Correlates of High Risk Fertility Behaviour in Ethiopia: A Multilevel Analysis of the 2011 Ethiopian Demographic and Health Survey Data

Eshetu Gurmu[1,2]   Tariku Dejene[1]
1.Center for Population Studies
2.Institute of Development and Policy Research
Addis Ababa University

Abstract

High risk fertility is one of the main public health concerns in Ethiopia. This study examines factors affecting high risk fertility (i.e. child birth at early (less than 18 years) and late (greater than 35 years), birth taking place within shorter birth interval (less than 24 months) and too many births (greater than four children)) based on last births taking place in the five years preceding the 2011 demographic and health survey data of Ethiopia collected among women in the age group 15–49 years. Percentage distribution was used to describe the data while a multilevel logistic regression model was fitted to identify the predictors of high risk fertility behaviour. The result shows that 58.7% of Ethiopian women were experiencing high risk fertility with considerable variation among the rural (62.1%) and urban (39.5%) residents. The likelihood of exposure to high risk fertility was significantly lower among educated women and those having high perception of HIV risk assessment but higher among that experiencing child loss and living in Somali region. The results generally indicate that high risk fertility behaviour in Ethiopia is partly explained by respondents' educational attainment, survival status of children born to a woman, region of residence and neighbourhood factors that shape the perception of women about their exposure to risky situations. Awareness raising efforts should thus consider the socio-cultural contexts in which behavioural change occurs to tackle exposure to high risk fertility in addition to promoting the status of women to reduce their dependency on offspring at later ages.
Keywords: High risk, fertility, child loss, Ethiopia

Corresponding author email: eshetugurmu@gmail.com
Background
Even though multiple efforts have been made to reduce maternal mortality rates, adverse reactions of pregnancy and childbirth are still the leading causes of death and disability for child bearing women in a number of developing countries (Nour, 2008). Maternal Mortality is one of the high public health concerns, as it is a preventable and curative health policy intervention (Garenne et al., 1997; Nikiema, Kameli, Capon, Sondo, & Martin-Prével, 2010) . The tragedy, however, is the inability to prevent such preventable death that had resulted in 287,000 maternal deaths globally in 2010 (Merdad, Hill, & Graham, 2013). Surprisingly, more than half of the maternal deaths are taking place in Africa (Hogan et al., 2010), and this is not a mysterious phenomenon, for the cause is preventable.

Improving health services to promote maternal wellbeing and to reduce maternal mortality is one of the key concerns of many international summits and conferences since 1980s (Hogan et al., 2010). Maternal death issues were also among the Millennium Development Goals (MDG 5) adopted in the Millennium Summit which was held in 2000 aiming at improving maternal health and reducing maternal mortality rate (MMR) by three-quarters for the year 2015 (UN, 2010). In spite of such prominent efforts to implement Safe Motherhood Initiatives and strategies to achieve the fifth MDG, a number of developing countries could not withstand higher hardships of maternal mortality due to high fertility norm predisposing the status of women and their wellbeing including their survivorship (Zureick-Brown et al., 2013). As a result, none of the sub-Saharan African countries had managed to decrease maternal mortality by three quarters in the year between 1990 and 2015 (Merdad et al., 2013). Studies conducted in Burkina Faso by Savadago *et al* (2014), for instance, revealed that severe socio-economic deprivation and resistant cultural practices had created inauspicious conditions to prevent the primary causes of maternal deaths.

Because of adopting and implementing the Safe Motherhood Initiative programs, a number of developing countries including Ethiopia had begun to offer maternal and childcare services for free or at reduced fee rates (Ministy of Health [Ethiopia], 2006). The Safe Motherhood Initiative program has included service provision that primarily focused on family planning, antenatal and delivery care, adolescent health, HIV/AIDS and STIs counselling and testing as well as providing food supplements to pregnant mothers with rich iron and vitamins. The motive was to encourage women in the reproductive age, to make use of contraception, to avoid unwanted and unintended pregnancies, and to benefit from the skilled care during the periods of pregnancy and delivery. To expand such access to maternal health care and provision of family planning services, the Ethiopian

Government has adopted the "Health Extension Program" in 2004 by deploying at least two health extension workers in each of the rural villages (Ministry of Health [Ethiopia]., 2007). The Health Extension Program has about 16 packages of which four of them are directly dealing with maternal health care services: first aid emergency measures; maternal, new born and child health; family planning; and immunization, nutrition, and adolescent reproductive health. Through effective implementation of each package, the widely accessible health service provision has improved the maternal and child health care to some extent. However, there are still gaps in making use of such services to the betterment of mothers and new-born children in the country (Memirie, Verguet, Norheim, Levin, & Johansson, 2016).

The overall objective of the study is, therefore, to identify individual and neighbourhood characteristics affecting high risk fertility behaviour in Ethiopia. Specifically, the study attempted to assess the mechanisms through which individual and neighbourhood variables contribute to high risk fertility behaviour in the country. It also evaluated the level of concern in line with the effectiveness of policy and program implementation strategies adopted at the national level.

