (0.55, 0.61)
Sex:				
Male	31625.26	428882.8	1.00	1.00
Female	31841.07	445133.9	0.92 (0.90, 0.93)	0.94 (0.92, 0.96)
Education status:				
Illiterate	15622.35	324105.9	1.00	1.00
Primary	2876.695	31730.81	2.21 (2.11, 2.31)	1.23 (1.17, 1.29)
Secondary plus	1917.728	9717.437	5.75 (5.44, 6.09)	2.82 (2.66, 2.98)
Pre-school age	43049.56	508462.6	1.46 (1.43, 1.49)	1.44 (1.40, 1.48)
Marital status:				
Married	5414.779	179630.8	1.00	1.00
Single	16590.09	188273.7	2.50 (2.41, 2.58)	1.55 (1.49, 1.62)
Others (too young to	40279.68	472495.6	1.59 (1.54, 1.64)	0.94 (0.90, 0.99)
marry)	1181.789	33616.6	1.14 (1.07, 1.22)	1.47 (1.37, 1.58)
Formerly married				
Religion:				
Muslim	35758.36	646415.1	1.00	1.00
Orthodox Christian	15187.48	197603.6	1.47 (1.43, 1.50)	1.29 (1.26, 1.32)
Protestants/Catholics	12520.49	29998.01	4.96 (4.82, 5.10)	4.71 (4.56, 4.87)
Environment:				
Highland	24883.25	377841.8	1.00	1.00
Lowland	20714.45	311713.1	1.11 (1.08, 1.14)	1.00 (0.97, 1.02)
Urban	17868.68	184461.9	1.86 (1.81, 1.91)	1.18 (1.15, 1.22)
Oxen ownership:				
No	15108.41	291140.9	1.00	1.00
Yes	11230.78	237562.7	0.82 (0.80, 0.85)	1.04 (1.01, 1.07)
Unknown	37127.14	345313.1	1.29 (1.26, 1.32)	1.13 (1.10, 1.16)
House ownership:				
Owned	48495.51	772449.5	1.00	1.00
Rented	7851.713	74550.84	2.31 (2.25, 2.38)	1.58 (1.52, 1.64)
Owed	7119.112	27016.36	2.88 (2.79, 2.98)	2.11 (2.04, 2.18)

*Statistically significant association at 5% level of significance

5.5 The Relationship between Fertility, Child Mortality and Migration

The association of childhood mortality, fertility and migration was shown in Table 15. Childhood mortality was significantly associated with fertility. Having included the variables residential ecology, ethnicity, religion, educational status, partner's educational status, occupation, partner's occupation, income level, household livelihood and current use of family planning in the Logistic regression model, it was found out that the odds of having more than four children were about 6.07 (5.36, 6.87) times higher with women who had the experience of child death compared to those without such an experience. On the other hand, the odds of high fertility were about 4% higher among in-migrants compared to those born in the demographic surveillance area though they were not significantly associated when the main background variables mentioned above were controlled.

There was also a need to see whether there was an association of the components of population change in the opposite direction. When other background characteristics were included in the model, the odds of childhood mortality experience were about 6.07 (5.36, 6.88) times higher among mothers who had more than 4 children compared to those who had four or less. However, the odds of the experience were only 1.02 times higher among in-migrant mothers compared to those born in the district though the association was not statistically significant.

Migration was not significantly associated with childhood mortality and fertility in the study district. The odds of migration were 1.02 times higher among mothers having the experience of child death compared to those without the experience. On the other hand, the odds were 1.04 times higher among mothers who gave birth to more than 4 children compared to those who had four or less when other background characteristics were included in the model.

Table 15: The association between child mortality, fertility and migration in Butajira in 2009

Component of Population Change		Adjusted OR of Fertility (CI) 0="≤4 children" 1=">4 children"	Adjusted OR of Child Mortality (CI) 0="no child death" 1=" child died"	Adjusted OR of Migration Status (CI) 0="born in site" 1="in-migrant"
Child death experience:	No	1.00	*NA	1.00
	Yes	6.07 (5.36, 6.87)		1.02 (0.89, 1.16)
Children ever born:	≤4	*NA	1.00	1.00
	>4		6.07(5.36, 6.88)	1.04 (0.92, 1.19)
Migration status:	born in site	1.00	1.00	NA
	In-migrant	1.05 (0.92, 1.19)	1.02 (0.90, 1.17)	

*NA – Not applicable

- Controlled for residential ecology, ethnicity, religion, education, partner's education, occupation, partner's occupation, income level, household livelihood and current use of family planning (All of the confounding variables were categorical)
- 95% confidence interval

6. Discussion

6.1 Levels and Determinants of Fertility

The total and marital fertility rates of 5.3 and 7.8 children per woman respectively in 2009 estimated in this study was one of the highest in the country though it was similar to the level in Gondar, North West Ethiopia, in 2007 (22). This could be attributed to the sustained credence of the Ethiopian community to large family size norm as children assisted households in subsistence farming, petty trade and services besides the care they render to parents in their old ages in developing countries (53, 99, 116, 117). The argument was further complemented by high fertility among women who were members of larger households compared to those who belonged to households with four or less members. A household in this study constituted individuals that lived in one or more houses with the same cooking arrangement regardless of their blood relations. Family size is, in fact, a function of the number of children in the household which could be cited as a limitation for this variable to support our claim. However, women of parity 4 in the study area had more than 79% chance to have the 5^{th} parity showing the deep-rooted culture of larger family size that might be supported in the study community in the foreseeable future (21). The Ethiopian national health extension program (HEP) put in place since 2003 has been delivering family planning services at the household level using female village-based health extension workers (HEWs) despite its respective achievement of 88%, 4.7% and 61% in the construction of health posts, certifying role model households, and deployment of health extension workers in Guraghe Zone in 2008 (12, 118). The three rounds of DHS in the country showed gradual decline of fertility in the country although we have to wait for more years before we see the total fertility rate of 4 children per woman by 2015 as planned in the Ethiopian National Population Policy (1, 7-9).

The long standing culture of extended child breastfeeding had been witnessed in this study since mothers breastfeed their children for more than 20 months on average and abstain from sex for nearly two months in the study area. Breastfeeding, though not exclusive for the first six months, was practiced by most women there (93). Postpartum infecundability had, therefore, a significant contribution to the reduction of fertility from its biological maximum by about 32%. That was similar to other studies done elsewhere in Ethiopia (119, 120). Contrary to the findings of many studies in the country, the 34% fertility inhibition effect of non-marriage in this study was a little higher than the inhibition effect of PPI. This could be attributed to marital disruption due to the higher out-migration of men even after marriage from the study area compared to other parts of the country (32, 121). However, the effect of the revised legal age at first marriage to 18 years in the new family law with implications on conclusion and dissolution of marriage practiced since 2000 could not yet be observed (48). The median and mean ages at first marriage of women in reproductive age in the study site were still 16 and 16.9 years, respectively. Non-marriage reduced natural fertility by about 47% and 59% among urbanites and those who attained secondary plus level of education respectively. Age at first marriage had also increased from 16.5 years to 17.8 and 19.7 years when residence type changed from rural to urban and educational status increased from illiteracy to secondary plus respectively. Similar studies in different parts of Ethiopia showed the paramount significance of postponement of age at first marriage in reducing fertility from its biological maximum in urban areas (74, 119, 120). On the other hand, contraception reduced fertility from its natural level by about 23%. The reduction of fertility due to contraception was higher in urban areas, among educated and Christian mothers while it was only 2% among the Silti nationals. That was similar to the findings elsewhere in the country (11, 74). The majority of population in the district lives in rural areas where

contraception, literacy and accessibility of family planning methods were low. However, the significant effect of contraception in reducing fertility was observed in other urban communities in the country and this was attributed by researchers to the poverty-driven acceptance of wider use of family planning among urbanites (122). Abortion was measured in this study against experiences of most studies of fertility determinants in sub-Saharan Africa. Collecting information on induced abortion in the study area was sensitive since the community strongly condemned its practice. The information was thus collected without differentiating whether the abortion was induced or spontaneous. It is, therefore, necessary to decompose the abortion data into induced and spontaneous abortion. In this line, a facility based study indicated the national abortion rate of 23 per 1000 women aged 15-44 years and an abortion ratio of 13 per 100 live births in Ethiopia (123). A study done in a tertiary level referral hospital that managed complications had also shown that about 93% of women treated for abortion complications in the SNNPR were due to induced abortion (123, 124). The abortion index obtained in this study was prorated by the national percentage of induced abortions documented in the national facility-based abortion study. However, the prorated percentage of induced abortion was almost equal to the total abortion in this study. Moreover, abortion whether induced or spontaneous, would have a negative effect on the magnitude of fertility. Besides, detailed analysis showed more than a third of abortions happened to low parity in-school mothers, and that might have been induced abortions by young women exercised to remain in school. It is further augmented by the fact that although the overall effect of abortion to cut off fertility from its natural level was only 4% the maximum fertility inhibition effect of 24% was observed among students who were currently enrolled in formal schools. Unwanted pregnancies might be common among in-school youth and such ones could end up in induced abortion since high school students in rural districts including

Butajira stay away from their parents. This means familial control would be compromised. Moreover, a qualitative study in Nigeria showed that adolescents prefer to undergo early termination of pregnancy rather than using modern contraceptives in fear of their adverse effects on fertility when continuously practiced, while they saw abortion as an immediate solution to an unplanned pregnancy (125).

There was also a significant association between distal background characteristics of women with achieved fertility level in the study area. Women married in their teens had significantly higher fertility compared to those married after they celebrated their 20^{th} birthday. This finding is not unusual in a community where contraception and median age at first marriage among married women was at lower level of 25%. Early marriage gave women more years of reproduction in the context of low contraception. On the contrary, several studies showed that first childbirth postponement to later ages using parity specific controls leads to fertility reductions since women would have fewer years of reproduction window (22, 99). Women who had many years of education had significantly lower fertility compared to those who were not enrolled in any formal education system which corroborates with similar studies (22, 53, 74). Educated women had been more responsive to fertility in the context of environmental pressures including poverty and food insecurity (122, 126). A study among the Sidamas in Southern Ethiopia, however, showed that fertility was higher among women with primary level of education compared to those who never attended any formal education (127). Higher education empowers women in social status and economic achievements. Thus, able women might feel that they could take care of many children and opted for large family size. This is consistent with the claim by some researchers that increased family income leads to increased fertility when family planning use is low (117). Educated women have better knowledge of choice and use of family

planning methods and know how to manage their side effects that could reduce default rate. On the other hand, women who did not know the time of pregnancy had higher fertility compared to those who knew it.

Disparities in level of fertility between urban and rural communities in the study population were similar to the finding in Gondar (22) that could be attributed to differences in contraceptive prevalence and age at first marriages between urbanites and rural residents in Ethiopia, since women in urban areas have better access to media, general knowledge and stay more years in school. It was, however, difficult to document reasons for the change in the direction of associations between residence ecology and fertility when other factors were controlled. Meanwhile, informed urbanites might have a positive attitude towards smaller family size besides having better access to family planning services. For instance, the urban fertility level of 3.3 children per woman found in this study was similar to the level found in 2007 for Awassa Town, the capital of the study region (74). In a similar context, fertility was significantly lower among women whose major livelihood was based on trade or services compared to those who earned a living from subsistence farming. Most households that relied on trade or services as main source of income could be influenced by urban culture and practice which had a low fertility norm in the country (11, 128).

Although food security was widely misunderstood, researchers considered it as shortages in the quality and quantity of food at any time while others defined it as shortage or absence of edible food (129). The study was conducted in a drought prone area (126) for which information on household food scarcity encounter in the past calendar year was collected. This variable might

not precisely measure household food security and this could be cited as a limitation. However, it indirectly showed the household economic status and risk of vulnerability. Fertility was significantly higher among women whose households suffered from food shortages. There could be an egg-chicken dilemma in this claim since the food shortage might be caused by the large family size which in turn could mainly be triggered by higher fertility. In a resource-constrained environment such as the study area, people had to share the scarce food and could probably be exposed to shortages particularly in rainy seasons, the time at which grain food of farming households would be depleted (5). Fertility was also found to be lower among malnourished mothers compared to nourished ones in a similar study conducted on the Sidamas of Southern Ethiopia (127).

An in-migrant to the DSA is a person who came in to live or otherwise stayed there for 6 months or longer. No significant association was observed between migration status of women and fertility in this study. This could be due to the fact that duration of residence of in-migrants may not be long enough to influence fertility and reproductive health behavior in the study area as migration was broadly categorized. It may also be related to the fact that in-migrant women could have come from rural villages in the same or nearby districts of the country which had similar socio-cultural and behavioral practices. Nevertheless, a study in China, though the context is a bit different, had indicated that rural-urban migrant returnees from middle and large cities had adapted positive fertility behavior towards small family size norm compared to their rural–rural return migrant counterparts (130). The same study also revealed that areas with higher prevalence of rural-urban migrant returnees particularly from middle and mega cities would have a positive effect to adapt small family size.

Studies done on fertility responses to childhood mortality have focused on insurance and replacement effects (36). Couples in high mortality settings anticipate the death of some of their children that might influence to change their reproductive preferences and behavior. Childhood mortality could also have the combined biological and volitional replacement effects to reduce the time to subsequent conception if the death occurs within a given interval. The time to conceive could also be reduced if child death occurs during a prior birth interval. Accordingly, this study revealed child mortality as a strong and significant predictor of fertility. The same was documented for the study site and elsewhere a decade ago (22, 23, 74). Epidemic and frequent episodes of drought which might have claimed the lives of children of the study community, might have provoked mothers to replace the lost ones (126).

Contrary to the findings of many studies, fertility was significantly higher among women who had no preference of sex of their children. Conversely, studies done in Ethiopia and Asia had revealed more preference towards sons since males inherit properties from their ancestors in a patrilineal society [120, 123]. A similar study in USA indicated a stable marital union or request for the custody of their child by fathers if the marriage was dissolved when couples had sons instead of daughters (127, 131, 132). Religiosity among women in the study community probably dimmed their decision.

6.2 Contraception and Unmet Need Levels and Determinants

The contraceptive prevalence rate (CPR) of 25.4% (95% CI: 24.2, 26.5) among married women in Butajira District in 2009 was comparable to the regional and national CPR of 25.8 and 28.6 respectively in 2011 (9). The relative increase in CPR in recent years could be attributed to the expanding health service coverage and an opening of a zonal hospital in the district in 2002 which improved the health service delivery (133) .

Although contraception increased significantly both nationally and in the study district in recent years, it was still lower than the anticipated target of 60% for the year 2010 (13). Moreover, the 52.4% unmet need of contraception was higher than 33.8% and 25.3% of the 2005 and 2011 levels respectively for Ethiopia. Unmet needs in 2005 and 2011 were respectively estimated at 37.4% and 25.0% for the region in which the study district is located (8, 9). About 75% of the unmet need recorded in this study was attributed to spacing and the rest to limiting. The commitment of the Ethiopian Government to achieve 80% contraceptive demand satisfaction by 2015 is far to reach, since about 71% of married women who have 4 surviving children desire to have more and the desire was even higher in rural areas where the majority of the Ethiopian population resides.

Women in the study area mentioned stock out of contraceptives, absence of client-preferred methods, religious pressure, service provider incompetence, and side effects of contraceptives, such as heart burn, excessive menstrual bleeding and their presumption of requirement of balanced diet and optimum workload as barriers to use family planning methods. Similar reasons of unmet need for contraception were also documented by other studies done elsewhere (134,

135). Inadequacy of methods and counseling were mentioned as reasons for unmet need in a similar study done in Gondar, North Western Ethiopia (136). The higher unmet need of contraception recorded in this study could be due to the population pressure and poverty driving women in densely populated areas such as the study district and urban centers to look for parity specific controls though service providers cannot cope with the demand (122). The relatively better level of contraception and lower unmet need among urban married women in the study area could be ascribed to accessibility of health services and awareness of the urbanites on family planning methods. Better mass media coverage in urban areas compared to the rural might have increased knowledge and practice. Urban women could also be more enlightened and autonomous to utilize health services compared to their counterparts in rural areas (103).

Unlike the study done in Jimma area which showed higher preference of pills, Depo-Provera is the most preferred method among current users of family planning methods in the study district (137). Women in the study area could be in favor of relatively long acting methods to avoid missing pills or some might have taken long acting methods without the consent of their partners which could be difficult in the case of pills.

Women's educational status was positively associated with contraceptive prevalence rate in the study district. Studies elsewhere revealed a similar pattern of relationship between educational status and maternal health service, including family planning utilization (88, 106, 138). Longer years of education could probably give married women a better chance to understand uses of contraception to reduce fertility, maternal and child morbidity and mortality. It might also increase awareness on the side effects of contraceptive methods and choose the most convenient

ones. Educated women could avoid the negative effects of family planning methods by getting appropriate advice from a service provider to increase their consistent use.

Moreover, experience of child death was negatively associated with family planning use in Butajira District. When women have experience(s) of child death they attempt to replace the lost ones and want to have more children (23). On the other hand, if they perceive low child death in their community, they might use family planning knowing that most of the children born would reach adulthood. The study district faced periodic droughts associated with epidemics in the context of abject poverty (126) which may be one of the reasons that the level of family planning use is still at a lower level as a response to perceived high early childhood mortality although it is on the rise in recent years.

Husband's educational status was associated with family planning use as shown in a study in Eastern Sudan (139). Men's educational status was directly related to economic and social empowerment which increased exposure to resources such as access to media and utilization of desired health care delivery services. More years of education exposed men to better knowledge of reproductive health behaviors in which case men would be liberal to initiate couple's discussion to use family planning. They would also consider managing family size as something that has to be decided by partners.

Furthermore, this study showed a positive association between couple's discussion on family planning and contraception which was similar to studies elsewhere (140, 141). The role of men in decision making has been instrumental in traditional patrilineal societies like Ethiopia. Men

decide in almost every aspect of life including reproductive health service choices. This study revealed significant association between men's support of family planning and its current use among married women. Similar studies done in different parts of Ethiopia showed a significant association of men's involvement in the use of family planning methods (88, 106, 142).

6.3 Under-five Mortality Levels and Its Determinants

The under-five mortality incidence of 29.5 deaths per 1000 children-years of observation over the 22 years of follow-up in Butajira District was relatively low compared to the national and regional estimates for the period of 2000-2011 (7-9). Results should rather be cautiously compared since they have been differently measured (the denominator of the rate in this study was under five children-years of observation while in the case of the EDHS the denominator is annual births) and refer to distinct durations. In fact, the infant mortality incidence rate of 86.6 children deaths per 1000 infant-years of observation was comparable to the national and regional level of infant mortality documented in the 2005 EDHS. The child mortality incidence rate of 19.2 deaths of children between the ages of 1-4 years per 1000 children-years of observation was even much lower. This could be attributed to a number of factors including the fact that first-born children in the study community are usually sent to grandparents for weaning from breastfeeding when their mothers become pregnant. In such a situation, child death may not be recorded by the demographic surveillance system as the incident happens outside the DSA. Some might go unrecognized as incidents take place while the children are temporarily away from their parent's home. Thus, the underestimation of early child mortality could be related to the under enumeration of both birth and death by the demographic surveillance system which, in fact, was the data source for this study. Besides, child mortality is almost always lower compared to infant

mortality when immunization and sanitation coverage are low in a community. The fact that infant mortality was higher than childhood mortality in the study district was acceptable since this has been the case in other studies in the country because of the low facility-based delivery and skilled attendance at delivery (7-9). Some of the declines in early childhood mortality could still be related to programmatic achievements due to the HEP and the implementation of the national reproductive strategy (13).

The antenatal care coverage and other maternal and child health services have also been unacceptably low until the wider implementation of Health Extension Program (HEP) by village-based community health workers initiated in 2003 (49). Such services have, however, been significantly scaled up and the uptake was remarkably increasing in recent years.

Infant mortality was higher among male children, lowlanders, Christians of non-Orthodox denominations, families owning their houses, those drinking unprotected potable water, and families living in houses roofed with thatched grass compared to their counterparts. On the other hand, as distance of households from the zonal hospital in Butajira increased, infant mortality has also increased in the study district. The relatively higher level of infant mortality could be attributed to the fact that the high prevalence of infectious diseases in the area such as malaria might have claimed the lives of children under the age of 12 months as is the case in other lowland areas in the sub-continent (143). It could also be related to the low vaccination coverage, especially before the initiation of the HEP, as seen in other studies (49, 144, 145). Besides, some traditional practices might have raised infant mortality (146). Infant mortality has been higher among male children in other communities as well which was in line with the finding of this study (147-149). Most of the Christians of non-Orthodox denominations come from nearby highland districts in search of employment and to form their own families in the cash crop

(pepper) growing lowland of Butajira which might have contributed to the death of infants from infectious diseases endemic in the area (6). Besides, it has been observed in some areas of the country that some of the "other Christians" prefer to pray for the health of sick children instead of taking them to health facilities for care. This of course warrants further studies to establish the reasons for high early childhood mortality rate among these religious groups of the population in the study area. Moreover, in-migrants did not have important assets such as arable land and oxen that made them rely on employment on the farms of the well-to-do indigenous households. The income they got from such employment might be very low to give appropriate care for the health of their children.

