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Modelling Age at First Marriage among Ghanaians in Urban Southern Ghana

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Abstract

The paper obtains models for determining age at first marriage (AFM) among Ghanaians in urban southern Ghana. Logistic regression models are developed for determining marriage under various circumstances and socio-economic changes that are necessitated by marriage. It also determines distributions that fit AFM and intended age of marriage (IAM) among various sub-populations in the study area. Generally, the distribution fit of AFM for males and females are Frechet and Cauchy, respectively, with corresponding expected ages of 30.8 and 28.0. Distributions have also been determined for IAM for males and females. It is found that both sexes have almost the same average IAM of about 27.5 years but with different distributions. Thus, respondents generally experience delayed marriages. The results show that in all models, one's religion is an overriding predictor of marrying under various circumstances. Other variables that are influential regarding issues of marriage are gender, level of extended responsibility, and level of education. One may therefore be guided in these variables in order to achieve the desired AFM.

Keywords: Age at First Marriage, Intended Age of Marriage

1. Introduction

Marriage, also called matrimony or wedlock, is a socially or ritually recognised union or legal contract between spouses that establishes rights and obligations between them, between them and their children, and between them and their in-laws. The definition of marriage varies according to different cultures, but it is principally an institution in which inter-personal relationships, usually sexual, are acknowledged. In some cultures, marriage is recommended or considered to be compulsory before pursuing any sexual activity (Saxena, 1999).

Individuals may marry for several reasons, including legal, social, libidinal, emotional, financial, spiritual, and religious purposes. Whom they marry may be influenced by socially determined rules of incest, prescriptive marriage rules, parental choice and individual desire. In some areas of the world, arranged marriage, child marriage, polygamy, and sometimes forced marriage, may be practiced as a cultural tradition. Conversely, such practices may be outlawed and penalised in other parts of the world out of concerns for women's rights and because of international law (Macfarlane & Mitchison, 1986).

A survey of various cultures shows that marriage has undergone gradual legal changes, aimed at improving the rights of the wife. However, in the 21st century, there continues to be controversies regarding the legal status of married women, legal acceptance of or leniency towards violence within marriage (especially sexual violence), traditional marriage customs such as dowry and bride price, forced marriage, marriageable age, and criminalisation of consensual behaviors such as premarital and extramarital sex.

Diversity of cultures gives rise to various types of marriage (LaHaye, 1976). Marriage as an institution may depend on some socio-economic statuses of individuals involved; that is, their wealth background, education level or qualification, occupation, place of residence, etc. Since not all individuals who marry are categorised as "upper class" in terms of socio-economic status, some may want to make the effort to change or upgrade their status after marriage (that is, change their place of residence or location, acquire higher education, change job etc) in order to be comfortable in their marriages or to make it work. One's socio-economic status in marriage will be determined to a large extent by the age at first marriage. Age at first marriage (AFM) refers to the age at which an individual marries for the first time. It appears often stable for long periods of time, and is influenced by rapid changes in modernisation, and in particular with prolonged schooling and new attitudes towards partnership. Age at first marriage is also quite responsive to economic challenges one faces which can delay marriage by a few years, though these effects do not last for long periods of time (Garenne, 2004).

Age at first marriage is an important characteristic of population dynamics. It is a critical element of susceptibility to childbearing, though significant proportions of women now have children prior to the first marriage. AFM is also an important factor of exposure to multiple sexual partnerships, especially when it occurs very early in one's life (Garenne, 2004; Moloy & Nahar, 2014; Nahar, Zahangir, & Islam, 2013).

Early marriage (first marriage at age 15-19 years) is usually associated with higher fertility and larger families. It was the most common in traditional societies of Africa and Asia prior to 1950, and is still the dominant pattern in many countries on these two continents. Late marriage (first marriage above age 25 years) seems to be a common feature of modern western societies and Japan at the end of the 20th century, as well as some typical Southern African societies (South Africa, Namibia, Botswana). The AFM in other developing countries and traditional societies seem in general to be in the 20-24 age band, with large variations at the individual level (UN yearbook 2013; Singh & Samara 1996; Westoff, Blanc & Nyblade 1994).

Around the world, it is found that place of residence, religion, region of birth, wealth index, education, and occupation are significantly important factors for determining AFM (Nahar, Zahangir & Islam, 2013). Substantial degree of difference in age at first marriage is associated with ethnicity, years of formal schooling, and premarital work experience. Pre-primary schooling and working before marriage are the strongest variables that delay age at first marriage (VonElm & Hirschman, 1979). Also, there is an indication that none of the theoretical probability distributions fits AFM with regard to various standard statistical procedures such as Chi-square test, Kolmogorov Smirnov test, and probability and quantile plots (Shrestha & Shrestha, 2008). These provide some motivation for work in the area.

Average age at first marriage in Ghana has not only increased over the past fifty years but has also remained unstable. According to the Ghana Statistical Service (2000), average AFM for males had remained around 27 years and that of females had increased from 18 years in 1960 to 22.3 years in 2000 (Population and Housing Censuses, 2000). Average AFM for males increased from 27.7 years in 2000 to 28.2 years in 2010 and that of females also increased from 22.3 years in 2000 to 24.8 years in 2010. The 2000 and 2010 Population and Housing Censuses (PHC) indicated that, the increase in average AFM especially for females may be due to the long years spent in school or a shift by females from early marriage to develop their carriers before entering into marriage.