High risk fertility is the outcome of several factors such as exposure to unintended pregnancy due to limited or no access to reproductive health services including contraceptive use (Guzzo & Hayford, 2011). It is also exacerbated by less desire and motivation to use existing services effectively (Akinyemi et al., 2015) and the effect of infant/child mortality on the reproductive intention of couples (Bean, Mineau, & Anderton, 1992). Unintended pregnancy, the outcome of woman's failure to plan child bearing or a failure to carry out the plan carefully, often leads to high risk fertility among women in both married and unmarried status. Women who are not using highly effective coitus independent methods of contraception are at higher risk of exposure to pregnancy at any age than those who take precarious measures (Nanda, 2009). Psychologists such as Brown and Eisenberg (1995), for example, argued that individual psychological characteristics such as self-efficacy and risk-taking tendencies are determinants of unintended fertility often influenced by the perception and motivation of individuals to control over desired outcomes, in general, and associated factors affecting the view of the group to which they belong, in particular.

Social norms and values that affect child birth also call for looking at the effects of neighborhood variables on high risk fertility. Neighborhood theories proposed by Ellen and colleagues (1997)] state that individual behaviors are influenced by neighborhood variables through neighborhood-based networks and norms, neighborhood institutions and resources, as well as stresses in the physical and social environment. Supporting the effects of neighborhood institutions and resources on effective utilization of existing facilities and services, Adler and colleagues (2012) and Ross and Mirowsky (2001) stated that poorer and less organized neighborhood are typically disadvantageous for the situation makes availability of well-educated and experienced medical doctors much difficult, provides poor and inadequate transportation system to arrive at service delivery points on time, and accommodates high crime rate to make people fearful to travel. Looking at the effects of neighborhood factors from different angles, Sampson and colleagues (2002) also stated that neighborhood-based social networks have tremendous effect on the health seeking behavior of women as the social relationship at local level determines the scope of collective trust and feeling of connectedness among neighbors in achieving common goals (e.g. cleaning the environment, healthy behavior and good schools) and sharing information that deals with child care and other resources that affect the health and reproductive behavior of residents in the community. According to them, if someone's friends take alcohol and have multiple sex partners, the person also has a greater chance of behaving in the same manner; i.e. influentially practical behaviors of a neighbor could shape other neighbors' behaviors and actions in the system of a possible wavelength.

The risk-insurance hypothesis on fertility, on the other hand, states that among a population living under harsh poverty conditions, high risk fertility behavior is a function of the generalized insurance against any uncertainty in the future (Robinson, 1986)[21], than access to reproductive health services and the intentions to use the services. Whilst explaining the relationship between family and fertility in developing countries, Cain (1982), for example, stated that in the absence of any other form of insurance for the poor, having as many children as possible is the only way to mitigate risks and uncertainties. The variation in the level of fertility among a population living in developing countries, according to Cain (1982), is mainly driven by the variation in the perception of risks of losing children and widening the opportunities to overcome such disastrous conditions. Given the significant impact of child loss experience on fertility (Bhat, 1998), the motivation of women to produce many children is stronger than their husbands (Mcallister, Gurven, Kaplan, & Stieglitz, 2012). An alternative way of reducing the effect of child mortality on high risk fertility is, thus, not only increasing access to reproductive health services including wider distribution of contraceptive supplies but also increasing the opportunity cost of children to women by enhancing their educational and employment status that reverses the effects of 'climate of risk' by providing greater present and guaranteed future economic security for the poor families (Cain, 1982).

As indicated above, the high risk fertility behavior due to the outcome of high risk pregnancy that requires closer monitoring than any pregnant woman is observed to be a function of both providing effective and

efficient reproductive health services including family planning supplies and improving the status of women that affects their future life and support at older ages. Given the fact that high risk fertility needs frequent visits of the primary care givers to avoid any possible complications during pregnancy and delivery aimed at minimizing loss of lives among mothers and children, factors affecting high risk fertility behavior shall thus be studied within the framework of promoting sustainable development which should result in dynamic behavioral changes and accelerating the socio-economic position of women living in the country.

Methods

The data for the present study was extracted from the 2011 Ethiopian Demographic and Health Survey (Ethiopian DHS). From the DHS data, all women who had their recent birth in the last five years preceding the survey were included in the analysis. However, all of the interviewed women were considered for the purposes of computing latent variables from existing data. As a result, the analyses were carried out using 7764 women who had their recent births in the five years preceding the survey period and living in 596 enumeration areas (EAs). The outcome variable of this study is high risk fertility behaviour of women in the reproductive age group. High risk fertility behavior was constructed using four different indicator variables; namely, closely spaced birth (a birth to birth interval of less than 2 years), too many births (births of order 5 or higher), too early (age of mother at birth of the baby is less than 20 years), and too late (age of mother at birth of the baby is greater or equal to 35 years). If any one of the four criterion mentioned above were met, a woman is considered to have experienced high risk fertility behavior. As a result, a dummy variable was constructed to have a value 1 if a woman has experienced a high risk fertility behavior and 0 otherwise.

Besides, three groups of predictor variables were included in the analysis. The first were individual characteristics such as age, marital status, employment status, educational status, and child loss experience of women. The second were neighbourhood characteristics akin to proportion of women with secondary and above level of education, magnitude of delivery at health facility, employment rate of women, HIV risk assessment and difficulty of access to health facility by women. The third group of predictor variables were house-hold and community variables measured on household wealth status and place and region of residence. The computation of neighborhood characteristics was done for the complete dataset, that is, all interviewed women were considered for the computation of neighborhood variables. The proportion of women with secondary and above level of education in the neighborhood was computed as the ratio of women having educational level of secondary and above level to the total number of women interviewed from the neighborhood. A similar procedure was followed to compute employment rate of women in the neighbourhood, magnitude of delivery at health facility, and difficulty of access to health facility. HIV risk assessment was taken as a composite measure constructed from abstinence (not having sex at all outside marriage), faithfulness (having only one sexual partner who has no other partner/s) and consistent use of condom. Accordingly, the ratios and HIV assessment scores of the 596 enumeration areas were reclassified into three quintile groups for the final analysis.