It has been relatively easy to construct houses for rural families though the supply and demand gap was wide in urban Ethiopia (150). The standards of most houses in the country has been so poor where most of them did not have separate kitchen, toilets and enough rooms to accommodate the large family size to minimize the effects of overcrowding (151). Similar studies showed infant mortality was higher in households living in low quality houses (152). As the distance of households from the zonal hospital increased the level of infant mortality increased. Associated costs such as transportation, food, lodging and other expenses for the caring family member accompanying infants who required health care would increase as the distance of households from the hospital increased. Besides, as the distance increased immunization coverage for infants would be relatively low as shown in other studies (153). Low coverage of child immunization would thus increase the level of infant mortality.

On the other hand, child mortality was higher among female children, lowlanders, Christians of other denominations than Orthodox Christianity, households owning their houses, those who got it free of pay, families that drink unprotected water, those located between 5-9 kms from the

zonal hospital, and families with thatched grass roofing. The sex differential of early childhood mortality was reversed when children grew from infancy to the ages of 1-4 years though it was difficult to explain the reversal in full detail. However, it might be partially attributed to child sex preference of predominantly Muslim communities in the district which favors males. The care rendered by families to their female children might be low compared to that given to male children in such communities (154). Houses owned and those secured from relatives free of pay could be of low quality in rural communities in Ethiopia which could be associated with high childhood mortality due to overcrowding and compromised household hygiene. Most rural households in the study district owned houses which had low standard (151). It was not unusual for rural families to give their houses rent-free to poor relatives. Urban households did also give houses which were still under construction to others to work as security guards. On the other hand, children have been bottle fed since very early in their lives in the study area. Unprotected water was used in making homemade solution foods for children. This might have exacerbated the poor food hygiene of children between the ages of 1-4 years and this claimed the lives of their peers as documented in this study. Children living 5-9 kilometers away from the zonal hospital in Butajira had more child mortality as compared to those located in the distance of 5 kilometers or 10 and above. The fact that children staying far away from the zonal hospital had relatively lower child mortality than those stayed between 5-9 kilometers could be related to the reality that households living very far away might have sought health care from other nearby facilities. Houses with conical roofs covered with thatched grass were blamed for indoor air pollution that enhanced child mortality in the study district similar to the finding of this study (151, 155, 156).

The magnitude of under-five mortality was higher among female children, lowlanders, non-Orthodox Christians, households who did not have their own houses but lived in rented ones, those who drank unprotected water, families located between 5-9 kilometers, and those who lived in houses roofed with thatched grass. Besides the risks of under-five mortality were higher among male children compared to females. The likelihood of under-five mortality was higher among Muslims and non-Orthodox Christians compared to Orthodox followers when other variables were included in the Poisson regression model. This could be attributed to the fact that Orthodox Christians in the study area live in urban areas which could increase child survival due to better access to health care services and education. In the same line, the odds of under-five mortality were higher in rural areas compared to the urban; the risk was even higher among children living in the rural arid lowland areas, where there have been epidemics of infectious diseases such as diarrhea and malaria (6). The likelihood of childhood mortality was higher among households who had oxen as compared to those who did not have them. This could also be attributed to the difference in hygiene between households whose livelihood depends on agriculture and others (157). Farm animals stay in house even in day light in the study area. Hays and other foods would be brought to them. Their feces and urine won't be cleaned immediately. Thus, the volume of ammonia in the house will be high which would expose children to upper respiratory tract infection. These animals might also harm children when their busy mothers could have been temporarily away involved in domestic chores. Rural agricultural households in the study area shared a room with animals which gave opportunities for the transmission of zonotic diseases. Besides, they also used dried animal dung for cooking food with no separate kitchen. In such contexts, studies showed high prevalence of acute respiratory infection due to indoor air pollution in the study area (155, 156). The odds of under-five mortality were also

higher among families who had their own houses and those who lived in rented houses compared to those who resided in rent-free houses offered by relatives. This could also be related to the fact that people in rent-free houses might live in single room houses where they cannot keep animals or might be in-school youth well informed about child health. Meanwhile, if couples did not have a house on which they had more control, they would most likely have fewer children which could be manageable to maintain their health. Studies showed higher level of early childhood mortality with couples having relatively many children (22, 37, 75). Though the crude odds of early childhood mortality were higher among households who use unprotected water compared to the ones drinking protected water, the direction of association was reversed and turned out to be statistically non-significant when other background characteristics were included in the model. It is difficult to explain why this happens. Other studies, however, showed higher odds of childhood mortality in households using unprotected water compared to those drinking from a protected source (157). On the other hand, the odds of early childhood mortality were higher among households living in houses roofed with thatched grass even after other background characteristics were controlled. The conical shaped roofs made of thatched grass in Ethiopia could contain many hazardous substances that would affect child health significantly. Similar studies in the area showed higher prevalence of acute respiratory infection which claimed the lives of children under-five years of age (155, 156). The odds of early childhood mortality increased as the distance of households from the zonal hospital increased except that it declined when the distance was 10 or more kilometers away from the zonal hospital. Child immunization, antenatal care (ANC), and health education messages would increase when households are located within few kilometers from hospitals. Associated costs such as transportation, room rent and food expenses in the town at which hospitals are located would be minimized or even

become non-existent. This study showed statistically non-significant effect of distance from hospital on child mortality particularly when distance was 10 or more kilometers. This finding considers situations of distance taken from Butajira zonal hospital only. However, households might have sought child health care services from other hospitals than the Butajira zonal hospital if that is relatively far from them compared to other hospitals elsewhere in the nearby districts. These hospitals may also render additional child health care services.

6.4 Levels and Determinants of Out-migration

The rate of out-migration was higher among the youth in the age group of 15-29 years and this could be attributed to the search for better educational and employment opportunities. Besides, marital arrangements elsewhere have been higher in the same age group. At least one of the couples should customarily leave their family homes when they got married. The exceptionally high rate of out-migration among teenagers in this community might be attributed to the influence of peers living in urban areas, often working as shoe shiners, petty traders and taxi conductors. They might pull their relatives and friends towards their destination in urban areas during annual visits to their parents at times of festivals such as 'Meskel' or 'Arepha' (158). Males had a higher chance of out-migration from Butajira than females as they could more easily get such jobs in urban centers.

Out-migration was higher among the educated in this study. A similar study in five major regions of Ethiopia indicated that educated out-migrants had better living conditions at the place of destination. This possibly stimulated the increased rate of out-migration among the group (96). The educated may detach themselves from simple social, cultural and environmental barriers in local areas and be more receptive towards positive external influences. In addition to this,

educated migrants have the necessary skills and experience to make a valid decision as to when and where to move by assessing the pros and cons of pull and push factors (105). The urban destinations where there are better life opportunities could be more receptive to them owing to their experiences. Even if they succeed, the non-educated ones may be making local or short distance moves which could not be correctly measured in this study since temporary short distance moves by residents were customary in the study community.

People who were not currently married were also more likely to move out since they had no social obligations or economic responsibilities forcing them to stay in their birth places. Marriage increases social responsibility and familial ties and deters the risk of out-migration. On the other hand, one or both partners are likely to leave the area of residence during marital dissolution. This study showed higher risk of out-migration among never married group which could be due to arrangement of marriage in a different area or dissolution forcing one of the parties to leave the area. Employment or education opportunities elsewhere could also facilitate out-migration. Moreover, the second higher risk of out-migration among people who dissolved their union was in agreement with a study done in the Netherlands that showed an increased rate of out-migration for one partner of a couple when dissolution happened (159). Another study done in Russia indicated that couples who often travelled over long distances had significantly higher rate of union dissolution than couples who did not move or moved only once (160). Thus, marital dissolution might be both the determinant and consequence of migration. Similar studies revealed migration as age, sex and education selective (26, 96, 97, 105, 158, 161-166). The youth, males and educated were more likely to move out of their usual place of residence (3).

Muslims outnumber Christians in the study area. The higher risk of out-migration among minority religious groups in the area might be because of the fears over tensions between Christians and Muslims in South-Western Ethiopia, which is adjacent to the study area. Moreover, out-migration rate was high among people from religious and ethnic minority groups in sub-Saharan Africa. Responsible factors were the search for better security and attraction by relatives and community groups living in the destination areas (166).

There was statistically significant difference in the risk of out-migration between rural highlanders and urbanites even after confounding factors were controlled. After allowing for other factors, there were no significant differences observed in the risk of out-migration between highlanders and lowlanders. However, it has to be recognised that the Butajira DSS sample population consisted of 10 non-contiguous neighbourhoods within the district, and so out-migration in some cases might have involved moving from an enumerated area into an adjacent non-enumerated one. Urbanites had better access to media, education and knowledge of opportunities elsewhere which could trigger more out-migration. They could also easily exploit new work opportunities which claimed movement from their neighbourhood by virtue of their physical access.

Rural inequality can influence behaviour and trends in migration(167). Property ownership could deter African families from migration, at least for economic reasons. Accordingly, ownership of ploughing oxen is considered to be detrimental to the economic growth of rural households in Ethiopia as subsistence farming is the major livelihood. This study indicated that people residing in households without oxen out-migrated slightly less than those with oxen though it was

marginally significant when other factors were controlled. This was similar to a study done in Botswana which showed more out-migrations from households owning cattle (30). This might be attributed to the fact that rural affluent households might be more prone to out-migration since they could have easily covered their transportation and other migration related expenses until they settle well in the destination area. Besides, they might have another out-migrated family member who had settled elsewhere and could facilitate the out-migration of the remaining family members.

Residential house is another important asset for most Ethiopians. It is relatively easy for rural households to own their house, whereas the poor in urban areas often live in a house rented from the local administration. Individuals living in rented houses had higher risk of out-migration compared to those living in their own houses. Moreover, members of households that lived in a house obtained free of rent from relatives showed even more risk of out-migration probably because they were given the house as they were too poor to pay rent. If people did not have easy access to have an asset such as a house in rural Ethiopia, they could not cope living in the area and would be more prone to the risk of out-migration.

6.5 The Relationship between the Three Components of Population Change

This study showed an association of child mortality with the fertility of women in Butajira District. The study had particularly shown statistically significant effect of child mortality on fertility and vice versa. This association could be related to fertility response of couples to perceived childhood mortality level in the area as documented in several studies in least developing countries (22, 23, 34, 36, 37, 83, 85). Couples in high mortality settings anticipate more risks of death of their children and decide to have many children to replace the lost ones which would increase fertility. Parents with experience of child death would also adjust their subsequent reproductive preferences and behavior to replace the lost ones. The replacement effect of child mortality on fertility has a biological component which is related to the fact that death of breastfeeding infants truncates lactational amenorrhea. It has also a volitional component that arises from parental decisions to have additional child to replace the lost one.

On the other hand, high fertility exposes children to compete for household resources. In such a situation, children might not get appropriate diets that might keep them healthy. Child malnutrition could be relatively higher in families with many children in communities like the study area where there have been frequent episodes of drought and famine (6). The immune systems of malnourished children from high fertility households might have been compromised. In such a setting, children might be exposed to more episodes of infection that may lead to relatively higher early childhood mortality. Families might also have difficulties to seek health care services for their malnourished and ailing children due to lack of awareness and economic and physical access. Delayed or absence of appropriate health care for very young children might have increased childhood mortality in the study area. There might also be problems of lack of hygiene and overcrowding since children did not have access to quality houses and facilities such

as protected water, improved toilets and baths, and the like. In high fertility households children caring for children might be one of the reasons for the high injury related deaths and infections from diarrhea because of absence of awareness by children caring for their younger siblings. Mothers with high fertility might have suffered from diseases related to frequent pregnancies or even died of maternal causes that could compromise the care rendered to their little children leading in turn to high rate of early childhood mortality.

In-migration status was not significantly associated with fertility in Butajira District. The impact of migration status on fertility was not statistically significant, neither was the impact of fertility on migration status in the study district. Three main hypotheses are of particular interest in the relationship between migration and fertility which include selection, disruption and adaptation (38). Migrants might delay having children in which case they would have lower fertility at both place of origin and destination. They would have lower fertility before and after the move than those who stayed in rural areas. Migration out of place of origin might inflate fertility in the place of origin. Disruption suggests that migrant's fertility is interrupted and postponed due to separation. Adaptation theory explains that migrants change their behavior to fit to their new destination environments and that new social networks will give them new ideas about fertility and family size. However, migrants to the DSA in Butajira come from neighboring districts and have similar background characteristics. As a result, there might not be any significant difference. There was no difference in fertility behavior between residents and migrants in the place of origin. Thus, we cannot claim theory of selection to operate in the study district. Neither is the theory of disruption applied since people in the area move out from the place of origin before they get married. The theory of adaptation is also less probable to influence migration and

fertility relationships because fertility level at the destination area was still higher and this could not affect the fertility behavior of migrants in the destination area of the study district.

The impact of fertility on migration status was also statistically not significant in the study district. This could also be related to the fact that only younger and unmarried people have been more likely to move out from their place of usual residence. Relatively older people with more children were less likely to move out from the study area.

The association between child mortality and migration status was not statistically significant in the study area. Neither the impact of early childhood mortality on migration nor the effect of migration on under-five mortality was statistically significant in the study district. Theories explaining the relation between under-five mortality and migration in sub-Saharan Africa relate to disruption, selection or environmental perspectives (39). Disruption explains that migration disrupts jobs and reduces family income thereby compromising households' capacity to give appropriate care for their children. This negatively impacts on the survival of children. On the other hand, disruption might also give more time for mothers to share their time with their young children. This, on the other hand, could enhance child survival. Selection theory states that migrants were more educated, employed in better paying jobs, and were wealthier and younger compared to non-migrants. Studies indicated child mortality was lower among educated, employed, wealthier and younger couples (152). The environmental approach explains that migrants will learn child health protective behaviors at the destination area through social interaction and increased exposure to new ideas which might lead to changes in attitudes, life style, and motivations.

7. Validity and Generalisability

It has been customary to evaluate the validity and generalisability in any research process. As indicated earlier, triangulation of methods and data sources were used to ensure validity in this study. Both qualitative and quantitative data collection techniques had been used. The priori focus group discussion solicited information on the concerns of the community related to the study objectives. Besides, quantitative data collection instruments were refined based on the findings of the qualitative study. Quantitative data collection instruments of the longitudinal data were standard tools used by demographic surveillance systems which are members of the INDEPTH-Network (115, 168). The tools have been standardized by the Network. Data collection guideline was drafted by the Network and shared by all member research centers including, the BRHP. This guideline has a special section on definition of main concepts used in the demographic surveillance system. The tool was adapted to the Butajira and Ethiopian context. Data collection instruments of the Butajira DSS have been used since 1987 and the community is well versed with terminologies and concepts in data collection instruments. On the other hand, the data collection instrument for the cross-sectional study was adapted from the Demographic and Health Survey which has been carried out in least developing countries of the World since 1980s. Such a survey has been undertaken in three rounds in Ethiopia (2000, 2005 and 2011) (7-9). Survey instruments were adapted to the local context. Thus, it was easier to adapt study instruments for this study. Appropriate statistical models and test statistics as recommended by researchers doing similar studies in the country and elsewhere were used. Large and comparable sample sizes were used for both the cross-sectional and longitudinal surveys. The field staff involved in either of the studies was experienced data collectors and supervisors that have been given appropriate trainings for the purpose. The data collection team

for the longitudinal survey had been given refresher training once per annum, while those involved in the cross-sectional survey were clinical nurses trained for five days. Intensive supervision had been put in place in both cases. The practice of such intensive supervision procedures improves the measurement of each study variable. In the absence of vital registration system in developing countries such as Ethiopia, accurate estimation of variables such as age is only possible in the context of demographic surveillance systems. Besides, the longitudinal data source has been periodically updated individual and household characteristics of residents using periodic censuses with a different team of field staff which had better expertise. Inputs from add-on studies in the surveillance system were also used to rectify some of the inconsistencies.

The findings of this study can be generalized at the district level since the ten surveillance villages were selected based on sampling proportionate to size technique from the 86 villages delineated under Meskan and Mareko District of the Guraghe Zone in Southern Nations, Nationalities and People's Region and to areas with similar socio economic status outside of the study area (115). Both quantitative studies had covered the entire eligible study participants, except for the cross-sectional survey that dropped to about 90% for the reasons mentioned above. On the other hand, previous studies in the area showed that a certain degree of generalizability can be made for certain attributes in the population such as childhood mortality (169). This could be attributed to the fact that the study area covers a wide range of ecological and environmental zones including, lowland, midland and highland areas as is the case for the entire country. In addition, participants from urban and rural areas were included. Above all, no intervention that could bring about significant change in the behaviors and practices of the surveillance population had been put in place in the area. The wider Ethiopian population did not undergo any surge in cultural, social and economic development that might lead to the formation of certain pocket

communities with different socio-cultural behaviors making generalization to the national level difficult.

8. Strengths and Limitations

The main strengths of this study are the use of triangulation of designs, data collection methods, statistical models, test statistics and data sources. Qualitative and quantitative research methods were used although the qualitative method was mainly used to refine study instruments for the quantitative study. Magnitudes and determinants of the three components of population change were measured by using complementary longitudinal and cross-sectional study designs. Appropriate statistical models were used after studying the characteristics of each outcome variable. The fulfillment of assumptions of the models used in the study was checked.

Standard and validated instruments were used. The field staff understood the local culture and values. The community knew and respected them. Periodical refresher trainings were given for the field staff involved in the longitudinal data collection while those who collected the cross-sectional data were professionals who have basic skills in clinical care and community based service provision. Intensive supervision, rigorous data editing and cleaning mechanisms were instituted.

The study was conducted in the demographic surveillance area which can be cited as both strength and limitation of the study. It is strength since the community has known the research team for quite some time now. This helped to create a favorable rapport that is necessary to establish trust between the research team and the community under surveillance. On the other hand, it could be a limitation as there might be a possibility of respondent fatigue due to the extended presence of the research in the area. Though participants might have been willing to give responses, they might have produced faulty information since they knew the questions and their possible answers due to their extended encounter. The cross-sectional study was conducted at the peak of the harvesting season due to resource limitation which might have contributed to

the relatively high non-response rate. The high non-response rate might partly be related to the quality of the surveillance database. It is not unusual to see some discrepancies between the realities in the field and those captured by the database in surveillances which have been functional for many decades. The involvement of clinical nurses as data collectors could also be cited as a limitation because of possible introduction of professional bias in the research process. However, one of the issues emphasized during the training was helping data collectors minimize their bias as a health care provider when collecting the cross-sectional data. In fact, clinical nurses involved in the data collection were not practicing clinical and nursing care when they were recruited for this work.

9. Conclusions

Fertility was still high in the study community with high rural urban disparity. Women of parity 4 had about 79% chance to have their fifth parity in the study area that indicated the deep rooted culture of large family size. The most effective proximate determinant to deduct fertility from its biological maximum level was non-marriage mainly due to disruption of marriage through migration of one of the partners. The contribution of contraception and non-marriage was also important among urbanites and educated women. Postpartum infecundability because of relatively longer duration of breastfeeding in the community significantly reduced fertility from its biological maximum though its contribution was not as desirable as shown in other studies in the country. Abortion had also played an important role in reducing fertility among in-school youth. Among the distal determinants of fertility, delayed marriage, higher education, smaller family size, absence of child death in the family, and living in food-secured households were significantly associated with small number of children. Besides, fertility was significantly higher among women with no child sex preference. However, migration status of women was not statistically significant.

The contraceptive prevalence rate in Butajira District was still low, though unmet need was very high. Barrier to contraception in the area included, stock out and absence of preferred family planning methods, religion, complaints related to providers and methods, assumption of having proper diet, and optimum workload when using family planning methods. Significant predictors of contraception in the district included urban residence, women's and their partners' educational status, child death experience, couple's discussion on contraception, and partners' support.

The magnitude of under five mortality level in the district recorded over the 22 years of surveillance, though low compared to the national and regional level, which were measured in a different approach, was still high. Although its current size is still high a series of studies on under five mortality indicated that Millennium Development Goal four can be achieved in the study area since it declined by three quarter between 1990 and now. Infant mortality was higher than child mortality in the district. Detailed analysis revealed that under-five mortality was significantly higher among male children, families confessing Muslim and non-Orthodox Christian denominations, rural residents, families owning oxen, those having their own houses, families living in rent-free houses, households with roofs of thatched grass, and families living in neighborhoods located between 5-9 kilometers from the zonal hospital as compared with their counterparts.

A high incidence of out-migration was observed in the district. Risk of out-migration was higher among males, teenagers, the youth, primary and secondary education or above completes, those not in marital unions, Christians, urbanites, and families in rented and owed houses compared to those in owned ones.

Furthermore, this study showed relationship between the three components of population change. It showed statistically significant association between under five mortality and fertility. Migration status affected under five mortality and fertility. However, the association between fertility and migration was not statistically significant. There was also no statistically significant association observed between under five mortality and migration in the study area.

10. Recommendations

The public should be intensively informed about the ills of fast population growth and its consequences. Federal and regional parliamentarians and district council members must educate their constituencies about the low family size norm and must introduce a mechanism by which they can evaluate their achievements in consultation with local implementers. Women in the study community should also be encouraged to sustain the good practice of extended breastfeeding. Moreover, longer years of women's education (preferably beyond primary level) should be scaled up to postpone childbirth to later ages and ultimately reduce fertility and childhood mortality. Efforts should also be exerted to increase contraception in rural communities and among school youth to reduce fertility and child mortality in the community. Besides, in-school students should be made aware on post abortion complications and youth-friendly family planning methods to reduce fertility, maternal mortality, childhood mortality and abortion among the youth in the community.

Health systems at various levels in Butajira District and the capacity of their leaders in family planning logistics system, and child and maternal health should be strengthened. The Government should also avail family planning methods with appropriate method mix, increase competence of providers, and create awareness on various methods and their temporary side effects. The local government might use the one in five structuring designed for development activities to introduce low family size norm at community level. Emphasis should also be given to rural communities and actively engage the HEWs in enhancing community-based service.

Intensive and rigorous child and maternal health education messages should be channeled through village-based health extension workers with more focus on rural communities.

Household hygiene has also to be given more emphasis. The Government should strive to increase facility-based delivery, antenatal care coverage and immunization in the district and beyond to increase child survival. Efforts should also be scaled up to improve the quality of residential houses with more attention to rural communities. An insurance scheme to care for the elderly should be put in place to bring about change in the behavior of families towards small family size norm. The health sector and partners should work towards further reduction of child mortality that could be perceived by families as a means of introducing low family size norm.

The high rates of out-migration among young adults and educated could have undesirable social significance if the trend continues. The development and economic progress of relatively rural areas such as Butajira District is unlikely to advance quickly if significant proportions of these key demographic groups leave for other areas. We suggest that local authorities need to consider strategies for retaining those people in their own areas to safeguard the future well-being of the entire population. Initiatives to facilitate local employment and housing opportunities for younger people would be vital in this context.

Researchers are advised to conduct detailed qualitative study to have an indepth understanding of the cultural norms and attitudes towards large family size in the study district and beyond. Fertility, migration and under five mortality trends analysis might have also help to understand the causes and consequences of population change. Targeted advocacy by researchers on ills of rapid population growth should be made to federal and regional parliamentarians, district council members and religious and community leaders through mass media and community conferences.

11. Acknowledgements

I would like to thank my advisor, Dr. Alemayehu Worku, for his thought provoking comments and guidance from the inception to the completion of the thesis. The School of Public Health/AAU, my home Institute, deserves acknowledgements for giving me this training and facilitating various short term trainings which helped me a lot to finalize this thesis. My heartfelt gratitude should also go to all instructors and PhD students at the School of Public Health who have been instrumental in sharpening my thoughts and understanding during the various seminars held at the School. I am very grateful to Prof. Ahmed Ali, who has been unreservedly sharing his wide experience in research and for his valuable comments on one of my articles and this thesis. Special thanks go to my wife, Tutu Tilahun, who shouldered the family management during my study. She also entered the cross-sectional data into the computer and that gave me the opportunity to closely monitor the quality of data entry. I had terribly missed my sweet children Mistre and Kaleab Wubegzier during my stay abroad in relation to this study. My heart was broken when I could not be with them most of the time because of the engaging behavior of the work. I thank my father, Aba Mekonnen Ayele and my mother Emahoy Alem Bizuneh for their upbringing and shaping me the way I am today. May God rest the soul of my beloved father in the Heavens. Father and mother, I always love you.

SIDA/SAREC and Gates Institute should be acknowledged for financially supporting the longitudinal and cross-sectional studies respectively used for the thesis work. My heartfelt gratitude should also goes to the study participants in Butajira who had consistently shared their valuable times in the last two decades. The field staff, data entry clerks and researchers who have maintained the longitudinal data and participated in the cross-sectional data and focus group discussion deserve special thanks. Last but not least, glory to Jesus Christ and His virgin mother!

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Annex: Published and submitted Articles

Mekonnen and Worku *BMC Public Health* 2011, 11:782
http://www.biomedcentral.com/1471-2458/11/782

Article I

BMC Public Health

RESEARCH ARTICLE Open Access

Determinants of fertility in rural Ethiopia: the case of Butajira Demographic Surveillance System (DSS)

Wubegzier Mekonnen* and Alemayehu Worku

Abstract

Background: Fertility is high in rural Ethiopia. Women in the reproductive age group differed in various characteristics including access to food and encounter to drought which requisite the assessment of determinants of fertility.

Methods: Reproductive age women were recruited from a DSS, the Butajira DSS database. A DHS maternity history questionnaire was administered on 9996 participants. Data quality was assured besides ethical clearance. Poisson regression crude and adjusted Incidence Rate Ratio with 95 Confidence Interval were used to identify determinants of fertility.

Results: Delayed marriage, higher education, smaller family, absence of child death experience and living in food-secured households were associated with small number of children. Fertility was significantly higher among women with no child sex preference. However, migration status of women was not statistically significant.

Conclusions: Policy makers should focus on hoisting women secondary school enrollment and age at first marriage. The community should also be made aware on the negative impact of fertility on household economy, environmental degradation and the country's socio-economic development at large.

Background

The three components of population change (i.e., fertility, mortality and migration) have consequences on one another and the overall size and/or structure. In countries at the second stage of demographic transition, mortality reduction is followed by fertility decline [1]. However, drop in fertility is not yet witnessed in the general population of sub-Saharan Africa although it has been observed in some metropolitan areas and selected communities in the sub continent [2-4]. Ethiopia has never been unique in this regard as there were only half a child cut off between 2000 and 2005 from a total fertility rate of 5.9 to 5.4 children per woman [5,6]. Fertility is higher in rural compared to urban areas in the country. Nevertheless, below replacement level fertility of 1.9 children per woman was observed in Addis Ababa. The total fertility rate was however over 6 children per woman in rural Ethiopia. Moreover, there are regional disparities in fertility in the country. Southern Nations Nationalities and Peoples region (SNNPR), where this study was conducted, has one of the highest total fertility rates of 5.6 children per woman in 2005 [6].

Regardless, no detailed study on fertility that had policy implication in the context of current decentralization for such high fertility regions was recently done in Ethiopia. Various individual and household background characteristics of women influenced the level of fertility which required systematic assessment. The study area is also located in one of the densely populated and resource constrained parts of the country. Frequent food shortages, land degradation and population pressure lead residents to migrate and face high mortality of children under the age of five years [7-9]. This also gives an additional impetus to assess the effects of migration and childhood mortality on fertility in the study area. Therefore, the main purposes of this study are to assess determinants of fertility in rural Ethiopia, characterized by high child mortality and mobility resulting from

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population pressure, frequent episodes of drought and pestilence.

Methods

This study was conducted in Butajira demographic surveillance system (DSS) started with 10 villages (9 rural and 1 urban) sampled according to probability proportional to size technique from 82 rural and 4 urban villages [10]. Butajira DSS is located in Guraghe zone of Southern Nations, Nationalities and People region (SNNPR) of Ethiopia. Residents of the study region varied in type of residential ecology, social, cultural, environmental, reproductive health and economic characteristics [11].

Active resident women in the reproductive age group recruited from the Butajira DSS database were interviewed during October-December 2009. The number of women in the reproductive age group living in the Butajira Demographic Surveillance Area (DSA) at the time of the survey was 11,133. A structured Demographic and Health Survey (DHS) type maternity history questionnaire was developed in English and translated into the local language of the respondents, and then back translated to English by an independent person. The questionnaire has been pilot tested in a different area prior to this study. Twenty clinical nurses and 5 supervisors all with a Bachelor degrees were recruited as data collectors and supervisors, respectively. Clinical nurses were recruited because advice on family planning use was part of the ethical consideration. Various data quality assurance mechanisms including using a standard data collection tool, recruitment of qualified female field staffs, intensive supervision, and mechanisms to minimize information contamination were put in place. Professional bias was over emphasized during the training prior to data collection to minimize it.

Data were entered into a template prepared on EPI INFO software with the CHECK program to manage internal consistency. Data were cleaned by reconciling inconsistencies. The cleaned data were exported to STATA version 11 for analysis. Total fertility rate (TFR), mean children ever born and Parity Progression Ratio (PPR) were computed. Moreover, Poisson regression [12,13] Incidence Rate Ratio (IRR) with 95 percent confidence interval (CI) was used to assess the association of various maternal and household characteristics with fertility. We checked that all assumptions of Poisson regression were fulfilled. Total children ever born to women in the reproductive age group which is a count data is considered as the outcome variable for this study. The overall significance of each covariate was first checked and those turned statistically significant were included in the bi-variate and multivariate Poisson regression model to compute crude and adjusted IRR. The reference category for each of the factors included in the model was selected based on a prior knowledge that women in this category had smaller fertility compared to the rest of the categories except for the case of household livelihood.

Ethical clearance was obtained from the Research and Ethics Committee of the School of Public Health; and Institutional Review Board of the College of Health Sciences of Addis Ababa University. Support letters were obtained from the districts, in which the study was conducted, through the Butajira DSS which hosted the study. Oral consent was also obtained from each study participant.

Results

Though the overall size of women in reproductive age group in the Butajira DSA was 11133, we interviewed 9996 which resulted in a response rate of about 90%. The mean age of first marriage of study participants was estimated to be 16.9 years (SD = 2.4) with more than 80% of them married when they were aged between 15-19 years. Nearly half of the women had no formal education as shown in Table 1. Study participants were fairly distributed in different residential ecological zones. Having large household size appears to be an accepted norm as nearly 59 percent of study participants were living in households that had more than four family members. The average household size was around 5.2 persons (SD = 2.2). More than 65 percent of women in this study belonged to households whose main livelihood was farming. Sixty five percent of the study participants were born within surveillance villages. About 28 percent of the study participants lived in food-insecure households. About 43 percent of the interviewed women had incidence of child death. The majority (63.4%) of women knew when in the menstrual cycle pregnancy could occur if they had sex. Sixty two percent of women did not have sex preference for their children.

The mean children ever born to women in the reproductive age group was found to be 4.5 children (SD = 2.6) whereas the average number of children born to those in the age group (45-49 years) was 7.6 children. On the other hand, total fertility rate (TFR) was estimated to be 5.3 children and the total marital fertility rate was higher with 7.8 children per married woman. The age specific fertility rate revealed a typical developing country pattern (shown elsewhere). The parity progression ratio, the conditional probability of having the next parity given that the women had already a certain parity level, revealed that women of parity four had 79.1 percent chance of having the 5th children (see Figure 1).

Analysis of determinants of fertility using Poisson regression Incidence Rate Ratio with 95 percent

Table 1 The distribution of study participants by various characteristics in Butajira, 2009

Characteristics	Number	Percent
Age at first Marriage	6289	100.0
20 and over	838	13.3
15-19	5069	80.6
Less than 15	382	6.1
Mean (SD)	16.9 (2.4)	
Educational status	9996	100.0
Secondary plus	1172	11.7
Primary	3906	39.1
Never	4918	49.2
Residential Ecology	9996	100.0
Urban	3593	35.9
Rural Lowland	2999	30.0
Rural highland	3404	34.1
Household size	9995	100.0
Small (less or equal to 4)	4065	40.7
Large (greater than 4)	5930	59.3
Mean (SD)	5.2 (2.2)	
Household livelihood	9996	100.0
Farming	6503	65.1
Trade/Service	1606	16.1
Civil service	463	4.6
Other	1424	14.3
Food shortage	9994	100
No	7185	71.9
Yes	2809	28.1
Migration status	9994	100.0
In migrant	3496	35.0
Study site	6498	65.0
Have a dead child	5929	100.0
No	3358	56.6
Yes	2571	43.4
Know pregnancy time	9994	100.0
Yes	2548	63.6
No	1459	36.4
Have child sex preference	9994	100.0
Yes	3798	38.0
No	6196	62.0

confidence interval showed that age at first marriage as a significant predictor of fertility even after including other variables in the model (Table 2). Fertility was 1.38 times higher among women married in their teens compared to those married after they celebrated their 20th birthday. Educational status of women had also been consistently and significantly found to be negatively associated with fertility. Women who had never been into any formal education had 1.24 times more children compared to those who completed secondary and above level of education.

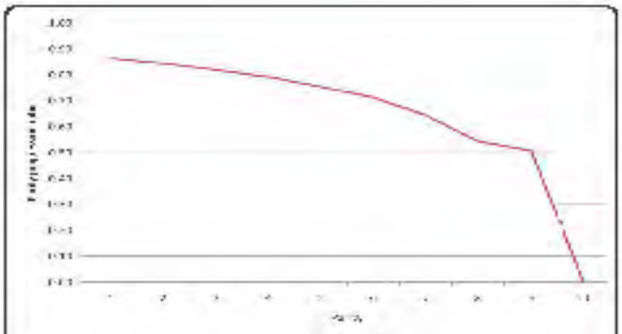

Figure 1 Parity Progression Ratio for Women in Butajira, 2009

Residential ecology composed of altitude and residence type in this study. The DSA comprised of lowland (below 1800 m), midland (188-2000 m) and highland (more than 2000 meters above sea level). Rural areas covered lowland and highland areas while Butajira fall in midland area. Residential ecology was significantly associated with fertility although the direction of association was changed when other covariates were included. Women resided in lowland rural Butajira had 1.3 times more children compared to those lived in the urban area. However, when other factors are included, women who lived in lowland rural Butajira had 12 percent lower fertility compared to urbanites. No fertility difference was observed between urban and highland rural Butajira when other factors were included. On the other hand, women who were members of a larger household (five plus) had about 2 times higher fertility compared to those who belonged to smaller households after other factors were added into the model.

Fertility among women whose households' main source of income was trade or service had 14 percent lower fertility compared to their counterparts whose household livelihood was farming after other factors were put into the model. On the other hand, women belonged to families whose household income was from the civil service had lower fertility compared to those earning their household income from farming although the statistical significance vanished when we control for other important variables. Meanwhile, the study was conducted in a drought prone area [7]. Women who were members of a food-insecure household had 6 percent higher fertility as compared to their counterparts in food secure households. The fertility of in-migrant women to the demographic surveillance area was lower than those who were born in the DSA although the association was statistically not significant when the effect of other vital variables were controlled. Women

Table 2 Crude and Adjusted Incidence Risk Ratio of the Associations between maternal characteristics with Fertility in Butajira, 2009

Characteristics	Crude IRR (95%CI)	Adjusted IRR (95% CI)
Age at first Marriage		
20 and over	1.00	1.00
15-19	1.33 (1.27, 1.39)	1.11 (1.01, 1.20)*
Less than 15	1.83(1.75, 1.91)	1.38 (1.27, 1.49)*
Educational status		
Secondary plus	1.00	1.00
Primary	1.34 (1.24, 1.44)*	1.14 (1.02, 1.27)*
Never	1.83 (1.70, 1.97)*	1.24 (1.10, 1.39)*
Ecology		
Urban	1.00	1.00
Rural Lowland	1.29 (1.25, 1.33)*	0.88 (0.79, 0.98)*
Rural highland	1.33 (1.29, 1.38)*	0.92 (0.83, 1.03)
Household size		
Small (less or equal to 4)	1.00	1.00
Large (greater than 4)	2.08 (2.03, 2.15)*	1.95 (1.84, 2.06)*
Household livelihood		
Farming	1.00	1.00
Trade/Service	0.79 (0.77, 0.82)*	0.86 (0.78, 0.96)*
Civil service	0.66 (0.62, 0.71)*	0.96 (0.83, 1.11)
Other	0.67 (0.64, 0.71)*	0.90 (0.80, 1.01)
Food shortage		
No	1.00	1.00
Yes	1.16 (1.14, 1.19)*	1.06 (1.01, 1.13)*
Migration status		
In migrant	1.00	1.00
None-migrant	1.04 (1.02, 1.08)*	1.02 (0.97, 1.07)
Have a dead child		
No	1.00	1.00
Yes	1.90 (1.86, 1.95)*	1.67 (1.59, 1.76)*
Know correct pregnancy time		
Yes	1.00	1.00
No	1.35 (1.28, 1.41)*	1.09 (1.03, 1.15)*
Have sex preference		
Yes	1.00	1.00
No	1.14 (1.11, 1.17)*	1.09 (1.04, 1.15)*

*Statistically significant at α = 5 percent

who had lost at least one of their children had about 1.7 times more fertility compared to their counterparts who never had an experience of child death. Fertility was about 9 percent higher in women who did not know the time at which women could be pregnant if they had sex. Similarly women who had no sex preference to their children had about 9 percent higher fertility compared to those with sex preference after including other significant covariates.

Discussion

Total fertility and marital fertility rates of 5.3 and 7.8 (shown elsewhere) children per woman, respectively, obtained in this study was similar to the finding in Gondar, North West Ethiopia done in 2007 [14]. The fertility level is still one of the highest. This could be attributed to the credence of the wider community to large family size norm as children assisted households in subsistence farming and petty trade. Though disparities were observed across major regions of the world, children were considered as assets to their parents when they get older as shown in a study using the Demographic and Health Survey in 43 countries [15]. This posit was further supported by the statistically-significant finding of higher fertility among women who were members of larger households compared to those who belonged to smaller sized households (less or equal to 4 members) in this study. In this study, household constituted individuals regardless of their blood relations that live in one or more houses with the same cooking arrangement. Most members of the household were nuclear family members. The fact that women of parity 4 had more than 79 percent chance to have the 5th parity augmented the deep rooted culture of larger family size that might have been supported in the study community in the foreseeable future. Thus, the total-fertility-rate goal stipulated in the Ethiopian population policy is far from reach [16].

Women that married in their teens had a significantly higher fertility compared to those married after they celebrated their 20th birthday. Moreover, this study revealed that current contraceptive prevalence among women in the reproductive age group and married women were 15 and 25 percent, respectively (figure not shown). Besides women who marry early in life may have an increased risk of having many children, in particular, if they started childbirth before the age of 20 years. On the contrary, several studies [16,17] have shown that postponement of first childbirth to later ages leads to fertility reductions since women would have fewer years of reproduction window which may introduce parity specific controls even after the initiation of child birth.

On the other hand, women who had many years of education had significantly lower fertility as compared to those who had never been enrolled into any formal education system. This corroborates with similar studies [13,17-19] and may be attributable to the postponement of childbirth due to longer schooling. Educated women might be more worried to have many children if their area of usual residence had been stricken by frequent food shortage [7]. Nonetheless, a study among Sidamas in Southern Ethiopia indicated that fertility was higher among women with primary level of education

compared to those who never attended any formal education. Higher educational level of women gives an opportunity of social and economic empowerments. Thus, able women might feel that they could take care of many children and opted for large family size. This is consistent with the claim by some researchers that increased family income leads to increased fertility when family planning use is low [17]. Education might also have impacts to bring about change in the knowledge and attitude towards low fertility. By the same token, women who did not know the time at which they could be pregnant had higher fertility as compared to those who knew it.

Disparities in level of fertility between urban and rural communities in this study population were similar to the finding in Gondar [18] that could be attributed to differences in contraceptive prevalence and age at first marriages between urbanites and rural residents in Ethiopia since women in urban areas had better access to media, general knowledge and services. It was however difficult to document reasons for the change in the direction of associations between residence ecology type and fertility when other factors were controlled. Meanwhile, informed urbanites might have a positive attitude towards smaller family size besides having better access to family planning services. For instance the urban fertility level of 3.3 children per woman found in this study (result not shown) was similar to the level found for Awassa town which is the capital of the study region [18]. In a similar context, fertility was significantly lower among women whose major livelihoods are based on trade or services compared to those households who got their main incomes from subsistence farming. Most of the households who relied on trade or services as main source of household income could be influenced by urban culture and practice which showed a low fertility norm.

Although food security was widely misunderstood, researchers considered it as shortages in the quality and quantity of food at any time while others defined it as shortage or absence of edible food [20]. In this study, encounter to household food scarcity in the past calendar year was collected. This variable might not precisely measure the household food security which could be cited as a limitation. However, it indirectly showed the household economic status and risk to vulnerability. Fertility was significantly higher among women whose households suffered from food shortages. There could be an egg-chicken dilemma in this claim since the food shortage might be caused by the large family size which in turn could mainly be triggered by higher fertility. In a resource constrained environment such as the study area, people had to share the scarce food and could probably be exposed to shortages particularly in rainy seasons, the time at which grain foods of farming households would be depleted [21]. Fertility was also found to be lower among malnourished mothers compared to nourished ones in a similar study done for Sidamas in Southern Ethiopia [22].

An in-migrant to the DSA is a person who went there to live or stayed in it for 6 or more months if did not have such intention. No significant association has been shown between migration status of women and fertility in this study. This could be due to the fact that the duration of residence of in-migrants may not be long enough to influence fertility and reproductive health behavior in the study area as migration was categorized broadly. It may also that in-migrant women could have come from rural villages in the same or nearby districts of the country which had similar socio-cultural and behavioral characteristics. Nevertheless, a study in China had indicated that rural-urban return migrants from middle and large cities had adapted positive fertility behavior towards small family size norm compared to their rural-rural return migrant counterparts [23]. The same study had also revealed that areas with higher prevalence of rural-urban return migrants particularly from middle and mega cities would have a positive effect to adapt small family size.