A multilevel logistic regression analysis was used to identify the predictors of high risk fertility behaviour. The levels considered were neighborhood (enumeration area) and individual women characteristics in that order from second to first. Data were analysed using STATA 14, and a significance level of 5% was used as a cut off value to declare statistical significance in the multivariable analysis. The results of univariate, bivariate and multivariate analysis were displayed using tables. In addition, level one and two estimates of variances were displayed where appropriate.

Results

A total of 7,764 women who had their recent birth in the last five year preceding the survey were include in the analysis. A third of these women were illiterate, and 9 in 10 of them were in marital union. While half of them were not working at the time of the survey, only one-third of them had a cash paying job. Regarding child loss experience, women with child loss experiences made up a third of the women included in the study. Four in five of women were rural residents and two in five were living in poor households. Oromia, SNNP, Amhara, and Tigray regions contributed over 50% of the sample women for this study (Table 1).

From the data analysis, it was found out that three in five (58.7%) of women who had their recent birth in the last five years preceding the survey period (i.e. the 2011 DHS) were experiencing a high risk fertility behaviour. High risk fertility behaviour of these women showed a greater variability across the various individual, neighbourhood, and community characteristics. A disproportionately declining trend in high risk fertility behaviour with an increase in educational status of women was also witnessed. Three in five (63.0%) of illiterate women, slightly over half (54.0%) of women with primary education, and one in four (26.5%) of women with secondary and above education experienced a high risk fertility behaviour (Table 1). A disparity in the level of high risk fertility behaviour was also noted among women with an experience of child loss as high as 81.0%, and women who had no experience of child loss were comparatively low with a 47.0% measure.

From Table 1 above, there was no noticeable pattern observed in high risk fertility behaviour over

marital and employment statuses of women. A remarkable pattern in high risk fertility behaviour, on the other hand, was noticed when considering household wealth status. The result showed that women living in poor households had an elevated possibility of high risk fertility behaviour (65.0%) as opposed to women living in rich households (45.9%). The result, in addition, revealed that the prevalence of high risk fertility behaviour was higher among women living in rural areas (62.1) than women residing in urban areas (39.5%). The distribution of high risk fertility behaviour over regions showed a considerable amount of variation. That is, though the prevalence was smaller to moderate in urban dominant regions such as Addis Ababa (24.6%) and Dire Dawa (47.2%), the rate was higher in pastoral regions including Somali (75.7), Benishangul Gumuz (64.8) and Afar (62.6%) (Table 1).

Table 1: Distribution of respondents by high-risk fertility status in Ethiopia: 2011

Characteristics	Categories	Number (Unweighted)	High Risk Fertility	
			No	Yes
			%	%
Education	Illiterate	5,184	37.0	63.0
	Primary	2,095	46.0	54.0
	Secondary+	485	73.5	26.5
Marital Status	Single	66	58.3	41.7
	Currently married	7,043	40.4	59.6
	Formerly in union	655	49.3	50.7
Employment	Unemployed	4,034	39.7	60.3
	Unpaid	860	39.5	60.5
	Cash Paid	2,546	44.8	55.2
	Paid in Non-cash	324	37.5	62.5
Child loss experience	No	5,156	53.0	47.0
	Yes	2,608	19.0	81.0
Proportion of women with secondary and above education in the EA*	Low	4,092	34.0	66.0
	Medium	2,014	44.0	56.0
	High	1,658	55.2	44.8
Proportion of women who delivered at health facility in the EA	Low	3,744	36.3	63.7
	Medium	2,091	40.1	59.9
	High	1,929	57.3	42.7
Proportion of women who had difficulty of accessing health facility in the EA	Low	1,889	54.2	45.8
	Medium	2,805	38.0	62.0
	High	3,070	37.0	63.0
HIV Risk Assessment among women in the EA	Low	3,108	36.3	63.7
	Medium	2,646	39.9	60.1
	High	2,010	48.3	51.7
Employment rate among women residing in the EA	Low	2,952	38.3	61.7
	Medium	2,390	41.5	58.5
	High	2,422	3.0	57.0
Place of residence	Rural	6,251	37.9	62.1
	Urban	1,513	60.6	39.4
Household wealth status	Poor	3,107	35.0	65.0
	Middle	2,832	39.4	60.6
	Rich	1,825	54.1	45.9
Region	Tigray	847	41.5	58.5
	Afar	714	37.4	62.6
	Amhara	965	44.2	55.8
	Oromia	1100	39.0	61.0
	Somali	559	24.3	75.7
	Benishangul-Gumuz	674	35.2	64.8
	SNNP+	1053	40.3	59.7
	Gambela	608	45.0	55.0
	Harari	440	46.1	53.9
	Addis Ababa	348	75.4	24.6
	Dire Dawa	456	52.8	47.2
Total		**7764**	**41.3**	**58.7**

+ SNNP=Southern Nations and Nationalities People.   *EA= Enumeration Area

The pattern in the prevalence of high risk fertility behaviour was assessed over selected neighbourhood characteristics such as proportion of women with secondary and above level of education, the magnitude of delivery at health facility, and HIV risk assessment. Accordingly, the prevalence of high risk fertility behaviour had steadily declined as the proportion of women with the aforementioned characteristics in the neighbourhood showed an increase in magnitude (Table 1). However, in neighbourhoods where access to health facility had been declared as difficult by women, the experience of high risk fertility behaviour was higher (63.0%); whereas in neighbourhoods where access to health facility was not a problem to women, the prevalence of such risk fertility was smaller (45.8%).