Studies done on fertility responses to childhood mortality have focused on insurance and replacement effects [24]. Couples in high-mortality settings anticipate the death of some of their children that might dictate them to change their reproductive preferences and behavior. Childhood mortality could also have the combined biological and volitional replacement effects to reduce the time to subsequent conception if the death occurs within a given interval. The time to conception could also be reduced if a childhood death occurs during a prior birth interval. Accordingly, this study had revealed child mortality as a strong and significant predictor of fertility as documented for the same study population a decade ago and elsewhere [17-19]. Epidemic and frequent episodes of drought in the study community, which might have claimed the lives of their children, provoked mothers to replace the lost ones [7].

Contrary to the findings of many studies, fertility was significantly higher among women who had no preference to the sex of their children. Conversely, studies done in Ethiopia and Asia had revealed more preference towards sons compared to daughters because males inherit properties from their ancestors in a patrilineal society. A similar study in USA indicated a stable marital union or request for the custody of their child by fathers if the marriage was dissolved when couples had sons instead of daughters [22,25,26]. Religiosity among women in the study community had probably dimmed their decision.

The use of Butajira DSS database to recruit study participants and administration of standard maternity history questionnaire by clinical nurses could be mentioned as strengths for the current study. The demographic surveillance staffs knew study participants for a long time and this built trust on the participants side to provide reliable information. The study was also conducted in a peak harvesting season which reduced the participation of certain community groups that could be away from their home by virtue of their work.

Conclusions

Local government authorities should play pivotal role to make women stay more years at school thereby increase the age at first marriage to reduce fertility in the area. Special attention should also be given to increase the enrollment of women in secondary education to significantly reduce fertility in rural communities. Moreover, the community should be made aware on the negative impact of large family size on the household economy, environmental degradation and the country's socio-economic development at large. Efforts to enhance child survival have to be scaled up to curve the level of fertility in resource-constrained rural Ethiopia.

Acknowledgements and Funding

We are grateful to Dr. Assefa Hailemariam who had commented on the first version of this article. Our heartfelt gratitude should go to study participants who had shared their valuable times with us. Last but not least the field staffs and data entry clerks involved in the study should be acknowledged for their contribution to the success of the project. We thank the Bill and Melinda Gates Institute for sponsoring this study.

Authors' contributions

WM participated from conception to the final approval of the final version of the article. AW supervised the whole exercise and made critical comments at each step in the research. He also approved the final version of the article.

Competing interests

The authors declare that they have no competing interests.

Received: 8 July 2011 Accepted: 10 October 2011
Published: 10 October 2011

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Pre-publication history

The pre-publication history for this paper can be accessed here:
http://www.biomedcentral.com/1471-2458/11/782/prepub

doi:10.1186/1471-2458-11-782
Cite this article as: Mekonnen and Worku: Determinants of fertility in rural Ethiopia: the case of Butajira Demographic Surveillance System (DSS). *BMC Public Health* 2011, 11:782.

Article II

Mekonnen and Worku *Reproductive Health* 2011, 8:37
http://www.reproductive-health-journal.com/content/8/1/37

REPRODUCTIVE HEALTH

RESEARCH Open Access

Determinants of low family planning use and high unmet need in Butajira District, South Central Ethiopia

Wubegzier Mekonnen* and Alemayehu Worku

Abstract

Background: The rapid population growth does not match with available resource in Ethiopia. Though household level family planning delivery has been put in place, the impact of such programs in densely populated rural areas was not studied. The study aims at measuring contraception and unmet need and identifying its determinants among married women.

Methods: A total of 5746 married women are interviewed from October to December 2009 in the Butajira Demographic Surveillance Area. Contraceptive prevalence rate and unmet need with their 95% confidence interval is measured among married women in the Butajira district. The association of background characteristics and family planning use is ascertained using crude and adjusted Odds ratio in logistic regression model.

Results: Current contraceptive prevalence rate among married women is 25.4% (95% CI: 24.2, 26.5). Unmet need of contraception is 52.4% of which 74.8% was attributed to spacing and the rest for limiting. Reasons for the high unmet need include commodities' insecurity, religion, and complaints related to providers, methods, diet and work load. Contraception is 2.3 (95% CI: 1.7, 3.2) times higher in urbanites compared to rural highlanders. Married women who attained primary and secondary plus level of education have about 1.3 (95% CI: 1.1, 1.6) and 2 (95% CI: 1.4, 2.9) times more risk to contraception; those with no child death are 1.3 (95% CI: 1.1, 1.5) times more likely to use contraceptives compared to counterparts. Besides, the odds of contraception is 1.3 (95% CI: 1.1, 1.6) and 1.5 (1.1, 2.0) times more likely among women whose partners completed primary and secondary plus level of education. Women discussing about contraception with partners were 2.2 (95% CI: 1.8, 2.7) times more likely to use family planning. Nevertheless, contraception was about 2.6 (95% CI: 2.1, 3.2) more likely among married women whose partners supported the use of family planning.

Conclusions: The local government should focus on increasing educational level. It must also ensure family planning methods security, increase competence of providers, and create awareness on various methods and their side effects to empower women to make an appropriate choice. Emphasis should be given to rural communities.

Keywords: Family planning use, unmet need, Butajira, rural, Ethiopia

Background

The rapid population growth does not match with available resource in Ethiopia [1] where the economy has been agrarian based on household subsistence farming [2]. Agricultural households in the country whose livelihoods depend on petty mixed farming require involvement of many household members including children who work on laborious farms free of pay. In this situation, large family size has been an accepted norm in Ethiopia to divide demanding farm workload among family members. The country also has a young population due to mainly high fertility in rural areas in the country [3-5].

Family planning is a viable solution to control such fast growing populations. In addition to spacing and limiting the number of children it improves maternal and child health, empowers women and enhances

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economic development [6]. However, married women of reproductive age group have unmet need for contraception, inability to use family planning methods to prevent pregnancy despite the interest of practicing it.

Contraception and unmet need levels varied across countries of the world, the lowest contraception and highest unmet need, being in sub-Saharan Africa mainly because of low level of knowledge and existence of variety of barriers [7,8]. Knowledge of any modern method among married women in Ethiopia increased from 85% in 2000 to 87% in 2005 [9,10] though contraception increased to only 15% in 2005 from its lowest level of 4% in 1990 [1,9,10]. The national contraceptive prevalence rate has also been more than doubled to about 29% in 2011[11]. Regional disparities in knowledge, access and use of family planning methods have also been observed in the country. Contraception among married women in the study region, where Butajira district is located, was consistently lower than the national level across the three rounds of demographic and health survey years [9-11]. On the other hand, unmet need for family planning was estimated at 35.8%, 33.8 and 25.3% in 2000, 2005 and 2011 respectively in Ethiopia. Unmet need varies across regional states in the country. Its value in the study region was similar to the national level except for 2005 which was by 3.6% higher than the country's unmet need. About 60.9%, 59.4% and 64.4% of the national unmet need for contraception in 2000, 2005 and 2011 respectively are attributed to child spacing. On the same token, the share of unmet need for spacing from the total unmet need was higher for SNNPR compared to the national except for 2011. Disaggregation of unmet need by population characteristics revealed significantly higher level among young women, living in rural areas, resides in Oromia and the study regions, illiterates and living in households with lowest wealth quintiles in 2005 [10].

Social and economic development of countries and communities dictated the level of contraception and reasons for unmet need [12]. Various population background characteristics related to health, population and economic policy environments, household structure and individual characteristics were associated to contraception [13]. Absence of all and/or certain family planning methods in the area, costs related to family planning methods provision, women's autonomy and their socio-economic status, medical and legal restrictions to use methods and provider bias and misinterpretation were shown as barriers of contraception [14]. Moreover, educational status of women and their partners, socio-economic level, type of residence area, access to media, knowledge about family planning methods, support to family planning methods by women and/or their partners and senior members of their family, age, migration status, wealth equity, parity, experience of abortion and child death, religious beliefs, ethnic affiliations were some of the individual background characteristics that were associated to the use of family planning methods [13,15-18]. On the other hand, reproductive health interventions changes the level of current use of contraceptives among women of reproductive age group and their partners [19]. The distal socio-demographic, economic, cultural and environmental individual factors have been indirectly influencing family planning use through proximate factors such as discussion between partners, knowledge of methods and their sheer availability and mix, distance of service delivery points and skills of providers to persuade their clients on correct and sustainable use of family planning methods [20,21].

Although family planning use among women of reproductive age has been increasing from its virtually non-existence level, it is still low in Ethiopia. Contraception has been consistently lower while unmet need is higher in the region where Butajira district is located compared to the national level. Besides, the nationwide health extension program (HEP) launched in 2003, showed a low success rate in 2008 in the study region[22,23]. Family planning provision to rural communities in the country is one of the 16 modules in HEP. Village based female health extension workers are overburdened with many activities which may deter the program's success.

Butajira district is predominantly rural, suffered from population pressure, inhabited by Muslims; and polygamy and widow inheritance is common [24]. Polygamy was attributed as barrier of contraception among predominantly Muslim communities in Nigeria [25] by raising women's desire to have many children through competition between co-wives to skew household resources towards them. As there is no study on the issue under caption, this study aimed at measuring levels and identifying determinants of contraception and unmet need for family planning use in the context of household level reproductive health delivery in a rural district of Ethiopia.

Methodology

The study was conducted in the Butajira district. All usual resident women of reproductive age group (15-49 years) within the Demographic Surveillance Area (DSA) of Butajira Demographic Surveillance System (DSS) were interviewed during October to December 2009. Clinical nurses were used as data collectors supervised by experienced staff with health and social science background. A structured Demographic and Health Survey type questionnaire was used to interview women. After they were briefed about the objectives of the study, oral consent were obtained from each study participant. Ethical clearance was also secured from the Institutional

Review Board of College of Health Sciences; Addis Ababa University after all ethical issues were considered. A total of 5746 married women were included in this study. Methodological details of the comprehensive study are documented elsewhere [26].

Data were entered and cleaned in EPI INFO software with a CHECK program and analyzed using STATA version 11. Married women are disaggregated by various background characteristics to have an insight of their characteristics. All background characteristics of women used in this study were categorical though the dependant variable, family planning use, was binary in nature. Current contraceptive prevalence rate and unmet need of contraception with 95% confidence interval were computed. Unmet need for contraception was decomposed into unmet need for limiting and spacing. Confidence interval was computed for unmet need for spacing since it had a major share of the total unmet need of contraception. Bivariate and multivariate Logistic regression with odds ratio along with the 95% confidence interval were used to ascertain the association between covariates and family planning use. Only covariates that were statistically significant at the bivariate level were included in the multivariate binary Logistic regression to control for confounding. Though many variables were considered in the analysis, only covariates significantly associated with contraception were reported.

Table 1 The frequency distribution of married women by their background characteristics in Butajira, 2009 (N = 5746)

Variable		Number	Frequency
Ecology	Urban	1462	25.5
	Lowland	2128	37.0
	Highland	2156	37.5
Educational status	Never	4153	72.3
	Primary	1330	22.8
	Secondary plus	283	4.9
Household food shortage	Yes	1951	34.0
	No	3794	66.0
Had dead child	No	3084	57.0
	Yes	2329	43.0
Partner's education	Never	2128	38.6
	Primary	2952	51.4
	Secondary plus	576	10.0
Migration status	In-migrant	2165	37.7
	Non-migrant	3580	62.3
Household livelihood	Farming	4296	74.8
	Trade/service	805	14.0
	Civil service	272	4.7
	Other	373	6.5
Discussion	Yes	3820	66.8
	No	1895	33.2
Partner's support	Yes	3899	67.9
	No	1844	32.1

Results

The 5746 married women varied in background characteristics as shown in Table 1. Married women were fairly distributed in ecological residential areas. About 72% of women never been enrolled into a formal education. Study participants were asked whether their households encountered any food shortage in the past year. They reported that food shortage was common in a third of households while 43% of married women had experience of child death. About 51% of sexual partners completed primary level of education. Nearly 38% of married women mentioned a birth place other than the Demographic Surveillance area. Three-fourth of the women belonged to a household whose main livelihood was farming. Majority were in the age bracket of 20-34 years with the mean age of 30.6 (± 7.8 SD) years (result not shown).

Critical examination of married women by their reproductive health characteristics showed that about two-third of them reported discussion about family planning among couples. Furthermore, about 87% of them (result not shown) and only 68% of their partners supported the use of family planning in Butajira district.

About 99% of women in Butajira district knew at least one method of contraception though some family planning methods were better known than others among resident women of a densely populated Butajira district in Ethiopia as shown in Table 2. Dipo-Provera and Pills were known by more than 97% of married women each followed by male condom and Norplants by about 82% and three-quarter of study participants, respectively. The least known modern contraceptive method was foam/jelly. Emergency contraceptive was also known by about 10% of married women in the study area. Meanwhile, traditional methods such as calendar method, Lactational Amenorrhea Method (LAM) and withdrawal were mentioned by 21.3%, 31% and 20.2% respectively of married women in the district.

On the other hand, more than half of married women have ever used one or another type of contraceptive. The most favorite modern contraceptive ever practiced among married women were Depo-Provera (42.2%) followed by pills (24.7%). The least ever used modern method of contraceptive was female condoms (0.4%). Emergency contraceptive has ever been used by 2% of married women in the study district. Nevertheless, calendar method, LAM and withdrawal had ever practiced by 16.5%, 14.7% and 12.3% of married women.

Table 2 Distribution of knowledge, ever and current use of Family Planning Methods by their type among married women in Butajira district, 2009 (N = 5746)

FP Method type	Percentage of FP Knowledge	Percentage of Ever users	Number of Ever users	Percentage of Current use (n = 1586)
Tubal ligation	19.0	2.9	1089	1.9
Vasectomy	8.2	1.1	473	0.1
Pills	97.5	24.7	5988	10.4
Loop	13.1	3.3	754	0.7
Depo-Provera	97.8	42.2	5619	74.2
Norplant	74.4	9.0	4272	6.1
Condom	81.9	1.7	4707	0.6
Foam/Jelly	4.1	0.9	235	0.0
Calendar Method	21.3	16.5	1222	5.0
LAM	31.0	14.7	1778	1.4
Female Condom	26.6	0.4	1529	0.1
Withdrawal	20.2	12.3	1158	1.1
Emergency contraceptive	10.2	2.0	587	0.1
Total	99.1	51.3	5746	25.4 (24.2, 26.5)

Nonetheless, about 25.4% (24.2, 26.5) of married women were currently practicing contraceptives. Still three-fourth of women currently using family planning method prefer Depo-Provera followed by about 10% and 6.1% of women who choose pills and Norplant, respectively. There was no woman among study participants who used foam/jelly for any parity specific control. Among traditional methods, calendar method was currently used by about 5% of women.

Disaggregation of knowledge by type of residential area showed that every woman in urban areas knew about contraceptives while more than 97% of them knew at least one method in lowland or highland Butajira as shown in Table 3. The level of ever and current use of family planning methods among married women by residential ecology was dissimilar. Ever use of family planning methods among married women was more than 77% in urban areas followed by about 45% and 40% of lowlanders and highlanders, respectively.

Current use of contraception among married women was estimated at 25.4% (24.2, 26.5). Meanwhile, current use of family planning methods was 46.9% (44.3, 49.4), 19.5% (17.9, 21.3) and 16.5% (15.0, 18.1) among urbanites, lowlanders and highlanders, respectively as shown in Table 3. There was no significant difference in the level of contraception between rural lowlanders and highlanders in the district though the difference in unmet need for limiting was not statistically significant.

The unmet need of contraception was estimated to be 52.4% as shown in Table 3. The unmet need for spacing was much higher as compared to limiting. The lowest unmet need for limiting was recorded for urban Butajira while the highest is for highland Butajira. Meanwhile unmet need for spacing was much higher in rural areas compared to urban Butajira. On the other hand, unmet need for spacing was about three-quarter of the total unmet need while the remaining percentage was attributed for limiting. Unmet need for spacing was more than 75% of the total unmet need in lowland and highland Butajira while it contributed to more than two-third of the overall unmet need in urban Butajira. There was statistically significant difference in unmet need for spacing between rural and urban areas.

This study had also revealed that women's desire for children did not significantly decline with increasing size of surviving children. For instance about 70.8% of

Table 3 The percentage distribution of knowledge, ever and current contraception and unmet need by residence type in Butajira district, 2009 (N = 5746)

Residence Type	No.	% of married women Knowing FPM	% of ever use of FPM	% of current use of FPM	% of unmet need for limiting	% of unmet need for spacing (CI)	% of total unmet need (CI)
Urban	1462	100.0	77.4	46.9 (44.3, 49.4)	12.5	25.0 (22.8, 27.3)	37.5 (35.0, 40.0)
Rural low	2128	98.0	44.8	19.5 (17.9, 21.3)	12.7	44.3 (42.2,46.4)	57.0 (54.9, 59.2)
Rural high	2156	99.6	40.1	16.5 (15.0, 18.1)	14.3	43.7 (41.6, 45.8)	58.0 (55.9, 60.1)
Total	5746	99.1	51.3	25.4 (24.2, 26.5)	13.2	39.2 (37.9, 40.4)	52.4 (51.1, 53.7)

married women having four surviving children wanted another child. Disaggregation of fertility desire by type of residence showed 62.9%, 73.7% and 71.0% of married women having 4 surviving children in urban, rural lowland and rural highland areas, respectively wanted to have another in the study district (result not shown).

Different reasons for the unmet need of contraception were mentioned by married women of reproductive age group included in this study. Some are reasons for the unmet need while others are socio-cultural values and norms that deter the use of family planning in the community. The majority (43.1%) replied they could not get the method they prefer in the nearby health facility unless they walk a long distance, in some instances up to 18 kilometers. On the other hand, about 22.2% of them expected rejections by religious leaders and their community to practice it. Another 12.6% reported absence of all contraceptives or the ones they preferred in facilities. About 4.8% mentioned lower level service providers' incompetence. Whereas, about 16.8% of married women reported reasons related to the side effect and contraindications of available contraceptive methods in the area such us heart burn, excessive bleeding and their presumption of requirement of balanced diet and optimum work load.

Table 4 showed the bi-variate and multivariate association of various background characteristics of married women with the current use of family planning use in the Butajira district. The odds of current use of family planning was 2.3 (95% CI: 1.66, 3.18) times higher among urbanites compared to highlanders. However, the odds of contraception between highland and lowland Butajira district residents were eliminated when other background characteristics of women were included in the model. There was a positive association between contraception and educational status of women. Women with primary and secondary level of education were about 1.32 (95% CI: 1.12, 1.56) and 1.99 (95% CI: 1.38, 2.88) times respectively more likely to use family planning compared to their uneducated counterparts. Besides, married women who were members of food self deficient households was about 1.58 (95% CI: 1.39, 1.81) times more likely to use family planning compared to their counterparts in food self sufficient households though the association turned statistically not significant when other variables are included.

Meanwhile, the odds of women with no experience of child death were 1.3 (95% CI: 1.13, 1.50) times more likely to use contraceptives compared to those who had dead children. Besides, there was a positive association between partner's educational status of women and contraception. The odds of contraception was 1.32 (95% CI: 1.13, 1.55) and 1.50 (95% CI: 1.12, 2.01) times higher among married women whose partners have primary and secondary plus level of education respectively compared to those who have uneducated partners.

In-migrant women were 1.38 (95% CI: 1.23, 1.56) times more likely to use family planning compared to those whose birth places are the study district though the statistical significance vanished when other factors were included. Furthermore civil servant, handicraft and merchant women were 6.2 (95% CI: 4.81, 7.99), 3.46 (95% CI: 2.78, 4.30) and 3.21 (95% CI: 2.73, 3.76) times respectively more likely to use family planning compared to those whose livelihood were farming although the statistical significant association disappeared when other factors are added in the model.

Discussion about the use of family planning between married women and their partners was significantly associated with contraception in Butajira district. Married women who had discussed about contraception with their partners were 2.2 (95% CI: 1.8, 2.7) times more likely to use the family planning compared to those who did not discussed about family planning. Nevertheless, the odds of contraception was about 2.59 (95% CI: 2.11, 3.17) times higher among married women whose partners support the use of family planning compared to their counterparts.

Discussion

The 2009 contraceptive prevalence rate (CPR) of 25.4% (95% CI: 24.2, 26.5) among married women in Butajira district is comparable to the regional and national CPR of 25.8 and 28.6, respectively in 2011 [11]. The increase in contraception in recent years could be attributed to the expanding health service coverage and start of an opening of a zonal hospital that has been functional in Butajira district since 2002 which improved the health service delivery [27].