The result from the multivariable analysis displayed in Table 2 below showed that the relationship between high risk fertility behaviour and age of the respondent were quadratic in nature (notice that OR<1 for **age** and OR>1 for **squared age**). The likelihood of experiencing high risk fertility behaviour at early and late ages, the respondents claimed, was higher; while the risk was relatively low in the middle age groups (P<0.001). The estimates obtained for age were also consistent across the different models where age had been used as a control variable. Educational status of women was considered as a predictor variable that has a potential to influence high risk fertility behaviour. Accordingly, women who had any experience of attending formal education had exhibited a reduced likelihood of having a high risk fertility behaviour. Evidentially, the possibility of experiencing a high risk fertility behaviour among women who attended primary level of education (AOR=0.85 Table 2 Models 3, 4 & 5, P<0.01) and a secondary and above level of education (AOR=0.45 Table 2 Model 3, 4 & 5, P<0.001) were smaller than women who did not have any formal schooling.

In the gross effect model of marital status, single women and formerly married women had a reduced chance of experiencing high risk fertility than women who were in marital union of a contemporary. This advantage, however, was reversed for single women when other factors were put under control. The likelihood of high risk fertility behaviour among formerly married women was lower by 33-35% (AOR=0.67 Table 2 Model 5, AOR=0.66 Models 3 & AOR=0.65 Model 4, P<0.001) when compared to the experience of women in marital union. Although the employment status of women was observed to have a significant influence in the gross effect model and in Model 1, such statistically significant relationships have disappeared when neighbourhood and community variables were controlled. Likewise, child loss experience, an individual level characteristic that was introduced in the model, has rather shown a statistically verifiable influence over high risk fertility behaviour at all times. Women who had an experience of child loss were fourfold likely to have a high risk fertility behaviour (AOR=4.03 Table 2 Model 3, AOR=4.02 Model 4 and AOR=3.96 Model 5, P<0.001) than women who had no child loss experience.

Among the neighbourhood variables considered in this study, all except HIV risk assessment had exerted no influence on the variability of high risk fertility behaviour when a region of residence was controlled. Besides, those women who were living in a neighbourhood where there was better awareness (i.e. an average or above average level of awareness) about the different ways of ways of reducing HIV transmission were less likely to have had the experience of high risk fertility behaviour and the effect is statistically significant (AOR=0.83, P<0.01 and 0.71, P<0.001, Table 2 Model 5). A similar result was observed in the model where their residence was controlled with a better strength of measure of association for HIV risk assessment (AOR=0.77 & 0.68 Table 2 Model 4, P<0.001). The result from model 4 of Table 2, however, indicated that women who resided in neighbourhoods with a higher proportion of educated women were 21% less likely to have the experience of high risk fertility behaviour. Similarly, the magnitude of employment rate of women in the neighbourhood had also an association with a high risk fertility. But the rate of high risk fertility behaviour was reduced by 17% (AOR=0.83 Table 2 Model 4, P<0.001) for women living in neighbourhoods where an average or above average number of women had been employed than for women residing in neighbourhoods where they had less chance of being employed. Moreover, women who had been living in neighbourhoods with a better access to health facility were 0.83 times less likely to have experienced high risk fertility behaviour than those women who had been residing in neighbourhoods with average or less than average level of access to health facility.

Table 2: Multilevel logistic regression results of the likelihood of having exposed to high-risk fertility in Ethiopia: 2011

Variables and characteristics		Gross Effect		Model 1		Model 2		Model 3		Model 4		Model 5	
		COR	SE	AOR	SE	AOR	SE	AOR	SE	AOR	SE	AOR	SE
Age		0.09***	0.02	0.08***	0.01			0.08***	0.01	0.08***	0.01	0.08***	0.01
Age²		1.05***	0.01	1.05***	0.00			1.05***	0.00	1.05***	0.00	1.05***	0.00
Education	Illiterate	1.00		1.00				1.00		1.00		1.00	
	Primary	0.65***	0.04	0.70***	0.05			0.85**	0.06	0.85**	0.06	0.85***	0.06
	Secondary+	0.22***	0.04	0.27***	0.04			0.45***	0.07	0.45***	0.07	0.45***	0.07
Marital Status	Single	0.55*	0.15	0.66	0.21			0.77	0.25	0.77	0.25	0.87	0.28
	Currently married	1.00		1.00				1.00		1.00		1.00	
	Formerly in union	0.75**	0.07	0.62***	0.07			0.66***	0.08	0.65***	0.07	0.67***	0.08
Employment	Unemployed	1.00		1.00				1.00		1.00		1.00	
	Unpaid	1.08	0.10	0.87	0.09			0.94	0.10	0.94	0.10	0.97	0.11
	Cash Paid	0.84**	0.05	0.84**	0.06			0.94	0.07	0.94	0.07	0.92	0.07
	Paid Non-cash	1.08	0.15	0.76*	0.12			0.86	0.14	0.86	0.14	0.92	0.15
Child loss experience	No	1.00		1.00				1.00		1.00		1.00	
	Yes	4.99***	0.61	4.20***	0.30			4.03***	0.29	4.02***	0.29	3.96***	0.28
Proportion of women with secondary+ education in the EA	Low	1.00				1.00		1.00		1.00		1.00	
	Medium	0.73***	0.06			0.85**	0.06	0.94	0.08	0.93	0.08	1.00	0.08
	High	0.32***	0.04			0.59***	0.06	0.77**	0.10	0.79*	0.11	0.83	0.10
Proportion of women who delivered at health facility in the EA	Low	1.00				1.00		1.00		1.00		1.00	
	Medium	0.80**	0.06			0.95	0.07	0.99	0.08	1.00	0.08	0.97	0.08
	High	0.36***	0.04			0.67***	0.06	0.82*	0.09	0.84	0.10	0.86	0.10
HIV Risk Assessment among women in the EA	Low	1.00				1.00		1.00		1.00		1.00	
	Medium	0.63***	0.05			0.79***	0.06	0.77***	0.06	0.77***	0.06	0.83**	0.07
	High	0.44***	0.04			0.73***	0.06	0.67***	0.07	0.68***	0.07	0.71***	0.07