Although contraception increased significantly both nationally and in the study district in recent years it was still much lower than the unachieved target of 60% put for the year 2010 [28]. Moreover, the unmet need of contraception of 52.4% is much higher than 33.8% and 25.3% of the 2005 and 2011 levels, respectively for Ethiopia. Unmet need was estimated at 37.4% and 25.0% for the region in which the study district is located in 2005 and 2011, respectively [10,29]. About 75% of the unmet need recorded in this study is attributed to spacing and the rest is for limiting. The commitment of the Ethiopian government to achieve an 80% contraceptive demand satisfaction by 2015 is far to reach since about 71% of married women who have 4 surviving children desire to have more children and the desire is even higher in rural areas.

Women in the study area mentioned stock out of contraceptives, absence of client preferred methods in facilities, religious pressure, service provider

Table 4 The association of background characteristics of married women with current family planning use in Butajira district, 2009 (N = 5746)

Background characteristics		# of married women using FPM	# of married women not using FPM	Crude OR (95%CI)	Adjusted OR (95%CI)
Ecology	Highland	356	1800	1.00	1.00
	Lowland	415	1710	1.23 (1.05, 1.43)*	1.14 (0.96, 1.35)
	Urban	685	777	4.46 (3.82, 5.20)*	2.30 (1.66, 3.18)*
Educational status	Never	800	108	1.00	1.00
	Primary	481	829	2.43 (2.12, 2.78)*	1.32 (1.12, 1.56)*
	Secondary plus	175	3350	6.79 (5.27, 8.73)*	1.99 (1.38, 2.88)*
Food shortage	Yes	387	1563	1.00	1.00
	No	1069	2724	1.58 (1.39, 1.81)*	0.89 (0.76, 1.04)
Dead child	Yes	429	1899	1.00	1.00
	No	966	2117	2.02 (1.77, 2.30)*	1.30 (1.13, 1.50)*
Partner's education	Never	336	1881	1.00	1.00
	Primary	825	2126	2.17 (1.89, 2.50)*	1.32 (1.13, 1.55)*
	Secondary plus	295	280	5.90 (4.83, 7.21)*	1.50 (1.12, 2.01)*
Migration	Non-migrant	823	2756	1.00	1.00
	In-migrant	633	1531	1.38 (1.23, 1.56)*	1.01 (0.87, 1.16)
Livelihood	Farming	794	3499	1.00	1.00
	Trade/service	339	466	3.21 (2.73, 3.76)*	1.13 (0.82, 1.56)
	Civil servant	159	113	6.20 (4.81, 7.99)*	1.25 (0.79, 1.98)
	Other	164	209	3.46 (2.78, 4.30)*	1.15 (0.80, 1.67)
Discussion	Yes	1283	2537	5.23 (4.40, 6.22)*	2.21 (1.80, 2.70)*
	No	167	1728	1.00	1.00
Husband support	yes	1288	2610	4.92 (4.14, 5.85)*	2.59 (2.11, 3.17)*
	No	168	1676	1.0	1.00

*95 5% confidence interval

incompetence and side effects of contraceptives such us heart burn, excessive menstrual bleeding and their presumption of requirement of balanced diet and optimum work load as barriers to use family planning methods. Similar reasons of unmet need for contraception were also documented by other studies done elsewhere [30,31]. Inadequacy of methods and counseling were mentioned as reasons for unmet need in a similar study done in Gondar, North Western Ethiopia [32]. The higher unmet need of contraception recorded in this study could be due to the population pressure and poverty driving women in densely populated areas such as the study district and urban centers to look for parity specific controls though service providers cannot cope with the demand [4]. The relatively better level of contraception and lower unmet need among urban married women in Butajira district could be ascribed to accessibility of health services and awareness of the urbanites on family planning methods. Better mass media coverage in urban compared to rural areas might have increased knowledge and practice. Urban women could also be more enlightened and autonomous to utilize health services compared to their counterparts in rural areas [33].

Unlike a study done in Jimma area which showed higher preference of pills, Depo-provera is the most preferred method among current users of family planning methods in the study district [16]. Women in the area could be in favor relatively long acting methods to avoid missing pills or some might have taken long acting methods without the consent of their partners which could be difficult in the case of pills.

Women's educational status is positively associated with contraceptive prevalence rate in the study district. Studies elsewhere revealed a similar pattern of relationship between educational status and maternal health service including family planning utilization [15,34,35]. Longer years of education could probably give married women better chance to understand uses of contraception to reduce fertility, maternal and child morbidity and mortality. It might also increase awareness on the side effects of contraceptive methods to prefer the most convenient ones. Educated women could avoid the negative effects of family planning methods by getting appropriate advice from a service provider thereby increased their consistent use.

Moreover, experience of child death is negatively associated with family planning use in Butajira district.

When women have experience(s) of child death they attempt to replace the lost ones and want to have more children [36]. On the other hand, if they perceived low child death in their community they might undergo contraception knowing that most of the children born would reach adulthood. The study district faced periodic droughts associated with epidemics in the context of abject poverty [37] which may be one of the reasons that the level of family planning use is still at a lower level although it is increasing in recent years.

Husband's educational status is associated with family planning use as shown in a study in Eastern Sudan [38]. Men's educational status is directly related to economic and social empowerment which increased exposure to resources such as access to media and utilization of desired health care delivery services. More years of education enabled men to better knowledge of reproductive health behaviors in which case men would be liberal to introduce couple's discussion to use family planning. They would also consider managing family size as something that has to be decided by couples.

Furthermore, this study showed a positive association between couple's discussion on family planning and contraception which was similar to studies elsewhere [20,21]. The role of men in decision making has been instrumental in traditional patrilineal societies like Ethiopia. Men decide almost in every aspect of life including reproductive health service choices. This study revealed significant association between men' support to family planning and its current use among married women. Similar studies done in different parts of Ethiopia showed significant association of men's involvement with family planning methods use [34,35,39].

This study has a drawback in terms of not including men as study participants to explore the difference in perception and practice between men and women and main reasons for this difference. It did not in particular ask the involvement of men in the utilization of family planning and their perspectives towards its use. Moreover, as it is a cross-sectional study it could be difficult to establish cause and effect relationship. It is a study conducted to understand main factors that contribute the current utilization of family planning in a high fertility community with population pressure wherein contraception rate was low which can be mentioned as strength of the study.

In conclusion current family planning use among married women in Butajira district was still low though the unmet need was very high. Barrier to contraception in the area included full stock out and absence of preferred methods, religion, complaints related to providers and methods; and assumption of having proper diet and optimum work load. Factors that were significantly associated with contraception were residential ecology, women and their partners' educational status, experience of child death of women, couple's discussion on contraception and partners' support.

Health systems at various levels in Butajira district and the capacity of their leader in family planning logistics system should be strengthened. The local government should also strive to increase the educational level of residents beyond primary level. The government should also avail family planning methods with appropriate method mix, increase competence of providers, and make awareness on various methods and their temporary side effects. Emphasis should also be given to rural communities.

Acknowledgements
Gates Institute funded this research through its collaborative project with School of Public Health in Addis Ababa University for which it deserves acknowledgement. We thank study participant women for their valuable time. We are also grateful to field staffs and data entry clerk involved in the study.

Authors' contributions
WM carried out the research from conception to the write up of the final draft of the article. AW had supervised and critically commented at each stage of the research. All authors read and approved the final manuscript.

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Competing interests
The authors declare that they have no competing interests.

Received: 24 October 2011 Accepted: 8 December 2011
Published: 8 December 2011

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doi:10.1186/1742-4755-8-37
Cite this article as: Mekonnen and Worku: **Determinants of low family planning use and high unmet need in Butajira District, South Central Ethiopia.** *Reproductive Health* 2011, **8**:37.

Article III

Original article

Levels and Proximate Determinants of Fertility in Butajira District, South Central Ethiopia

Wubegzier Mekonnen, Alemayehu Worku

Abstract

Background: Uncontrolled population growth is evidenced mainly because of the high fertility. Improving maternal and child health services in Ethiopia were one of the main aims of the health extension program. The impediment of early marriage was revised in the national family code which claims assessment of fertility situations.

Objectives: This study aimed at measuring levels and fertility inhibition effects of proximate determinants in Butajira district.

Methods: A cross-sectional study was conducted on resident women of reproductive age group recruited from the Butajira demographic surveillance system database. A total of 9996 women with different characteristics were thus interviewed.

Results: Total fertility rate was 5.3 children per woman with high urban-rural gradient. The non-marriage (C_m=0.66) had the highest fertility inhibition effect followed by postpartum infecundability (C_i=0.68), contraception (C_c=0.77) and abortion (C_a=0.96). Main differences were observed across residential environment and educational status. Abortion had a paramount significance among in school women (c_a=0.76).

Conclusion: Not being married followed by postpartum infecundability and contraception inhibited high fertility. Abortion significantly reduced fertility among students. Keen awareness about negative consequences of high fertility should be attained. Women ought to be advised to marry late and stay in-school for long years. Extended breast feeding should be maintained for birth spacing. There must be sustained effort to increase contraception use rate. In-school women should be educated on problems of abortions. Youth-friendly contraceptive services must also be made available. [*Ethiop. J. Health Dev* 2011; 25(3):184-191.]

Introduction

Ethiopia has had documented history of uncontrolled population growth during the past three decades going from 39.9 to 73.9 million people though the growth rate was found to have declined slightly from about 3 percent during the first census in 1984 to 2.6 percent in the latest census in 2007 (1). Total fertility rate (TFR) shrank by only 0.5 children from the 2000 level of 5.9 to the 2005 rate of 5.4 children per woman with more than that in the rural areas compared to urban ones (2, 3). Life expectancy at birth remained low while maternal and childhood mortality rates were still among the highest in the sub-region. Cognizant of these facts the government of Ethiopia started a health extension program having as one of its main aims being provision of maternal and child health service at the household level in 2003. The general achievement level rates obtained in 2008 called for more efforts into the program to sustain it (4, 5). Moreover, impediments related to the empowerment of women and the minimum legal ages for marriage were revised in the new family code of the country (6).

Regional disparities in population growth rates and fertility were observed. Southern Nations, Nationalities and Peoples Region (SNNPR), where the study district of Butajira is located, is one of the regions with the highest population growth and fertility rates of 2.9 percent per annum and 5.6 children per woman, respectively. The share of SNNPR's population in the country's total and its population density had increased between the inter-censusal periods of 1994 and 2007 (1). The migration rate due to population pressure was high in the dense and mainly Guraghe inhabited Butajira district (7). The district was home to more than 430,949 people (213,649 male and 217,300 female) according to the 2007 Ethiopian census. Epidemiological transition was also observed in the district besides revealing a similar pattern of child and adolescent mortality with the general Ethiopian population (8, 9).

The paramount contribution of fertility to changes in the size and structure of the population in rural Ethiopia and its link to the success of reproductive health programs and policies needs a detailed study. Fertility has been the centerpiece of such programs. The determinants of fertility are mainly categorized as proximate determinants and distal factors (10). Proximate determinants include bio-demographic and behavioral factors which directly affect fertility that include non-marriage, contraception, postpartum infecundability, and induced abortion. On the other hand, distal factors consist of socio-economic variables such as maternal, paternal and household characteristics that influence the proximate determinants in bringing about change in fertility. Thus, distal factors have an indirect impact while proximate determinants have a direct effect in changing levels of fertility. The distal determinants of fertility in Butajira were documented elsewhere (11).

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Indentifying the fertility inhibition effects of proximate determinants lends a hand to better understand the mechanisms by which fertility changes in a defined community with respect to the prevailing policies and programs. Hence, this article aims at measuring levels and fertility inhibition effects of proximate determinants in Butajira district.

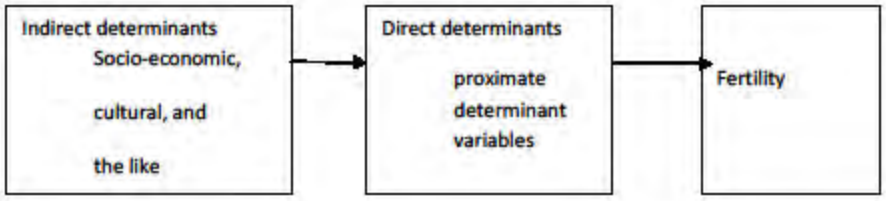
Methods

This study was conducted in the Demographic Surveillance Area (DSA) of the Butajira Demographic Surveillance System (DSS) during October-December 2009. The Butajira DSS was conducted in 10 surveillance villages *(kebeles)* sampled based on probability proportional to size technique from 82 rural and 4 urban *kebeles*. Only one of the 10 sample villages was urban, which is a quarter of Butajira town. The Butajira DSS has been explained in detail elsewhere (12). We used the DSS database to recruit women in reproductive age group as study participants. The database had documented 11,133 women in 2009 though some could not be interviewed because they were absent in three subsequent visits. A total of 9996 women in the reproductive age group (15-49 years) were included in the study.

A standard DHS type maternity history data collection questionnaire was developed in English and translated into the local language and translated back to English by an independent person. The questionnaire was pilot tested in a similar area. Twenty clinical nurses and 5 supervisors with a bachelor degree in different disciplines were recruited as data collectors and supervisors, respectively. The DSS data collection team members were also used as field guides. The field staff was given an intensive training on the principles of data collection and how to use study instruments for three days. The training included lecturing, mock interview and practical sessions in an area other than where the actual study was made.

All field staff members were deployed in one *kebele* to complete the questionnaire in a short period of time before unwanted rumors about seeking information on abortion collected by this survey started spreading that would increase non-response rate. The same exercise was done in the next closest *Kebele* until all of them were finished. Supervisors re-interviewed five percent of study participants besides reviewing each completed questionnaire daily. Every morning, enumerators got feedback about errors they had made on the previous day. Principal investigators were overseeing and organizing the whole exercise in the research. Data were entered into a template prepared on EPI INFO software with CHECK program designed to insure internal consistencies. The data entry clerk was also trained on how to manage inconsistencies. Moreover, investigators checked 50 percent of records entered into the computer daily. The cleaned data were exported to STATA version 11 for analysis.

Total fertility rate was used to measure the magnitude of fertility. Moreover, the Bongaarts' method of measuring the fertility inhibition effect of each proximate determinant was applied (10). Fertility determinants were categorized as indirect (distal) and proximate (direct) factors as shown in the following diagram.



In this model, the total observed fertility rate (TFR) is a function of total fecundity rate (TF), which is the biological maximum number of children a woman can have without any parity specific control, and the four main proximate determinants not being married (being single, separated, divorced or widowed), contraception, postpartum infecundability and induced abortion as shown below.

i. $TFR = TF * C_m * C_c * C_i * C_a$

The indices of proximate determinants of fertility fall between 0 and 1. If the index is closer to 0 the particular proximate determinant under consideration would have a higher fertility inhibiting effect whereas an index close to 1 would have an insignificant inhibiting effect. The index of non-marriage is measured as:

ii. $C_m = \Sigma m(a) * g(a) / \Sigma g(a)$, where $m(a)$ is the age specific proportion of married women and $g(a)$ is the age specific marital fertility rate.

The index of contraception is determined as:

iii. $C_c = 1 - 1.18 * u * e$; where u is the average proportion of married women who are currently using family planning methods; e is the average contraceptive effectiveness; and 1.18 is the sterility correction factor. The average contraception effectiveness of 0.85 was considered for this study as per the recommendation of Bongaarts and an experience in rural Ethiopia (10, 13).

Components of birth intervals include postpartum infecundable sub-interval (which is about 1.5 months without lactation); waiting time to conception, which starts at the first ovulation following birth and ends with a conception (which is about 7.5 months); time due to intrauterine mortality (which is about 2 months); and the nine months of gestation. The total birth interval can thus add up to 20 months. The difference between the total birth interval and the postpartum infecundability without lactation is 18.5 months. The index of postpartum infecundity is computed as the ratio of the average birth intervals without and with lactation as:

iv. $C_i = 20 / (18.5 + i)$, where i is average duration (in months) of infecundability.

The index of induced abortion is calculated as,

v. $C_a = TFR / (TFR + 0.4 * (1 + u) * TA)$; where TFR is the total observed fertility rate; Bongaarts (10) showed that an induced abortion averts 0.4 births on average; u is the average proportion of married women who are currently on contraception; and TA is the average number of induced abortions per woman at the end of the reproductive period.

Ethical clearance for the study was obtained from the Research and Ethics Committee of the School of Public Health and the Institutional Review Board of College of Health Sciences of Addis Ababa University. Oral consent was also obtained from each study participant.

Results

A total of 9996 women with different socio-economic, environmental and cultural characteristics (see Table 1) were interviewed. Nearly half of them and more than 64 percent of their partners had never attended formal school. About 58 percent of them were not married. More than half of the women belonged to the Meskan ethnic group and three quarters of them were Muslims. More than two-third of them were members of farming households.

About 70 percent of their partners were farmers. The average and median household's annual income were estimated to be 12,526.63 and 5950 Ethiopian Birr (equivalent to 963 and 458 USD at the time of the study) respectively.

About 79.2 percent of the women were below 35 years of age with a mean age of 25.9 (±9.1) years as indicated in Table 2. Over 59 percent of the participants had given birth to children. Over 28 percent had 4 or more children. A little over 5 percent of them had one abortion in the preceding five years. About 81 percent wanted to have a child or more children. About 16 percent of the women in reproductive age group and 25.4 percent of married women used family planning methods. Meanwhile, 90.4 percent of the women and about 43 percent of their partners supported the use of family planning methods. Some 42.5 percent of them mentioned discussions about family planning methods with their partners.

Table 1: **The distribution of study participants by demographic, social, economic, environmental and cultural characteristics in Butajira district, Ethiopia, 2009**

Characteristics (n=9996)	Number (percent)
Women's educational status	
Illiterate	6454 (64.6)
Primary	2964 (29.7)
Secondary	375 (3.8)
Post secondary	203 (2.0)
Marital status	
Single	5476 (57.5)
Married	3707 (37.1)
Separated	179 (1.8)
Divorced	116 (1.2)
Widowed	248 (2.5)
Ethnicity	
Sebatbet, Dobi and Others	1465 (14.7)
Meskan	5071 (50.7)
Mareko	1038 (10.4)
Silti	1773 (17.7)
Other Ethnic groups	649 (6.5)
Religion	
Orthodox Christians	1843 (18.4)
Other Christians	689 (6.9)
Muslims	7464 (74.7)
Partner's occupation	
Farmer	4035 (70.0)
Trader	627 (10.9)
Employees	916 (15.9)
Others	184 (3.2)
Woman's occupation	
Employed	3664 (36.7)
House wife	3040 (30.4)
Student	3292 (32.9)

The analysis showed a total fertility rate of 5.3 children per woman and a marital fertility of 7.8 children per married woman, respectively. Moreover, the highest fertility was documented in rural lowland areas (6.6) while the lowest was observed in Butajira town (3.3). The peak age group of fertility was 25-29 years as shown in Figure 1.

As pointed out earlier the main proximate determinants of fertility include non-marriage, contraception, abortion and postpartum infecundability. The index of non-marriage, which measures the effect of late marriage and marital instability, reduced fertility from its biological maximum by 34 percent. Further analysis of the effect of non-marriage to reduce fertility from its biological maximum showed a decrease of 47 percent among urbanites. On the other hand, fertility went down from its biological maximum by about 59 percent in women with secondary and above level of education. Non-marriage reduced fertility from its natural level by 43 among Orthodox Christians whereas it had registered the fertility inhibition effect of 39 percent among Guraghes other than the Meskan clan. It had also reduced natural fertility by 74 percent among girls who were by then attending school. The fertility reduction pattern of non-marriage

among member women of households in different income quintiles was not clear.

Table 2: **The Distribution of Study Participants by their Reproductive Health Characteristics in Butajira District, Ethiopia, 2009**

Characteristics	Number (Percent)
Age group (n=9996)	
15-19	3284 (32.9)
20-24	1728 (17.3)
25-29	1630 (16.3)
30-34	1274 (12.8)
35-39	1012 (10.1)
40-44	699 (7.0)
45-49	369 (3.7)
Mean (±SD)	25 .9 (±9.1)
Child birth (n=9994)	
Yes	5934 (59.4)
No	4060 (40.6)
Children everborn (n=9996)	
≤ 2	5674 (56.8)
3-4	1522 (15.2)
4<	2800 (28.0)
Abortion in the past 5 years (n=9994)	
Yes	515 (5.2)
No	9479 (94.8)
Want (more) child (n=9994)	
Yes	8083 (80.9)
No	1256 (12.6)
Infertile	589 (5.9)
Don't decide	66 (0.7)
Contraception all women (n=9992)	
Yes	1586 (15.9)
No	8406 (84.1)
Contraception (n=5743) (married women)	
Yes	1456 (25.4)
No	4287 (74.6)
Support family planning (n=9993)	
Yes	9038 (90.4)
No	955 (9.6)
Partner support for family planning (n=9993)	
Yes	4287 (42.9)
No	1946 (19.8)
Have no partner	3760 (37.6)
Discussion with partner on FP (n=9992)	
Yes	4250 (42.5)
No	2164 (21.7)
Have no partner	3578 (35.8)

On the other hand, contraception reduced fertility from the biological maximum by only about 23 percent in the area. A detailed analysis of contraception by various socio-economic characteristics showed that contraception reduced natural fertility by about 43 percent in urban Butajira while the reduction in natural fertility was about 57 percent among women who attended secondary and above level of education. On the other hand, contraception reduced natural fertility by a maximum of 31 percent among Christians of other denominations. Contraception had paramount importance in reducing fertility from its biological maximum among in migrant ethnic groups and Guraghes other than the area majority Meskan clan with percentage reduction levels of 33 and 32, respectively. Contraception reduced natural fertility by 42 percent among students whereas the reduction effect was about 47 percent among women married to husbands of secondary plus educational level. The effect of contraception in reducing fertility from its biological maximum increased from 15 to 36 percent as the wealth quintile increased from 1st to 5th quintile.