Variables and characteristics		Gross Effect		Model 1		Model 2		Model 3		Model 4		Model 5	
		COR	SE	AOR	SE	AOR	SE	AOR	SE	AOR	SE	AOR	SE
Employment rate among women residing in the EA	Low	1.00				1.00		1.00		1.00		1.00	
	Medium	0.59***	0.06			0.91	0.07	0.83**	0.07	0.83**	0.07	0.91	0.08
	High	0.72***	0.06			0.98	0.07	0.83*	0.08	0.83*	0.08	0.93	0.09
Proportion of women who had difficulty of accessing health facility in the EA	Low	0.45***	0.05			0.80**	0.07	0.82*	0.09	0.83*	0.09	0.91	0.09
	Medium	1.00				1.00		1.00		1.00		1.00	
	High	1.16*	0.09			0.96	0.07	0.92	0.07	0.92	0.07	0.93	0.07
Place of residence	Rural	1.00								1.00			
	Urban	0.34***	0.04							0.88	0.14		
Household wealth status	Poor	1.24***	0.08							1.05	0.08	1.04	0.08
	Middle	1.00								1.00		1.00	
	Rich	0.47***	0.04							1.08	0.13	1.01	0.11
Region	Tigray	0.93	0.12									0.83	0.12
	Afar	1.19	0.16									0.93	0.13
	Amhara	0.86	0.10									0.61***	0.08
	Oromia	1.00										1.00	
	Somali	2.18***	0.35									1.70***	0.27
	Ben-Gumuz	1.29	0.18									1.07	0.14
	SNNP	1.01	0.12									0.86	0.10
	Gambela	0.86	0.11									0.73**	0.11
	Harari	0.69*	0.10									0.99	0.16
	Addis Ababa	0.20***	0.04									0.44***	0.09
	Dire Dawa	0.57**	0.09									0.66**	0.11
Number (Unweighted)		7764		7764		7764		7764		7764		7764	
Number of EAs		596		596		596		596		596		596	
Var1-Level2				1.17**	0.05	1.13**	0.04	1.12	0.04	1.12***	0.04	1.04	0.03

*** P<0.001   ** P<0.01   * P<0.05   SE = Standard error; COR = Crude odd ratio; AOR = Adjusted odd ratio A further important variable of investigation was household wealth status because it had been influencing the variability in high risk fertility behaviour when considered alone. The data showed that there was a linear inverse relationship between household wealth status and risky fertility behaviour. This inverse linear relationship, however, disappeared when other variables were controlled. Interestingly, a place of residence had shown an association with the variability in the outcome variable as the prevalence of high risk fertility behaviour was much smaller among women living in urban areas than those living in rural areas in the gross effect model. Nevertheless, the introduction of other variables into the model nullified the influence of place of residence on high risk fertility behaviour. The outcome variable has also shown variability among the various administrative regions. The prevalence of high risk fertility behaviour among urban dominant administrative regions was smaller (AOR=0.44-P<0.001- & 0.66-P<0.01- for Addis Ababa & Dire Dawa-Model 5) as compared to Oromia region which was taken as a reference group. The behaviour was, however, more prevalent in Somali region (AOR=1.70 Table 2 Model 5,P<0.001). Nevertheless, a statistically significant association of the study variables did not exist in Harari region as can be seen from Table 2, Model 5, while a statistically significant result were identified in Gambella and Amhara regions: AOR=0.73 P<0.01, & 0.61 P<0.001, respectively.

Discussion

High risk fertility is one of the obstacles to tackle maternal and child mortality (Arps, 2007). It is one of the deterring factors on the efforts put by multiple parties to reduce the death of mothers and children. It is discovered that high risk fertility has the power to affect the desired rate at which a given population has to grow. It deteriorates the wellbeing of mothers and children by affecting their physiological capability and nutritional status resulting into poor health and competition among siblings. It hinders the vital efforts towards promoting the wellbeing of children and mothers in addition to the diminishing care and support to be given to the new born

child (Alam, 1995; Bøhler & Bergström, 1995; Tracer, 1991). The results of this study, in general, showed that individual level educational attainment, child loss experience of a respondent women, neighbourhood level risk assessment of respondent women about HIV epidemic, and region (a proxy variable for differences in socio-cultural setting and local administration's commitment to avoid unplanned and unwanted fertility) explained high risk fertility behaviour in Ethiopia.

Hopeful is that individual level educational attainment was inversely related to high risk fertility. Hence, education was identified as a decisive factor that can bring fundamental change in the positive fertility behaviour of women in a number of ways. Firstly, educated women look for quality children (i.e. better fed, educated and well reared) than a large number of children deprived of adequate care and support. Unlike this, uneducated women wish to have as many children as they could to maximize the chances of their survival and obtain support at later ages of life (Basu, 2002). As a result, the quality versus the quantity children trade-off which defined educated and uneducated women's perception of demand for children is one of the main factors affecting women's exposure to high risk fertility. This trade-off is usually supported by educated and uneducated men in many developing countries. Secondly, better educated women have adequate knowledge and the courage and power to use effective, efficient and consistent family planning methods to avoid unwanted and unplanned pregnancy (Bbaale & Mpuga, 2011). Hence, better-educated women are rarely exposed to the risks of high fertility number and behaviour. Thirdly, better-educated women often engage in high paying employments outside home which can bring better alternatives to childcare activities. For educated women, the opportunity cost of rearing children is very great compared to the level of tolerance of having multiple births, since they usually want to use most of their time to acquire knowledge and develop multiple skills. They always aspire to grow and develop in their careers (Basu, 2002; Cette, Dromel, & Méda, 2007). Fourthly, better-educated women have the power to resist socio-cultural pressures persistent in traditional societies that demand large family size and impose pregnancy at early and later ages of reproductive life (Adhikari, 2010). It is, thus, so possible to argue that the aforementioned factors collectively, jointly or categorically or independently have the power to reduce high-risk fertility among better-educated women; whilst those uneducated are victims of too often, short as well as early and late age pregnancies.

Previously married women are not at high-risk fertility behaviour mainly due to their irregular sexual exposures, and they exhibit a higher tendency to have safer sex practices in order to avoid unwanted and unplanned pregnancy (Chandra, Copen, & Mosher, 2013). Very unlikely have been to the unmarried women who could meet with high likelihood of risky fertility practices similar to currently married women as premarital pregnancy at early ages is often taken as an excuse of maximizing chances of marriage. Married women usually wish to have large family size to fulfil social and familial obligations related to affirming the marriage and validating the union (LeGrand, Koppenhaver, Mondain, & Randall, 2003). Above all, parenthood is one of the principal reasons for marriage in developing countries like Ethiopia (Langdridge, Sheeran, & Connolly, 2005).

Women experiencing loss of a child or children are greatly exposed to high risk fertility due to the prominent effects of a child's or children's death on fertility. The classic insurance effect plays a significant role in having more children within shorter birth intervals and at earlier or later ages to replace those children who died, and they usually want improve their prospects for replacement births even if some of them are to die (LeGrand et al., 2003). This strategy is contrary to the initiative of intensifying the efforts to safeguard child health and survival by investing more on few children (Yinger & Ransom, 2003). Well-nourished, better-cared and healthy children could survive more and be successful in their educational attainment and engage in the labour force than others who are given little care and attention due to high number (Bhat, 1998). In societies where child mortality is high, investment in child quality is unfortunately getting diminished because of the desire for more children to let some of them survive at the end. Consequently, high-risk fertility in most of the Sub-Saharan countries is becoming a function of uncertainties facing the survival status of children than the family planning and other reproductive health services made available to the nations.

Likewise, an inverse relationship between the level of neighbourhood who conduct HIV risk assessment and exposure to high-risk fertility were found out to be basic indications of behavioural change towards maintaining riskless fertility, and allocation of adequate resources and care to bring them up (Statham & Chase, 2010). For women living in neighbourhoods by conducting assessments of HIV risks at extensive levels, there is an already established social norm aimed at curbing risky behaviours to safeguard members of the family at a household level and the larger community at village, district or regional levels (Baylies, 2000). The ultimate goal of such "healthy and prosperous" women's concern is to improve the living condition of mothers and children than the reproductions under worst and hostile conditions (Gregson, Zhuwau, Anderson, & Chandiwana, 1998). Another explanation for the inverse relationship between the high perception of HIV risk assessment and high-risk fertility is the tendency of regulating unwanted and unplanned fertility through the use of effective and efficient family planning methods (Cooper, Heron, & Heward, 2007). Copper and his colleagues added that these groups of women are likely to terminate pregnancies which they feel as "unprepared" to welcome new birth.

Region of residence, which could serve as a proxy variable for the socio-cultural setting of the

Ethiopian population due to the ethnic based federation and governance system in the country, has also caused diminishing effects on the neighbourhood factors for riskless fertility practices. There is a clear fact that neighbourhood practices effected in fertility behaviours as collective determinations toward a risk averse or a risk taker woman. In inclusive or exclusive representations of the locally based networking systems, actors and information sharing mechanisms, termination and personalization would definitely vary. Neighbourhood practices related to fertility behaviours had lost their importance when region of residence was included in the model, and revealed that ethnic based federal governance system is very powerful to override the net effects of community level variables. This system of governance reversed the positive power of good neighbourhood for desirable reproductive behaviour. Hence, federal regionalism bred high risk fertility behaviours. That is, the statistically significant variation in the high-risk fertility behaviour across regions in Ethiopia is thus a reflection of the diverse socio-cultural setting differently responding to factors affecting fertility and child survival in the country than perception of a given community members to the issue in their own settings. It should also be noted that there is a considerable variation in actual fertility level across the different regions in the country (CSA-Ethiopia, 2012). Therefore, the likelihood of getting exposed to high-risk fertility behaviour is observed among regions experiencing high fertility and vice-versa indicating that the desire for more children is a trigger of high risk fertility.