The overall contribution of abortion to reduce fertility from its natural level was only 4 percent. However, abortion reduced natural fertility by a similar level of 7 percent among urbanites and those who attained secondary plus level of education. Abortion reduced natural fertility by about 6 percent among women who confessed in the Orthodox Christianity. The percentage reduction of natural fertility by abortion varied from 3 to 5 percent in the major ethnic groups. Abortion had the highest fertility inhibition effect of 24 percent among students that were attending formal schools. Nevertheless, the effect of abortion to reduce fertility from its biological maximum was about 5 percent among women married to partners with secondary plus level of education. There was no difference in abortion fertility inhibition effect among women in food insecure and secured households.

The overall postpartum infecundability (PPI) index of 0.68 reduced natural fertility from its biological maximum by about 32 percent. PPI brought down the biological maximum of fertility by about 37 percent in highland rural Butajira while its inhibition effect is only 20% in Butajira town. The fertility reduction effect of PPI decreased from 35 to 14 percent as educational status increased from illiterate to secondary plus. No significant differences in fertility reduction effects of PPI were observed across the various religious groups though the effect was a bit higher among Muslims. PPI had a higher inhibition effect of fertility among the Silti with a level of 34%. The effect of PPI to reduce fertility was only 22% among students although it was 32 percent among house makers and employed mothers. The effect of PPI to reduce natural fertility decreased from 36 to 20% as partners' educational status increased from no formal education to secondary plus. PPI had a higher fertility inhibition effect of 35% among women of food insecured households compared to only 25% among those who belong to food sufficient households. The fertility inhibition effect of PPI decreased from 34 to 26 percent as wealth quintile rose from lowest to highest.

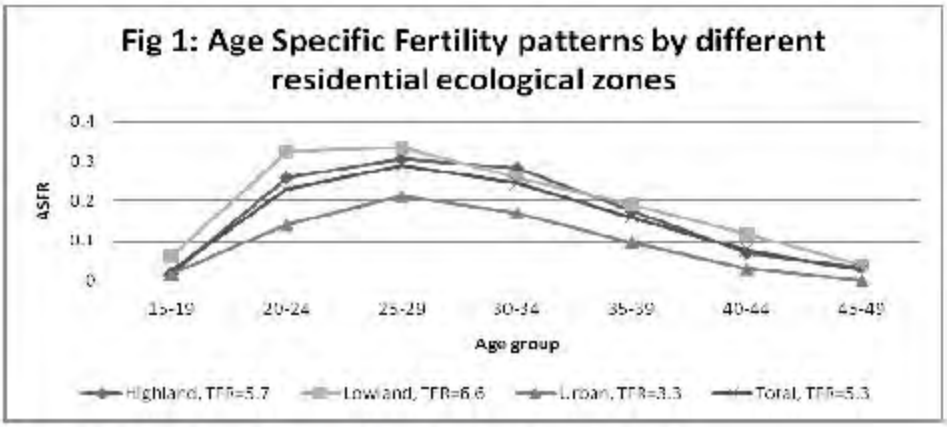


Figure 1: **Age specific fertility patterns by different residential ecological zones**

Table 3: **Indices of the proximate determinants of fertility in Butajira district, Ethiopia, 2009**

Factors	Indices of Proximate Determinants				Observed TFR	Predicted TFR
	C_m	C_c	C_a	C_i		
All women	0.66	0.77	0.96	0.68	5.3	5.1
Ecology						
Highland	0.75	0.85	0.97	0.63	5.7	5.9
Lowland	0.72	0.82	0.96	0.66	6.6	5.7
Urban	0.53	0.57	0.93	0.80	3.3	3.5
Women's education						
Illiterate	0.78	0.82	0.97	0.65	6.3	6.1
Primary	0.61	0.66	0.94	0.75	4.6	4.4
Secondary plus	0.41	0.43	0.93	0.86	2.3	2.2
Religion						
Orthodox	0.57	0.69	0.94	0.71	4.2	4.0
Other Christians	0.63	0.69	0.96	0.71	5.5	4.6
Muslims	0.69	0.79	0.96	0.68	5.5	5.4
Ethnicity						
Other Guraghes*	0.61	0.68	0.95	0.71	4.9	4.3
Meskan	0.66	0.77	0.96	0.68	5.0	5.1
Mareko	0.72	0.83	0.97	0.68	7.0	6.0
Silti	0.69	0.98	0.96	0.66	7.9	6.6
Others	0.67	0.67	0.96	0.73	4.4	4.8
Occupation						
Employed	0.69	0.76	0.95	0.68	5.1	5.2
House wife	0.92	0.78	0.96	0.68	8.0	7.2
Student	0.23	0.58	0.76	0.78	1.1	1.2
Partner's education						
Illiterate	0.47	0.86	0.96	0.64	4.0	3.8
Primary	0.99	0.74	0.96	0.70	8.1	7.6
Secondary Plus	0.99	0.53	0.94	0.80	5.9	6.1
Household food shortage						
Yes	0.64	0.82	0.96	0.65	5.7	5.0
No	0.67	0.74	0.96	0.75	5.1	5.0
Income quintile						
First	0.73	0.85	0.96	0.66	6.4	5.4
Second	0.63	0.81	0.96	0.66	5.6	4.3
Third	0.65	0.81	0.96	0.66	4.5	4.3
Forth	0.67	0.72	0.96	0.70	5.1	4.0
Fifth	0.64	0.64	0.94	0.74	4.4	3.3

*Other Guraghes include Sebatbet, Dobi, Sodo other clans.

Discussion

The high and uncontrolled population growth rate of Ethiopia due to mainly a natural increase as a result of high fertility rate in rural Ethiopia may create a resource gap in the country that may hold back the achievement of the goals set in the national population policy (1, 3, 14). The national health extension program has been implemented in Ethiopia since 2003 with one of the main aims being delivery of maternal and child health services including family planning at the household level though the overall achievement of constructing health posts, certified role model households and deploying health extension workers in Guraghe zone were 88, 4.7 and 61 percents, respectively in 2008 (4, 5). Moreover current contraceptive prevalence rate among all women in the reproductive age group of 15-49 years and married women were 16 and 25.4 percent, respectively. More than 90 percent of women and about 69 percent of their partners were in support of practicing family planning methods. On the other hand, the family law which has implications on ending and forming marriage and women's rights are being implemented as of 2000 (6). The legal age at first marriage of women, which has a direct impact on fertility, was revised to be 18 years in the new family code. However, the median and mean ages at first marriage of women in reproductive age group in this study were 16 and 16.9 years, respectively.

Total fertility rate was 5.3 children per woman in Butajira district in 2009, which was similar to the level in Gondar in 2007. It was lower by 0.3 children when compared to the SNNPR level in 2005 (3, 15). Fertility was measured in different ways in this study conducted in Butajira DSA and the national Ethiopian Demographic and Health Survey and, therefore, the interpretation of the results should be done cautiously. Fertility level in Butajira district was still one of the highest in the country. This could be due to the large family size norm that requires many children to assist parents in their subsistence farming and to take care of them in old age. On the other hand, the relatively low fertility level in Butajira town might be attributed to the reduction of fertility driven by poverty, rising housing costs and absence of employment opportunities in the urban areas in Ethiopia (16, 17).

Women in Butajira district breastfed their children for more than 20 months and abstained from sex for nearly two months due to cultural reasons. Thus, postpartum infecundability had a significant influence to reduce fertility from its biological maximum by about 32 percent as documented in similar studies in other parts of Ethiopia (15, 18). The contraceptive effect of breast feeding in many developing countries, more than any other method of control, promotes the longer spacing of births although the fertility inhibition effect of marriage was a little higher in this study (19). Any decline in breast feeding must be offset by a comparable increase in the use of contraceptives if increases in fertility are to be prevented, especially in countries such as Ethiopia where breastfeeding is still an important factor. This seemed implausible in the case of Butajira district since contraception prevalence was still low.

Most women in developing countries give birth to children within wedlock with more babies in early marriage and stable unions. Nevertheless, high marital instability was documented in Ethiopia (20) whose fertility effect has been offset by the high re-marriage rate. Marriage as we use it here refers to both legal and consensual unions. The ceiling fertility inhibition effect was documented by non-marriage with a value of 34 percent although PPI had the maximum inhibition effect in similar studies in rural Ethiopia (18, 21). It had also shown variability in effect among different social, economic and cultural characteristics. The fertility inhibition effect of non-marriage was higher among urbanites and those who attained secondary plus level of education with 47 and 59 percent, respectively. In this study, increase in the proportion of singles had reduced fertility below replacement level similar to in Addis Ababa (17). Accordingly, age at first marriage differed from 16.5 years in rural Butajira to 17.8 years among urbanites whereas it was postponed from 16.5 years to 19.7 years when educational status increased from no education to secondary plus. Similar studies in different parts of Ethiopia have also indicated the more significant effect of postponement of age at first marriage in reducing fertility from its biological maximum in urban areas (15, 18, 22).

On the other hand, the fertility inhibiting effect of contraception from its natural level was 23 percent with more effects in urban areas, among educated and Christian mothers whereas it has the lowest effect among the Silti (2%). The paramount contribution of contraception to reduce fertility was documented in other urban areas in Ethiopia (17, 22). The majority of the people in the district lived in rural areas where contraception, literacy and accessibility of family planning methods were low. Urbanization and the rise in poverty level among urbanites might have contributed to the increase in contraception and thereby reduced the fertility rates in urban areas as documented in Addis Ababa (16).

Contrary to most studies on fertility determinants in sub-Saharan Africa, measurement of abortion was possible in Butajira district in this study. It was not, however, possible to single out induced abortion in this study since collecting such information in a community, which strongly condemned its occurrence, is sensitive. However, a facility based study indicated a national abortion rate of 23 per 1000 women aged 15-44 years and an abortion ratio of 13 per 100 live births in Ethiopia (23). The study done in a tertiary level referral hospital that managed complications revealed that 93 percent of women treated for abortion complications in SNNPR were due to induced abortion (23, 24). Prorating the abortion index obtained in this study by the percentage of

induced abortions (which is 93 percent) documented in the national facility based abortion study did not change the result significantly. Moreover, abortion, whether it was induced or spontaneous, would have a negative effect on the magnitude of fertility. Besides, detailed analysis showed more than a third of abortions happened to mothers, in school which made us think that most of them were induced abortions as young women did it to remain in school. This is further augmented by the fact that, although the overall effect of abortion to cut off fertility from its natural level was only 4 percent, its maximum fertility inhibition effect (about 24 percent) was documented among students who were currently enrolled in formal schools. Unwanted pregnancies might be common among in-school youth that could end up in having induced abortion since high school students in rural districts including Butajira stay away from their parents that compromise familial control. Moreover, a qualitative study in Nigeria showed that adolescents prefer to undergo early termination of pregnancy rather than using modern contraceptives in fear of their adverse effects on fertility when continuously practiced, while they saw abortion as an immediate solution to an unplanned pregnancy (25).

In conclusion, fertility is still high in the study community with high rural - urban disparity. Postpartum infecundability due to mainly extended breast feeding contributed immensely to reduced fertility from its biological maximum level. The contribution of contraception and non-marriage was also important among urbanites and educated women. Abortion had also played an important role to reduce fertility among in school youth.

An intensive awareness program should be done about the negative consequences of large population caused by high fertility for households, communities and the society at large. Women should also be advised and encouraged to sustain extended breastfeeding. Moreover, longer years of women's education should be scaled up to postpone child birth to later ages to ultimately reduce fertility. Efforts should also be exerted to increase contraception in rural communities and among the school youth. Besides, students should be made aware of the post abortion complications and youth-friendly family planning services.

Acknowledgements

Our deepest gratitude goes to the Bill and Melinda Gates Institute for funding this study. We also thank Dr Assefa Hailemariam who commented on the earlier version of this article. We are very grateful for the study participants who had shared their valuable times. The contribution of the data collection staff and data entry clerk should also be acknowledged.

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Article IV

The young, educated, minorities and the poor move out from south central Ethiopia.

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ABSTRACT

Famines changed population redistribution and often increased migration in Ethiopia. Guraghe zone was densely populated. Population growth fragmented rural landholdings with low cropping intensity and low yields creating surplus labour. This study aimed at measuring the incidence and risk differentials of out-migration in rural Ethiopia.

The Butajira demographic surveillance system database from 1987 to 2008 was extracted to conduct event history analysis. Life Table outmigration incidence rate and Poisson regression rate ratio with 95% confidence interval was computed to measure the level and risk of out-migration.

There were 39,679 out-migration episodes in 999,025.97 person-years of observation with an out-migration incidence rate of 3.97% (3.93, 4.01) over the 22 years. The risk of out-migration was 1.90 (1.85, 1.96) and 1.77 (1.71, 1.82) times higher among teenagers and the youth compared to children under the age of 15 years. Though out-migration was lower among females compared to males 0.94 (0.92, 0.96). Out-migration risk was 1.23 (1.17, 1.29) and 2.81 (2.65, 2.97) times among primary and secondary plus attainders compared to illiterates. Singles and dissolved residents had 1.56 (1.50, 1.62) and 1.47 (1.36, 1.58) times higher risk of out-migration related to currently married. Minority Christians and urbanites had 1.29 (1.26, 1.32) and 1.47 (1.36, 1.58) more risks to migrate compared to Muslims and highlanders respectively. The risk of out-migration was also 1.58 (1.52, 1.64) and 2.11 (2.04, 2.18) times higher among persons who lived in a rented and owed house compared to those lived in owned house.

The relatively high risks of out-migration among young adults and educated could have social significance if continued. The development and economic progress of rural areas is unlikely to advance quickly if significant proportions of these key demographic groups leave for other areas. We suggest local authorities need to consider strategies for retaining these people in their own areas, to safeguard the future well-being of the entire population. Initiatives to facilitate local employment and housing opportunities for younger people would be important in this context.

INTRODUCTION

People might move from their home places because of unsuitable living condition and better opportunities elsewhere. Unequal access to assets, income, education and access to properties such as land, ox or house ownerships may change the rates of human migration (169, 170). Natural and man-made calamities, a dearth of employment opportunities, and civil strife push residents to leave for an area where there are no such problems (160, 171). Communication with out-migrant family members, friends and neighbours often motivate residents at their place of origin to migrate to these areas where their relatives and friends are living (172-175). Individuals usually decide to migrate after making a risk-benefit analysis (29).

Rates of migration varied across communities and involved movement of individuals, families, or groups from one area to another. Migration plays a role in the size, composition and spatial redistribution of societies (32, 176). Migration studies revealed the youth, males, people who have less access to land holdings and property ownerships, minority ethnic and religious groups and educated people were at a higher risk of out-migration (106, 110, 177-179). Also, formation and dissolution of marriage, and interest in continuing education or dropping out of school were observed as reasons for out-migration(96, 180).

Often, migration flows increased dramatically during famines which changes population redistribution in Ethiopia (181). The Guraghe area of Ethiopia is one of the most densely populated zones in the country (182, 183). Rapid population growth fragments rural landholdings with low cropping intensity and low yields thus creating surplus labour (184). Guraghes have been found in most urban areas in Ethiopia because of the unfavourable living condition in their area of origin. A nationally representative sample survey showed the population and environmental pressures force many residents to look for better livelihoods mostly in urban centres in Ethiopia (180). An earlier study indicated that about 48% of individuals migrated in or out of Butajira Demographic Surveillance Area (DSA) at some stage over a ten-year period, as recorded in monthly household visits between 1987 and 1996. There was also a net incidence of migration into the urban area, particularly among young adults (32). The focus of this study was on out-migration of people from 10 sampled neighbourhoods. It

aimed to measure the incidence of out-migrations among different population groups. Moreover, the relative risk of out-migration across various population groups was identified.

MATERIALS AND METHODS

The study was conducted in Butajira District of Guraghe zone which is about 135 kms South of Addis Ababa. Guraghe zone was located in the Southern Nations, Nationalities and Peoples region of Ethiopia. The study area encompassed arid and semi-arid geographical areas. The district was predominantly inhabited by different clans of the Guraghe tribe. Silti and Mareko were the other major ethnic groups living in the district. The majority of residents in the district are Muslims followed by Orthodox Christians. The district had been stricken by cyclical famines. The time between one and the next cycle of famine had been shortened nowadays (126)

The study design was an open cohort. The Butajira Demographic Surveillance System (DSS) launched in 1987 (185) continuously recorded births, deaths, changes in marital and migratory status in sampled 9 rural and 1 urban neighbourhoods (kebeles). The 10 sampled kebeles based on probability proportionate to size technique has been the DSA of the Butajira DSS. A baseline population and housing census was conducted at the beginning of the surveillance in 1987. Then, a continuous registration of events was conducted monthly up to 1999 and quarterly thereafter. Data were captured by trained village based enumerators who paid visits to all households within the DSA. One field supervisor was assigned in 2 kebeles to re-interview at least 5 per cent of the households and undertake validity and consistency checks. The Butajira DSS has been described in detail elsewhere (91).

Data were originally entered into a software designed using the DBase IV platform to manage longitudinal data (Buta 3.01). The software automatically generates unique identifiers and checks consistency for each household and individual under follow-up. It also helps to define the episodes of exposures. For instance a person could be illiterate for certain period of time and literate thereafter. The Butajira DSS longitudinal database in the period of 1987 and 2008 was extracted for this study. Data cleaning and analysis were done using STATA version 11.

Migration is a very complex subject to study. It could be seen in the context of international and internal migration. While international migration refers to the crossing of a national boundary, internal migration deals with in-migration to or out-migration from a division of a country. The main interest in this study is out-migration. A member of the Butajira DSS has been considered as an out migrant if the individual moved out of the DSA with an intension of living elsewhere or wouldn't come back within 6 months though the person did not have such intention.

A censoring variable was coded as 1 if an individual moved out of the DSA and 0 otherwise, while duration episodes of exposure (in years) was computed from dates of entry and exit into an open cohort. Entry into the demographic surveillance system could be possible through in-migration, birth and dejure residence in the DSA during the baseline census enumeration. Whereas, exit from the surveillance system happened through death, out-migration or end of the follow-up. The difference between dates of entry and exit was a measure of the duration of exposure. Besides covariates including age, sex, educational status, marital status, religion, oxen and house ownership were cleaned for inconsistencies and recoded.

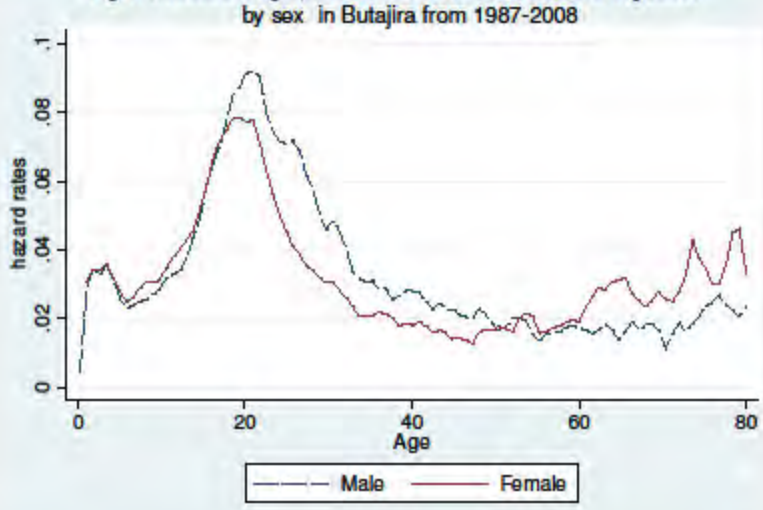
Person times of exposure were computed using event history analysis technique since the database was longitudinal in nature. Life Table out-migration incidence rates were computed for various categories of population characteristics. Smoothed out-migration age pattern by residential ecology and sex groups was also revealed graphically. A Poisson regression model was used to examine risks of out-migration taking into account individual exposure time. This model therefore reflects the influence of all individual person-time risk exposure before out-migration for those who out-migrated, compared with the same individual risk exposure for those who never moved out. The association of various covariates with out-migration was ascertained by out-migration Incidence Rate Ratio (IRR) with a 95% confidence interval.

RESULTS

There were a total of 39,679 out-migration episodes in a 999,025.97 person-years of observation which corresponds to 3.97% (3.93, 4.01) out-migrations per 100 person-years of observations over the twenty two years.