Conclusions

High risk fertility is an embodied precarious behaviour penetrating into the socio-cultural rooting of the Ethiopian population. Traditional norms and values that have perpetuated a high fertility norm coupled with the high rate of child mortality are escalating the need to have births in closer intervals, in early and late reproductive ages, and in large number. Given the fact that traditional practices and cultural beliefs hamper free and open discussions about the timing and the number of births both at family and societal levels, the knowledge and the means to regulate fertility and enhance the survival chances of children is at stake. Hence, the timing and interval between consecutive births of children is attributed to the reprehensible behaviour of individuals and the community in which they are living. The findings of this study thus indicated that the importance of enhancing the status of women through education is doubtless. Women have to be employed in high earning jobs, and they should be engaged in high income generating activities. Vital is also relinquishing socio-cultural settings that can propagate high fertility norm due to fear of child death and insurance effects to let some of them survive instead of investing on few children to acquire them for prosperous and healthy life which encourages desirable reproductive behaviour. Proper understanding of the socio-cultural milieu of the Ethiopian population and strengthening the health service provision sector to provide effective and efficient reproductive health services including family planning supplies as well as infant/child health care would result in tremendous changes towards the reduction of high-risk fertility at community and individual woman levels.

To this end, the media-based reproductive health promotion campaigns should take into consideration variations in desire for children across regions, places of residence, educational levels, and assessment of risks of HIV/AIDS. Providing comprehensive culture-sensitive knowledge through well-designed and sustained media interventions is also required to raise the awareness of women and the community in general about the pros and cons of high risk fertility and unreasonable panics associated to child deaths. Unjustified taboos about sex, pregnancy, birth, growth and death have to be recursively and scientifically broadcasted through multiple media types. Hence, total overhaul of media campaign approaches and strategies that can respond to specific but pervasive circumstances, needs and challenges are also extremely important and the necessities of the time in Ethiopia.

Declarations

Availability of data and material
The data that were used to undertake this study is publicly available. Interested persons can request and obtain the data from DHS Programs.

Authors' contribution
EG designed the study. TD analysed the data. EG and TD interpreted results and wrote the report. Both authors

have read and given final approval of the manuscript.

Competing Interest
The authors declared that they have no competing interests.

Consent for publication
Not applicable.

Ethical approval and consent to participate
Ethical approval was not required. Data was obtained from the Central Statistical Agency of Ethiopia and consent is not necessary when data is used for research with statistical purposes only (i.e. when individuals cannot be identified from published material). The 2011 Ethiopian Demographic and Health Survey, was however, provided ethical clearance by the Ethiopian Health and Nutrition Research Institute (EHNRI) Review Board, the National Research Ethics Review Committee (NRERC) at the Ethiopian Ministry of Science and Technology, the Institutional Review Board of ICF International, and the Centre for Disease Control and Prevention (CDC).

References
Adhikari, R. (2010). Demographic, socio-economic, and cultural factors affecting fertility differentials in Nepal. *BMC Pregnancy and Childbirth*, *10*(1), 19.

Adler, N., Bush, N. R., & Pantell, M. S. (2012). Rigor, vigor, and the study of health disparities. *Proceedings of the National Academy of Sciences*, *109*(Supplement 2), 17154–17159.

Akinyemi, A., Adedini, S., Hounton, S., Akinlo, A., Adedeji, O., Adonri, O., … Barros, A. (2015). Contraceptive use and distribution of high-risk births in Nigeria: a sub-national analysis. *Global Health Action*, *8*, 10–3402.

Alam, N. (1995). Birth spacing and infant and early childhood mortality in a high fertility area of Bangladesh: age-dependent and interactive effects. *Journal of Biosocial Science*, *27*(4), 393–404.

Arps, S. L. (2007). *High fertility in a high-risk environment: A biocultural study of maternal health in Honduran Miskito communities*. The Ohio State University.

Basu, A. M. (2002). Why does education lead to lower fertility? A critical review of some of the possibilities. *World Development*, *30*(10), 1779–1790.

Baylies, C. (2000). The impact of HIV on family size preference in Zambia. *Reproductive Health Matters*, *8*(15), 77–86.

Bbaale, E., & Mpuga, P. (2011). Female education, contraceptive use, and fertility: evidence from Uganda. *Consilience: The Journal of Sustainable Development*, *6*(1), 20–47.

Bean, L. L., Mineau, G. P., & Anderton, D. L. (1992). High-risk childbearing: fertility and infant mortality on the American frontier. *Social Science History*, *16*(3), 337–363.

Bhat, M. (1998). The effects of child mortality on fertility: The Indian case study. *Washington, DC: National Research Council*.

Bøhler, E., & Bergström, S. (1995). Subsequent pregnancy affects morbidity of previous child. *Journal of Biosocial Science*, *27*(4), 431–442.

Brown, S. S., Eisenberg, L., & others. (1995). *The best intentions: Unintended pregnancy and the well-being of children and families*. National Academies Press.

Cain, M. (1982). Perspectives on family and fertility in developing countries. *Population Studies*, *36*(2), 159–175.