High out-migration were observed among the youth aged 15-19 and 20-29 years at an incidence rate of 7.25% (7.09, 7.40) and 6.26% (61.4, 6.38), respectively (Table 1). On the other hand, the incidence rate of out-migration was only 1.94% (1.84, 2.05) and 2.08% (1.98, 2.18) among adults aged 40-49 years and 50 plus years, respectively. The out-migration incidence rate had also shown sex disparity with a rate of 4.16% (4.10, 4.22) among males compared to 3.79% (3.74, 3.85) among females, respectively. A smoothed outmigration hazard estimate age pattern in Figure 1 also indicated consistently higher incidence rate of out-migration for males compared to females. The pick age of incidence of out-migration were documented at age 20 years for both sexes.

Fig 1: Smoothed age pattern hazard estimates of out-mgration by sex in Butajira from 1987-2008

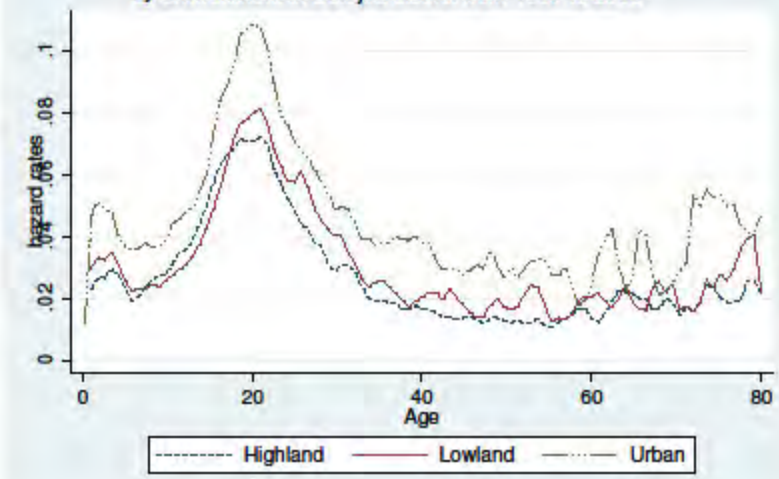


An assessment of the incidence of out-migration by literacy status also revealed a higher out-migration among illiterates at a level of 17.96% (17.46, 18.48) followed by those who were not in the school going age at a level of 4.73% (4.66, 4.81). A critical examination of incidence of out-migration across attained level of education has however showed a different pattern. Out-migration was far higher among more educated residents of Butajira District with an incidence rate of 10.92% (10.42, 11.45%) within secondary plus attainders. Higher out-migration was also estimated among people who had been too young to marry and singles with an incidence rate of 7.07% (6.97, .16) and 3.94% (3.87, 4.01), respectively. The incidence of out-migration was however very low among ever married residents showing no statistically significant difference among currently married and dissolved with levels of 1.41% (1.37, 1.46) and 1.44% (1.35, 1.54), respectively. The highest out-migration incidence rate of 19.04% (18.61, 19.48) was estimated among people whose religious groups were not documented in the database. Minority Christian groups also revealed the second higher out-migration incidence rate 4.31% (4.23, 4.01).

There was also statistically significant difference in the levels of out-migration across residential ecological areas. Out-migration was higher among urban Butajira residents with a level of 5.58% (5.48, 5.68) and lower amid highlanders with a level of 3.37% (3.32, 3.43). Moreover, a smoothed age pattern of the hazard of out-migration showed consistently higher incidence of outmigration in urban Butajira (Figure 2). Comparison of out-migration incidence rate in the two rural residential ecologic zones documented a higher rate among highlanders up to age 20 years though the pattern was in favour of lowlanders thereafter.

Fig 2: The smoothed age pattern hazard estimates of out-migration

by environment in Butajira district from 1987 to 2008



Out-migration rate was also distinct across asset ownership status. The incidence rate of out-migrations was higher among residents whose oxen ownership status were not known with a level of 6.39% (6.31, 6.48) followed by those who did not have the animal with a rate of 3.61% (3.54, 3.67). A minimum out-migration incidence was shown among those who had oxen at a rate of 2.18% (2.14, 2.23). On the other hand people living in houses obtained from relatives free of pay had the highest incidence of out-migration rate of 12.74% (12.34, 13.15). The next higher out-migration incidence was observed among those who lived in rented houses with a rate of 6.52% (6.35, 6.69), whereas people living in their own houses had a minimum out-migration incidence rate of 6.52% (6.35, 6.69).

Table 1: Distribution of out-migration Incident Rates in Butajira DSS from 1987 to 2008

Factors		Person time	Out-migrations	Incidence Rate (95% CI)
Age group:	0-14	450045.91	14194	3.15 (3.10, 3.21)
	15-19	118419.77	8583	7.25 (7.09, 7.40)
	20-29	172960.01	10822	6.26 (6.14, 6.38)
	30-39	110263.57	3114	2.82 (2.73, 2.93)
	40-49	68614.197	1332	1.94 (1.84, 2.05)
	50+	78722.507	1634	2.08 (1.98, 2.18)
Sex:	Male	488830.69	20329	4.16 (4.10, 4.22)
	Female	510195.27	19350	3.79 (3.74, 3.85)
Literacy status:	Illiterate	26876.047	4828	17.96 (17.46, 18.48)
	Literate	650296.41	19619	3.02 (2.98, 3.06)
	Other	321853.51	15232	4.73 (4.66, 4.81)
Educational status:				
	Never	495774.23	10175	2.05 (2.01, 2.09)
	Primary	52118.171	2253	4.32 (4.15, 4.50)
	Secondary plus	15667.165	1711	10.92 (10.42, 11.45)
	Other	435466.4	25540	5.86 (5.79, 5.94)
Marital status:	Married	305644.04	4322	1.41 (1.37, 1.46)
	Single	320484.29	12616	3.94 (3.87, 4.01)
	Other	308813.09	21818	7.07 (6.97, 7.16)
	WDS	64084.55	923	1.44 (1.35, 1.54)
Religion:	Muslim	727646.58	22431	3.08 (3.04, 3.12)
	Christian	233791.04	10090	4.31 (4.23, 4.01)
	Other	37588.35	7158	19.04 (18.61, 19.48)
Environment:	Highland	430532.45	14519	3.37 (3.32, 3.43)
	Lowland	351413.65	13042	3.71 (3.65, 3.78)
	Urban	217079.86	12118	5.58 (5.48, 5.68)
Oxen ownership:	No	315717.19	11389	3.61 (3.54, 3.67)
	Yes	365647.09	7984	2.18 (2.14, 2.23)
	UK	317661.69	20306	6.39 (6.31, 6.48)
House ownership:				
	Owned	878258.46	29967	3.41 (3.37, 3.45)
	Rented	91200.504	5945	6.52 (6.35, 6.69)
	Other	29567.003	3767	12.74 (12.34, 13.15)
Total		999025.97	39679	3.97 (3.93, 4.01)

Multivariate analyses of the association of individual and household characteristics with out-migration was measured by Poisson regression out-migration incidence rate ratio taking into account individual exposure times as shown in Table 2. The risk of out-migration was 1.9 (1.85, 1.96) and 1.77 (1.71, 1.82) times higher among teenagers (15-19 years) and young adults aged

20-29 years respectively compared to children under the age of 15 years. However, the risk of out-migration was significantly lower among adults over the age of 30 years in reference to the same group. Meanwhile, the risk of out-migration was about six percent lower among females compared to males with an IRR of 0.94 (0.92, 0.96).

The risk of out-migration revealed disparity among people in different literacy groups. Higher risk of out-migration was observed among literates compared to illiterates. A critical examination of the risk of out-migration by educational status showed a pronounced risk as educational level increased. The risk was 1.23 (1.17, 1.29) and 2.8 (2.65, 2.97 times higher respectively among those attained primary and secondary plus compared to those had never been into a formal education.

On the other hand, the risk of out-migration was 1.56 (1.5, 1.62) and 1.47 (1.36, 1.58) times higher among singles and dissolved persons respectively, who did not have stronger familial ties, compared to those in current marital union. Besides, minority Christians and those whose religions were not documented in the surveillance had an out-migration risk that was 1.29 (1.26, 1.32) and 4.71 (4.56, 4.87) times higher respectively compared to the area majority Muslims.

Informed urbanites had the higher risk of out-migration compared to rural highland residents. The risk of out-migration was 1.47 (1.36, 1.58) times higher compared to rural highlanders. There was however no statistically significant difference in out-migration rate ratios between lowlanders and highlanders in Butajira District controlling for other variables.

Meanwhile, the association of oxen ownership and out-migration was marginally significant 1.03 (1.00, 1.06). However, the risk of out-migration was 1.58 (1.52, 1.64) and 2.11 (2.04, 2.18) times higher among persons who lived in a rented house and obtained rent-free from a relative compared to a those lived in a house owned by a household member.

Table 2: Association of socio-demographic factors with outmigration incidence in Butajira DSS from 1987 to 2008

Variable	Person times of exposure		Out-migration Incidence Rate ratios (95% confidence interval)	
	Out-migrants	Non-migrants	Crude	Adjusted
Age group: 0-14	25343.55	370570.8	1.00	1.00
15-19	11354.89	100831.4	2.14 (2.09, 2.19)	1.90 (1.85, 1.96)
20-29	16036.88	147814.6	1.97 (1.92, 2.02)	1.77 (1.71, 1.82)
30-39	4902.728	97972.48	0.89 (0.86, 0.93)	0.93 (0.89, 0.97)
40-49	2297.157	6745.73	0.53 (0.50, 0.56)	0.64 (0.60, 0.68)
50+	3531.126	90381.68	0.50 (0.47, 0.52)	0.58 (0.55, 0.62)
Sex: Male	31625.26	428882.8	1.00	1.00
Female	31841.07	445133.9	0.92 (0.90, 0.93)	0.94 (0.92, 0.96)
Literacy status:				
Illiterate	8716.516	127476.7	1.00	1.00
Literate	27097.04	420057.4	1.34 (1.30, 1.38)	1.11 (1.07, 1.16)
Other	27652.78	326482.5	1.25 (1.21, 1.29)	1.05 (1.01, 1.09)
Education status:				
Never	15622.35	324105.9	1.00	1.00
Primary	2876.695	31730.81	2.21 (2.11, 2.31)	1.23 (1.17, 1.29)
Secondary plus	1917.728	9717.437	5.75 (5.44, 6.09)	2.81 (2.65, 2.97)
Other	43049.56	508462.6	1.46 (1.43, 1.49)	1.44 (1.40, 1.48)
Marital status:				
Married	5414.779	179630.8	1.00	1.00
Single	16590.09	188273.7	2.50 (2.41, 2.58)	1.56 (1.50, 1.62)
Others	40279.68	472495.6	1.59 (1.54, 1.64)	0.99 (0.94, 1.04)
WDS	1181.789	33616.6	1.14 (1.07, 1.22)	1.47 (1.36, 1.58)
Religion: Muslim	35758.36	646415.1	1.00	1.00
Christian	15187.48	197603.6	1.47 (1.43, 1.50)	1.29 (1.26, 1.32)
Others	12520.49	29998.01	4.96 (4.82, 5.10)	4.71 (4.56, 4.87)
Environment:				
Highland	24883.25	377841.8	1.00	1.00
Lowland	20714.45	311713.1	1.11 (1.08, 1.14)	0.99 (0.94, 1.04)
Urban	17868.68	184461.9	1.86 (1.81, 1.91)	1.47 (1.36, 1.58)
Oxen ownership:				
No	15108.41	291140.9	1.00	1.00
Yes	11230.78	237562.7	0.82 (0.80, 0.85)	1.03 (1.00, 1.06)
UK	37127.14	345313.1	1.29 (1.26, 1.32)	1.14 (1.11, 1.17)
House ownership:				
Owned	48495.51	772449.5	1.00	1.00
Rented	7851.713	74550.84	2.31 (2.25, 2.38)	1.58 (1.52, 1.64)
other	7119.112	27016.36	2.88 (2.79, 2.98)	2.11 (2.04, 2.18)

*Statistically insignificant association at 5% level of significance

DISCUSSIONS

Similar studies revealed migration as age, sex and education selective (96, 106, 160, 172-174, 181, 183, 186, 187). The youth, males and educated were more likely to move out of their usual place of residence (188). People who were not currently married were also more likely to move out since they had no social obligations or economic responsibilities forcing them to stay in their birth places. Moreover, out-migration rate exceeded among people from religious and ethnic minority groups in sub-Saharan Africa, seeking more security and attracted by their relatives and community groups living in the destination areas (187). This study indicated that young people aged 15-29 out-migrated at a higher rate, which could be attributed to search for better educational and employment opportunities and marital arrangements elsewhere since they customarily leave their family homes when they got married. The exceptionally high rate of out-migration among teenagers in this community might be attributed to the influence of peers living in urban areas, often working as shoe-shiners and taxi conductors, who might pull their relatives and friends towards their destination urban areas during annual visits to their parents' homes in festivals (183). Males had a higher chance of out-migration from Butajira than females as they could get such jobs in urban centers more easily.

Out-migration was higher among educated in this study. A similar study in five major regions of Ethiopia indicated that educated out-migrants had better living conditions at the place of destination that stimulated the increased rate of out-migration among this group (96). People with higher levels of education may detach themselves from simple social, cultural and environmental barriers in local areas and be more receptive towards positive external influences. In addition to this, educated migrants have the necessary skills and experience to make a valid decision as to when and where to move by assessing the pros and cons of pull and push factors(106). The destination urban areas where there are better life opportunities could be more receptive to them looking for their experiences. Even if they succeed, the non-educated ones may be making local or short distance moves.

Marriage increases social responsibility and familial ties and deters the risk of out-migration. On the other hand, one or both couples are likely to leave the area of residence during marital dissolution. This study showed higher risk of out-migration among never married group which

could be due to arrangement of marriage in a different area or dissolution forcing one of the couple to leave the area, employment or education opportunities elsewhere. Moreover, the second higher risk of out-migration among people who dissolved their union was in agreement with a study done in the Netherlands that showed an increased rate of out-migration for one partner of a couple when dissolution happened (158). Another study done in Russia indicated that couples who often travelled over long distances had significantly higher rate of union dissolution than couples who did not move or moved only once (159). Thus, marital dissolution might be both the determinant and consequence of migration. Muslims out-number Christians in the study area. The higher risk of out-migration among minority religious groups in the area might be because of the fears over tensions between Christians and Muslims in South-Western Ethiopia, which is adjacent to the study area.

There was statistically significant difference in the risk of out-migration between rural highlanders and urbanites even after confounding factors were controlled. After allowing for other factors, there were no significant differences in the risk of out-migration between highlanders and lowlanders. However, it had to be recognised that the Butajira DSS sample population consisted of 10 non-contiguous neighbourhoods within the district, and so out-migration in some cases might involve moving from an enumerated area into an adjacent non-enumerated one. Urbanites had better access to media, education and knowledge of opportunities elsewhere which could trigger more out-migration. They could also easily exploit new work opportunities which claimed movement from their neighbourhood by virtue of their physical access.

Rural inequality can influence behaviour and trends in migration (35). Property ownership could deter African families from migration, at least for economic reasons. Accordingly, ownership of ploughing oxen is considered to be detrimental to the economic growth of rural households in Ethiopia as subsistence farming is the major livelihood. This study indicated that people residing in households without oxen out-migrated slightly less than those with oxen though it was marginally significant when other factors are controlled. This was similar to a study done in Botswana which showed more out-migrations from households owned cattle (170). They might

be attributed to the fact that rural affluent households might be more prone to out-migration since they could have easily covered their transportation and other migration related expenses until a migrant settles well in the destination area. However, a residential house is another important asset for most Ethiopians. It is relatively easy for rural householders to own their house, whereas the poor in urban areas often live in a house which is rented from the local administration. Individuals living in rented houses had higher risk of out-migration compared to those living in households' owned houses. Moreover, members of households that lived in a house obtained from relatives free of monthly house rent showed even more risk of out-migration probably because they obtained the residential house since they are too poor to pay a house rent. If people did not have an easy to have asset such as a house in rural Ethiopia they could not cope living in the area and would be more prone to the risk of out-migration.

The overall findings, of relatively high rates of out-migration among younger adults and those with education, could be of social significance if the same trends continue. The development and economic progress of relatively rural areas such as Butajira District is unlikely to advance quickly if significant proportions of these key demographic groups leave for other areas. We suggest that local authorities need to consider strategies for retaining these people in their own areas, to safeguard the future well-being of the entire population. Initiatives to facilitate local employment and housing opportunities for younger people would be important in this context.

ACKNOWLEDGEMENTS

We are grateful to SIDA/SAREC and the Ethiopian Science and Technology Commission who have financially supported the Butajira Rural Health Programme for many years. We are thankful to the School of Public Health, Addis Ababa University, Ethiopia, and the Centre for Global Health Research at Umeå University, Umeå, Sweden for their support. We are greatly indebted to the residents of the study area who have shared their valuable time for the past two decades. The field staff who have worked with great commitment and enthusiasm are also acknowledged.

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English Version Quantitative Questionnaire

I. Identification particulars

No	Question	Response	
101	Date of Interview		
102	Number visits and results 1. Completed 2. Partially completed 3. Respondent absent and postponed 4. Respondent not found in 3 visits 5. Respondent not willing to participate	1st visit Result _____ 2nd visit Result _____ 3rd visit Result _____	
103	Data collector's name and ID	Name	ID
104	Supervisor's name and ID	Name	ID
105	Village/Kebele code (use the DSS Code)		
106	Household Number (use the DSS code)		
107	Respondent's ID number from the DSS		

II. Background Characteristics of women

No	Question	Response
200	Relationship with the head of the household	1.head 2.spouse 3.Son/Daughter 4.Son/Daughter of spouse 5.Grand son/daughter 6.Other relative 7.Not related 8.Maid 9.Other (specify)_____
201	Age in completed years	
202	**Can you read and write simple sentences in any language you speak?**	1.Yes, read only 2.Yes, Read and write 3.No
203	If 2 for Q202, what is the highest level of education you attained?	203.1 Informal (literacy program, self learning or religious schools) _____ 203.2 Grade completed for formal school attendants_____

204	What is your ethnicity?	0.Welene 1.Sodo 2.Dobi 3.Meskan 4.Mareko 5. Silti 6. Amhara 7.Oromo 8. Hadiya 9. Kembata
205	What is your religion?	1. Orthodox Christian 2. Cahtholic 3. Protestant 4. Muslim 5. No relgion 6. Other (specify)_____
206	What is your main occupation?	1. Farmer 2. Trader 3. Civil servant 4. Local drink seller 5. Handicrafts 6. House maker 7. Student 8. Daily laborer 9. Carpentry 10. Other (specify) _____
207	What is your current marital status?	1. Married 2. Single 3. Divorced 4. Separated 5. Widowed
208	If married, what is the type of marital union?	1. Monogamous 2. Polygamous
209	A younger brother inherits the wife of a dead elder brother in parts of this community; did you encounter such a problem in your marriage?	1. Yes 2. No.
210	What is your age at first marriage?	Age in completed years_____
211	If you are currently married, does your husband read and write simple sentences in any language he speaks?	1. Yes, he knows how to read only 2. Yes, he both reads and writes 3. No, he can not read and write
212	If 2 for Q211, what is the highest level of education he attained?	212.1 Informal (literacy program, self learning or religious schools) _____ 212.2 Grade completed for formal school attendants_____

213	If you are currently married, what is the main occupation of your husband?	1. Farmer 2. Trader 3. Civil servant 4. Trader/Service provider 5. Handicrafts 6. Guard 7. Student 8. Daily laborer 9. Carpentry/Construction worker 10. Other (specify**)** **_____**
214	How long has your husband stayed in this Kebele?	1. Been here since birth 2. _____month(s)/_____Year in this Kebele 3._____month(s)_____Year in other Kebeles in Butajira DSS? Name of Kebele where he resided_____
215	What is the major livelihood for your household?	1. Agriculture 2. Trading/Service 3. Public service 4. Other (specify)_____
216	If 1 for Q214, what is the size of farming plots your household currently owns?	___(*Timad*)
217	If 1 for Q214, How many oxen does your household own?	___Number of oxen
218	If 1 for Q214, Do farm animals live together with domestic animals?	1. Yes 2. No
219	If 1 for Q214, How many quintals of crop does your household produce in the last harvesting season?	___ (*quintals*)
220	What is the estimated annual income for your household?	____Birr (Convert the income in kind to cash income for rural families _____ _____
221	Do you have a functional transistor radio?	1. Yes 2.No
222	How frequent did you listen to the radio?	1. Everyday 2. Frequently 3. Occasionally 4. Rarely 5. No
223	Did you read a Magazine/News paper?	1. Yes, frequently 2.Yes, rarely 3. No

224	Does your household own the house in which you are living?	1. Yes 2. No
225	What is the Floor type of your house?	1. Earthen floor 2. Cemented floor/marble/bricks 3. Tiled floor 4. Other (specify)____
226	What is the type of roof for your house?	1. Iron sheet with ceiling 2. Iron sheet without a ceiling 3. Thatched grass
227	How many rooms (*excluding the kitchen*) does your house have?	_____Number of rooms
228	Does your house have windows?	1. Yes 2. No
229	What is the size of your household?	___ (*usual members)*
230	How many of these household members are women of reproductive age? (15-49 years)	____Women in RH group
231	What is the common source of potable water for your household?	1. Pipe 2. Protected well 3. Protected spring 4. Unprotected well 5. Unprotected spring 6. River 7. Pool/Pond 8. Other (specify)_____
232	What is the type of your toilet facility?	1. None 2. Private Pit 3. Pit shared with other households 4. Private VIP 5. VIP shared with other households 6. Private flashed with water 7. Share flashed with water 8. Other (specify)_____
233	Where does your household dispose garbage?	1. Open field 2. Pit dug for the purpose 3. Burn it 4. Municipality 5.Other (specify)_____
234	When you are sick who will decide to take you to health facilities for medication?	1. Husband 2. My self 3. Both 4. Elderly Kins 5. Other (specify)_____
235	When an under 5 child is sick at your household who decides to take him/her to health facilities for medication?	1. Husband 2. Myself 3. Both 4. Elderly Kins 5.Other (specify)_____

236	Who will decide on the type of food to be prepared for children?	1. Husband 2. Myself 3. Both 4. Elderly kin 5.Other (specify)_____
237	Who will decide on major household expenditure?	1. Husband 2. Myself 3. Both 4. Elderly kin 5.Other (specify)_____
238	Has there been any food shortage in your household in the past 3 years?	1. Yes 2. No
239	If there were food shortages in your household when did you usually encounter such shortages?	1. During the rainy season 2. During the dry season 3. Throughout the year 4. Other (specify)_____
240	If there was any food shortage in your household did any member of your household died of food shortage in the last five years?	1. Yes 2. No
241	Was there any member of your household who moved out of your area of abode due to food shortage in the past 5 years?	1. Yes 2. No
242	Was there any member of your household who was forced to ask for money due to food shortage in the past 5 years?	1. Yes 2. No
243	How did you cope with the food shortage?	1.Eating small/Skipping meals 2. Borrowing from others 3.Receiving aid in cash/cereal 4.Head/other member migrated 5.Selling household assets 6. Eating commonly inedible items 7.Other (specify)_____
244	Did you have a garden to plant vegetables?	1. Yes 2. No
245	How do you use the vegetables?	1.We sell it all 2. We sell it partially 3. We eat it all 4. Other (specify)_____
246	Was there any family member receiving food aid last year?	0. No 1.Yes, emergency food aid 2. Yes, Safety net 3.Yes, food from work 4. No, we do not support food aid 5.Other (specify)_____ 6.Doo not know
247	Was there any family member involved in food aid in the past year?	1. Yes 2. No

248	What type of aid did you get in the food for work program?	1.Cearal 2. Cash 3.Cearal/Cash 4. Other (specify)
249	Did you receive any food aid from your district office in the past year?	1.Yes 2. No 3. DK

III. Migration

No	Question	Response
301	Where is your birth place?	1. Within the ten Kebeles 2. Outside the ten Kebeles in same districts 3. Outside study districts in same zone 4. In the same region 5. In a different region 6. Abroad (specify)_____
302	If your birth place is not within the ten Kebeles when did you start living in this Kebele?	302.1 Date of In-migration_____ 302.2 Duration since in-migration__(years).
303	If your birth place is not in these Kebeles, what was the type of your birth place?	1. Rural 2. Big town/ city 3. Small town
304	Have you ever been out of the ten Kebeles with the purpose of living elsewhere?	1. Yes 2.No
305	If yes to Q304 list five areas (name of town or if rural, district) where you have resided for 6 or more months?	305.1 District Names 305.2 Urban Centers 1._____1._____ 2._____2._____ 3._____3._____ 4._____4._____ 5._____5._____
306	Where have you been living outside of the ten Kebeles for a long time?	1. Outside the ten Kebeles in same districts 2. Outside study districts in same zone 3. In the same region 4. In a different region 5. Abroad (specify)_____
307	List five areas (name of town or (if rural) districts) in migrants to these Kebeles are coming from.	307.1 District Names 307.2 Urban Centers 1._____1._____ 2._____2._____ 3._____3._____ 4._____4._____ 5._____5._____
308	What do you think are problems facing in-migrants to these Kebeles from the above	A. Difficulty to assimilate with the local people

	areas in Q307?	B. Environmental hazards (Dry weather) C. Frequent disease episodes D. Shortage of farming land E. Bad health behaviors F. Poor shelter G. Poor familial ties H..None I.other (specify)_____
309	What good opportunities do in-migrants to these Kebeles would encounter?	A. A community to which can easily assimilated B. Conducive living environment (weather) C. No disease episode D. Good/Farming land E. Good health behavior F. Good shelter G. Good familial ties H. None I. Other (specify)_____
310	If you are an in-migrant, what is the main reason that pushed you from your previous area of residence?	1. Absence of education facilities 2. Marriage/Dissolution 3. Absence of health facilities 4. Absence of employment opportunities 5. Shortage of arable land/Oxen to farm 6. Left area of abode together with my family 7. Draught/Famine or other natural calamity 8. Community pressure due to religion/ethnicity/political difference 9. Conflict within family or neighbors 10. Death of a caring Kin 11. Villagization/Resettlement 12. Other (specify) _____
311	If you are an in-migrant, what factors pull you to reside in surveillance Kebeles?	1. Availability of educational facilities 2. Availability of educational facilities 3. Marriage 4. Availability of employment opportunities 5. Availability of Arable land/Oxen 6. To join family living in these Kebeles 7. Join people with the same community outlook (religion, politics, etc.) 8. Villagization/ Resettlement 9. Other (specify)_____

312	Did you have a kin or neighbor living in these Kebeles before you decided to come to this area?	1. Yes 2. No
313	If yes, how do they influence your decision to come to these Kebeles?	1. Gave all the required information 2. Assisted me economically 3. Decide for me to move into this place 4. Arranged shelter for me 5. Found a job for me 6. Facilitated my marriage 7. Other (specify)_____
314	Mention five common destination areas of out-migrants from this Kebele?	314.1 District Names 314.2 Urban Centers 1._____1._____ 2._____2._____ 3._____3._____ 4._____4._____ 5._____5._____
315	What is the main reason for out-migrants to choose these destination areas?	1. Kinship ties 2. Employment opportunities 3. Good ecology 4. Education facilities 5. Health facilities 6. Abundant farming land 7. Other (specify) _____

IV. Fertility and child mortality

No	Question	Response
401	Did you ever give birth to a live born child?	1. Yes 2. No
402	If you give birth to a child, what was your age at first birth?	____age at first birth
403	What is the total number of children ever born to you? (Please include stillbirths, perinatal deaths, died, living elsewhere, married, got employment elsewhere)	402.1 Male _____ 402.2 Female ____ 402.3 Total_____
404	How many are living with you?	403.1 Male _____ 403.2 Female ____ 403.3 Total_____
405	How many are living elsewhere?	404.1 Male ___ 404.2 Female ___ 404.3 Total____
406	Did you ever have a dead child or a still birth?	1. Yes 2. No
407	If yes to Q405, how many are dead? How many are still birth?	407.1 Male ___ 407.2 Female ___

		407.3 Total____
408	How many stillbirths did you have?	408.1 Male ___ 408.2 Female ___ 408.3 Total____
409	Total number of children ever born?	_____CEB

Table of Birth History of Women

410	411	412	413	414	415	416	417	418	419
Full Name (Start from the child born very recently)	**Was__ a twin?** 1.Single 2.Twin	**What was the Sex___?** 1.Male 2.Female	**What is the DOB__?**	**What is the Age__?**	**What is the Survival status of____?** 0. Dead 1. Alive	**If__ died, what was theage at death?**	**If the child is under five years, Was ___ immunized?** 1.Fully 2.Partially 3.No	**Where was ___delivered?** **1. Home 2. Hospital 3. Other facility 4. relatives home 5 Other**	**Who assisted to deliver___?** **1. HP 2. TBA/TTBA 3. Relatives 4. Neighbors 5. Other**
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***For infants under the age of 12 months record in months, for neonates in days and for all others in years and specify this.**

No	Question	Response
420	Did you have any birth in the past 5 years?	1. Yes 2. No
421	Has your menstrual period returned since the birth of the last child?	1. Yes 2. No
422	How many months after the birth of last child did you not have a period?	____months
423	Have you resumed sexual relations since the birth of your last child?	1. Yes 2. No
424	For how many months after the birth of your last child did you not have sex?	**_____months**
425	Did you have any birth in the past 3 years?	1. Yes 2. No
426	How many children did you give birth in the past 3 years?	426.1 Male_____ 426.2 Female_____ 426.3 Total_____
427	Did you have any birth in the past 3 years?	1. Yes 2. No
428	How many children did you give birth in the past 3 years?	428.1 Male_____ 428.2 Female_____ 428.3 Total_____
429	Did you ever breast feed your children?	1. Yes 2. No
430	Did you squeeze out and throw away the first milk for the last child?	1. Yes 2. No
431	How long have you exclusively breast fed your last born child?	___(months)
432	If you wean breast feeding to the child born last, what is the main reason?	1. The child is growing 2. Child refused 3. Working made it difficult 4. Sickness 5. The volume of breast was small 6.Other (specify)_____
433	When was your last menstrual period?	_____weeks ago
434	From one menstrual period to the next, are there certain days when a woman is more likely to become pregnant if	1. Yes 2. No 3. DK

	she has sexual relations?	
435	When is this time at which women will likely be pregnant if they have sex?	1. Just her period begins 2. During her period 3. Right after her period has ended 4. Half way between two periods 5. Other (specify) _____
436	Are you pregnant now?	1. Yes 2. No 3. Unsure
437	If yes, how many months pregnant are you now?	____Months
438	At the time you have you give birth to your last child did you want to have a baby THEN did you want to wait until later, or did you LATER or not want to have any (more) children at all?	1. Then 2. Later 3. Not at all
439	Would you like to have (a/another) child, or would you prefer not to have any (more) children?	1. Yes, have a/another child 2. No more 3. Says she cannot get pregnant 4.Undecided/Do not know
440	Before having a (another) child how long do you want to wait?	1___Month 2___year 3. want to have the child 4. Don't want to have a baby 5. Other(specify)_____ 6. DK 7. Wait until self dependent
441	How many (more) children would you like to have?	441.1 Male_____ 441.2 Female_____ 441.3 Total_____
442	Including those you currently have, how many children you want to have?	441.1 Male_____ 441.2 Female_____ 441.3 Total_____ 98. Up to God
443	Are you currently breastfeeding?	1.Yes 2. No
444	Did you ever have an abortion, miscarriage or still birth?	1. Yes 2. No

445	Did you have an abortion, miscarriage or still birth in past 5 years?	1. Yes 2.No
446	When did you have such pregnancy terminations in the past 5 years?	Month___Year____
447	How many months pregnant were you when your pregnancy terminated in such away?	_____months
448	Was there someone else to care for your last child at your household?	1. Yes 2.No
449	Was there a sibling at your household to care for your last child?	1. Yes 2. No
450	Did you prefer one sex over another for your children?	1. Yes 2. No
451	Which sex did you prefer?	1. Male 2. Female 3. Indifferent

V. Contraception

501. Have you ever heard about (METHOD)?	**RESPONSE**	**502. Have you ever used (METHOD)?**
1. Female sterilization: Women can have an operation to avoid having more children.	1. yes 2. No	1. yes 2. No
2. Male sterilization: Men can have an operation to avoid having more children.	1. yes 2. No	1. yes 2. No
3. Pill: Women can take a pill every day to avoid becoming pregnant.	1. yes 2. No	1. yes 2. No
4. IUD: Women can have a loop or coil placed inside their uterus by a doctor or a nurse.	1. yes 2. No	1. yes 2. No
5. Injectables: Women can have an injection by a health provider that stops them from becoming pregnant for one or more months.	1. yes 2. No	1. yes 2. No
6. Inplants/Norplants: Women can have several small rods placed in their upper arm by a doctor or	1. yes 2. No	1. yes 2. No

nurse which can prevent pregnancy for five or more years.		
7.Condom: Men can put a rubber sheath on their penis before sexual intercourse	1. yes 2. No	1. yes 2. No
8. Diaphragm/Foam/Jelly: Women can place a sheath and/or a suppository/tablet/jelly/cream in their vagina before intercourse.	1. yes 2. No	1. yes 2. No
9. Standard day method: Women can use a cycle of beads to count the days they are most likely to get pregnant and avoid sexual Inter course during those days.	1. yes 2. No	1. yes 2. No
10.Lactational Amenorrhea Method (LAM)	1. yes 2. No	1. yes 2. No
11. Rhythm Method: Every month that a woman is sexually active she can avoid pregnancy by not having sexual intercourse on the days of the month she is most likely to get pregnant.	1. yes 2. No	1. yes 2. No
12. Withdrawal method: Men can be careful and pull out before climax.	1. yes 2. No	1. yes 2. No
13. Emergency Contraception: women may take high dose pills within 24/72 hours of coitus. In some instances IUD may be used instead of pills.	1. yes 2. No	1. yes 2. No
14. Other method: Have you heard of any other ways or methods that women or men can use to avoid pregnancy? Specify_____	1. yes 2. No	1. yes 2. No

No	Question	Response
503	Do you support the use of contraceptive methods?	1. Yes 2. No
504	What are your main reasons for not supporting family planning use?	1.Want to have many children 2. Religion 3.Harms my health 4.Want to protect myself from attach of families with many children 5.To increase my clan size 6.Other(specify)_____
505	Did your partner support the use of contraceptives?	1.Yes 2. No
506	What are your partner's main reasons for not supporting family planning use?	1.Want to have many children 2. Religion 3.Harms my health 4.Want to protect myself from attach of families with many children 5.To increase my clan size 6.Other(specify)_____
507	Are you currently doing something or using any method to delay or avoid getting pregnant?	1. Yes 2. No

508. Which (METHODS) are you currently using?	Yes, I am **(**my partner is) currently using.	No, I am not (my partner is not) currently using.
1. Female sterilization	Yes	No
2. Male sterilization	Yes	No
3. Pill	Yes	No
4. IUD	Yes	No
5. Injectables	Yes	No
6. Implants/Norplants	Yes	No
7. Condom	Yes	No
8. Diaphragm/Foam/Jelly	Yes	No
9. Standard Days Method	Yes	No
10. LAM	Yes	No

11. Female Condom	Yes	No
12. Withdrwal	Yes	No
13. Emergency contraceptive	Yes	No
14. Other (Specify)_____	Yes	No

No	Question	Response
509	If you are not currently using contraceptives, were there problems of accessing contraception in your area while you wanted to have it?	1. Yes 2. No
510	What is the main barrier in accessing this contraceptive?	1.There are frequent stock outs 2. No trained health personnel in giving them 3. The place of delivery is far 4. I have no enough money to get the service 5. I do not want it due to religious reason 6. Other (specify)
511	How many children did you have when you used contraception for the first time?	____Children 98. Never used FPM
512	The last time you obtained (CURRENT METHOD IN Q506), how much did you pay in total, including the cost of the method and any consultation you may have had?	____ (*birr)*
513	What month and year did you start using (CURRENT METHOD) continuously?	__Month __Year
514	For how long have you been using (CURRENT METHOD) now without stopping?	___years
515	Where did you obtain (CURRENT METHOD) the last time?	01. Government Hospital 02. Health Center 03. Health post 04. Private clinic 05. Non-governmental hospital 06. Government Pharmacy 07. Private Pharmacy 08. Private health personnel 09. Friends/families/relatives 10. Shop 11. Other (specify) _____
516	When you obtained (CURRENT METHOD) the last time,	1. Yes 2. No

	were you told about side effects or problems you might have with the method?	
517	Were you told by a health facility/family planning worker/ reproductive health agent about side effects or problems you might have with the contraceptive method when you use it the last time?	1. Yes 2. No
518	Were you ever told by a health facility/family planning worker/ reproductive health agent about other methods of family planning that you could use?	1. Yes 2. No
519	Do you know of places where you can obtain a method of family planning?	1. Yes 2.No

520. Where is that?

Sources of Contraceptives/Facilities	Do you obtain_____FPM?
1. Government hospital	1. Yes 2.No
2. Health Center	1. Yes 2.No
3. Health post	1. Yes 2.No
4. Private clinic	1. Yes 2.No
5. NGO hospital/Clinic	1. Yes 2.No
6. Government Pharmacy	1. Yes 2.No
7. Private Pharmacy	1. Yes 2.No
8. Private health personnel	1. Yes 2.No
9. Friends/Families/Relatives	1. Yes 2.No
10. Shop	1. Yes 2.No
11. Other (specify)_____	1. Yes 2.No

No	Question	Response
521	Did you ever discontinue the use of a family planning method?	1. Yes 2. No
522	If yes, why do you decide to discontinue the use of family planning method?	1. To have a child/more child 2. Husband refused 3. Parents/Family refused 4. Difficult to find the method convenient for use 5. Due to health problem 6. No need to use/Abstained 7. Switch to another method 8. Fear of side effects 9. Infertility 10. Other (specify)_____
523	In the past 12 months, were you visited by a community based health agent/distributor who talked to you about family planning?	1. Yes 2. No
524	If yes, what is his/her level of training?	A. Kebele Health Promoter B. HEW C. CBRHA D. TBA E. Health Workers F. Other (specify) _____
525	In the past 12 months, have you visited a health facility for care for yourself (or your children)?	1. Yes 2. No
526	Did any staff member at the health facility speak to you about family planning methods?	1. Yes 2. No
527	Do you think that it is easy to get any kind of contraceptives you want to use?	1. Yes 2. No
528	Which contraceptive do you prefer most?	1. Female sterilization 2. Male sterilization 3. Pill 4. IUD 5. Injectables 6.Implants/Norplants 7. Condom 8. Diaphragm/Foam/Jelly 9. Standard days method 10. LAM

		11. Rythem 12. Other (specify) _____ 13. Do not want to use
529	Why do you prefer this contraceptive?	1. It is less costly 2. It is easy to have it 3. It is not forgettable 4. People doesn't know I am using it 5. I can find it at my proximity 6. It is reliable/effective 7. Other (Specify)_____
530	How do you rate the cost of this contraceptive?	1. Very expensive 2. Expensive 3. Moderate 4. Cheap 5. Very cheap
531	How far are the places at which this contraceptive is delivered?	1. At home 2. Less than 30 minutes 3. 30 minutes to 1 hour 4. 1-2 hours 5. 2 plus hours
532	Have you ever discussed the use of contraception with your partner?	1. Yes 2. No
533	Did he approve it?	1. Yes 2. No
534	Who else other than your husband influences your decision to use contraceptives?	1. No one else 2. Husband's parents 3. My parents 4. Religious leaders 5. Other (Specify)_____
544.1	Check if 1 is circled in Q507	1. Yes 2. No
535	If you are not currently using contraceptives do you intend to use it in the future?	1. Yes 2. No
536	If you are not using contraception in the future what are your main reasons for not using it?	**1.** Infrequent/no sex 2. Sterilized/Menopausal 3. Wants as many children as possible 4. Respondent opposed 5. Husband opposed 6. Others opposed

		7. Religious opposition 8. Knows no method 9. Knows no source 10. Health concerns 11. Lack of access/Far 12. Costly 13. Inconvenient to use 14. Disturbs the body 15. Method not available 16. Fear of side effects 17. Infertility 18. Other (specify)_____
537	During unexpected sexual act, are you aware that there are emergency contraceptives to prevent pregnancy if taken within 72 hours?	1. Yes 2. No
538	If yes to Q 537, where do you here about emergency contraceptives?	A. Government hospital B. Health Center C. Health Post D. Private Clinic E. NGO Hospital F. Government Pharmacy G. Private Pharmacy H. Health personnel, private I. Friend/Relative/Family J. Shop K. Other(specify)_____
539	Where do you find emergency contraceptives if you would like to use them?	A. Government hospital B. Health Center C. Health Post D. Private Clinic E. NGO Hospital F. Government Pharmacy G. Private Pharmacy H. Health personnel, private I. Friend/Relative/Family J. Shop K. Other(specify)_____

Thank you So Much!

Focus Group Discussions Guide

Guiding Questions

1. How do you understand your community problems?
2. Please describe the problems related to population growth and development
3. What are the main reasons for the high fertility in this area?
4. What should be done by each resident, the community and government to reduce the high fertility level?
5. What are the main reasons for the high out-migration in this community in this area?
6. What should be done by each resident, the community and government to reduce the high out-migration in this area?
7. What are the main reasons for the high under five mortality in this area?
8. What should be done by each resident, the community and government to reduce the high under five mortality in this area?
9. What are the relationships between high fertility and out-migration in your community?
10. In your opinion, what are the relationship between high fertility and child mortality in your community?
11. In your opinion, what are the positive and negative consequences of out-migration on child mortality in your community? Why?

13. Declaration

I, the under signed, declare that this is my original work, which has never been submitted to this or any other university, and that all the resources and materials used for the thesis have been duly acknowledged.

Name: Wubegzier Mekonnen, M.A.

Signature: _____

Date: 31 May 2012

Place: School of Public Health, Addis Ababa University

Date of submission: 28 June 2012

This thesis has been submitted for examination with my approval as a university supervisor.

Name: Alemayehu Worku, PhD

Signature: _____

Date: 28 June 2012