Cette, G., Dromel, N., & Méda, D. (2007). Opportunity costs of having a child, financial constraints and fertility. *Applied Economics Letters*, *14*(4), 239–244.

Chandra, A., Copen, C. E., & Mosher, W. D. (2013). Sexual behavior, sexual attraction, and sexual identity in the United States: Data from the 2006--2010 National Survey of Family Growth. In *International handbook on the demography of sexuality* (pp. 45–66). Springer.

Cooper, J., Heron, T., & Heward, W. (2007). *Applied Behaviour Analysis*. New Jersey: Pearson Education.

CSA-Ethiopia, I. C. F. (2012). *International: Ethiopia Demographic and Health Survey 2011. 2012. Maryland, USA: Central Statistical Agency of Ethiopia and ICF International Addis Ababa, Ethiopia and Calverton*.

Ellen, I. G., & Turner, M. A. (1997). Does neighborhood matter? Assessing recent evidence. *Housing Policy Debate*, *8*(4), 833–866.

Garenne, M., Sauerborn, R., Nougtara, A., Borchert, M., Benzler, J., & Diesfeld, J. (1997). Direct and Indirect Estimates of Maternal Mortality in Rural Burkina Faso. *Studies in Family Planning*, *28*(1), 54–61.

Gregson, S., Zhuwau, T., Anderson, R. M., & Chandiwana, S. K. (1998). Is there evidence for behaviour change

in response to AIDS in rural Zimbabwe? *Social Science & Medicine*, *46*(3), 321–330.

Guzzo, K. B., & Hayford, S. (2011). Fertility following an unintended first birth. *Demography*, *48*(4), 1493–1516.

Hogan, M., Foreman, K., Naghavi, M., Ahn, S., Wang, M., Makela, S., … Murray, C. (2010). Maternal Mortality for 181 Countries 1980–2008: A Systematic Analysis of Progress towards Millennium Development Goal 5. *Lancet*, *375*, 1609–1623.

Langdridge, D., Sheeran, P., & Connolly, K. (2005). Understanding the reasons for parenthood. *Journal of Reproductive and Infant Psychology*, *23*(2), 121–133.

LeGrand, T., Koppenhaver, T., Mondain, N., & Randall, S. (2003). Reassessing the insurance effect: A qualitative analysis of fertility behavior in Senegal and Zimbabwe. *Population and Development Review*, *29*(3), 375–403.

Mcallister, L., Gurven, M., Kaplan, H., & Stieglitz, J. (2012). Why do women have more children than they want? Understanding differences in women's ideal and actual family size in a natural fertility population. *American Journal of Human Biology*, *24*(6), 786–799.

Memirie, S. T., Verguet, S., Norheim, O. F., Levin, C., & Johansson, K. A. (2016). Inequalities in utilization of maternal and child health services in Ethiopia: the role of primary health care. *BMC Health Services Research*, *16*(1), 51.

Merdad, L., Hill, K., & Graham, W. (2013). Improving the Measurement of Maternal Mortality: The Sisterhood Method Revisited. *PLOS One*, *8*(4).

Ministry of Health [Ethiopia]. (2007). *Health Extension Program in Ethiopia: Profile*. Addis Ababa.

Ministy of Health [Ethiopia]. (2006). *National Reproductive Health Strategy 2006–2015*. Addis Ababa.

Nanda, S. (2009). CORRELATES OF HIGH-RISK FERTILITY BEHAVIOUR OF WOMEN AND THEIR PREGNANCY WASTAGE: EVIDENCES FROM ORISSA. *Man in India*, *89*(3), 353–359.

Nikiema, L., Kameli, Y., Capon, G., Sondo, B., & Martin-Prével, Y. (2010). Quality of Antenatal Care and Obstetrical Coverage in Rural Burkina Faso. *Journal of Health, Population and Nutrition, 28*(1), 67–75.

Nour, N. (2008). An Introduction to Maternal Mortality. *Review of Obstetrics and Gynecology*, *1*(2), 77–81.

Robinson, W. C. (1986). High fertility as risk-insurance. *Population Studies*, *40*(2), 289–298.

Ross, C. E., & Mirowsky, J. (2001). Neighborhood disadvantage, disorder, and health. *Journal of Health and Social Behavior*, 258–276.

Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "neighborhood effects": Social processes and new directions in research. *Annual Review of Sociology*, *28*(1), 443–478.

Savadogo, L. G. B., Zombra, A., Tamini, C., Kinda, M., & Donnen, P. (2014). Maternal mortality risk factors in regional hospital of Burkina Faso. *Open Journal of Epidemiology*, *2014*.

Statham, J., & Chase, E. (2010). Childhood Wellbeing: A brief overview. *Loughborough: Childhood Wellbeing Research Centre*.

Tracer, D. P. (1991). Fertility-related changes in maternal body composition among the au of Papua New Guinea. *American Journal of Physical Anthropology*, *85*(4), 393–405.

UN. (2010). *The Millennium Development Goals Report. Development 17 (1 Supplement). 2000-2008*.

Yinger, B. N. V, & Ransom, E. I. (2003). Why Invest in Newborn Health? *Save the Children: Population Reference Bureau*.

Zureick-Brown, S., Newby, H., Chou, D., Mizoguchi, N., Say, L., Suzuki, E., & Wilmoth, J. (2013). Understanding global trends in maternal mortality. *International Perspectives on Sexual and Reproductive Health*, *39*(1).