However, the Ghana Living Standard Survey (Ghana Statistical Service, 2013) indicates that, average age at first marriage for both male and female has decreased over a four year period from 2010 to 2013. For females, there is a decline from 24.8 years to 20.8 years, and for males, there is a decline from 28.2 years to 25.1 years. Thus, recent figures on AFM appear to deviate from results of previous surveys. We thus find further research in the area necessary as the subject generates interest around the world (e.g., Nguyen, 1995; Ntaganira, 2010; Palamuleni, 2011; Rahman, & Goni, 2013; Sah, 2011; Gurmu, & Etana, 2014). This paper intends to obtain the current best description of the phenomenon. In the process, we will determine the main factors that influence AFM as well as its suitable models and models that describe social and economic changes that are necessitated by marriage.

2. Data and Methodology

A structured questionnaire was administered to a sample of 500 ever-married working persons selected from urban southern Ghana. Specifically, the capitals of four regions along the south were selected for the study and percentage quotas sampled in the identified areas. The regions, with indicated quotas, are the Greater Accra (35%), Western (30%), Central (25%) and Volta (10%). The assigned quotas are informed by the estimated populations in the various regional capitals. The respondents consist of government workers, private institution workers and the self-employed. Within each location, quota sampling was used to select secondary school teachers (25%), University lecturers (10%), health workers (20%), traders (15%), service providers (15%), other government workers (10%) and bankers (5%). These percentages within each location were as a result of the proportion of ever-married person in each of the various occupations in urban southern Ghana. The overall sample size was determined using Cochran's formula.

There are fourteen variables examined in the study. In no specific order, these are numbered as follows: (1) Timing of marriage (at three levels); (2) Living with both parents (at two levels); (3) Mode of entry into marriage (at four levels); (4) Order of birth among siblings; (5) Number of children of parents; (6) Intended occupation; (7)

Religion; (8) Ethnicity; (9) Intended number of children (10) Main life goal; (11) Extended family responsibility; (12) Number of half siblings; (13) Wealth Type; and (14) Age at first marriage.

We provide a brief explanation of each of the variables. By 'Timing of marriage', we find out whether a respondent married at the right time, married early or married late. Thus, this variable is a qualitative variable with three levels. The likelihood of marrying at a specified timing will be modeled in terms of relevant variables (Religion, Number of children of parents, Ethnicity, etc.). 'Living with both parents' finds out whether or not a respondent stayed with both parents in his/her childhood. Thus, this variable is a qualitative variable with two levels. The 'Mode of entry into marriage' seeks to find out whether the respondent got married because he/she was compelled by circumstances, by one's own volition, the marriage was arranged or by pressure from family and friends. Thus, this variable is a qualitative variable with four levels. We will model the likelihood of mode of entry into marriage given suitable variables. The 'Order of birth among siblings' finds out the respondent's birth order among his/her siblings. The respondent may be the "first born", "second born", "third born", and "fourth born or after". This variable is a qualitative variable taken at four levels. By 'Number of children of parents', we find out the number of children of the respondent's parents including the respondent. This variable is a qualitative variable and will be considered at three levels: "1-3 children", "4-6 children" and "7 or more children". The 'Intended occupation' intends to find out the kind of work the respondent intended to do before getting married. This variable will enable us to keep track of changes in socio-economic status of the respondent after marriage. The 'Religion' finds out the religion respondents belong to. This variable will be examined at four levels: Christianity, Islam, Traditional and Other. 'Ethnicity' intends to find out the ethnicity of respondents. This variable will be considered at nine levels represented as Akan, Ewe, Ga-Adangbe, Guan, Mole-Dagbani, Grusi, Gruma, Mande and Others. 'Intended number of children' finds out the number of children respondent wanted to have before getting married. We will consider this variable at three levels: "1-3 children", "4-6 children" and "7 or more children". The 'Main life goal' intends to find out whether respondent's timing of marriage was influenced by a desire to obtain higher education, some level of comfortable life, a job with good salary or to marry at a specific age. Thus, this variable is considered at four levels. By 'Extended family responsibility', we find out respondent's level of responsibility towards the extended family before marriage and in marriage. We will examine this variable at four levels, namely, High, Moderate, Low and None. The 'Number of half siblings' finds out the number of siblings a respondent has in common with one of the parents. The variable is taken at four levels: "None", "1-3 siblings", "4-6 siblings" and "7 or more siblings". The 'Wealth type' finds out respondent's ownership of selected assets such as television, bicycles, materials used for housing construction, types of water access and sanitation facilities. Thus, this variable is a qualitative variable with three levels: "Poor", "Middle", and "Rich". These levels are determined by a factor analysis of responses on the ownership of these items. The 'Age at first marriage' is a continuous variable that measures the number of years from birth until the age at which a respondent married for the first time. The definitions of the levels of these variables are selected based on the dominant religious, social and economic cultures of the study population.

To determine the right description of AFM, it is necessary to understand distribution underlying it. To determine this distribution, it is common to fit the observed distribution to a theoretical distribution by comparing the frequencies observed in the data to the expected frequencies of the theoretical distribution.

Age at first marriage can be modeled as a waiting time process since one has to wait until the eventual spouse is found. In order to model the distribution of a waiting time process, the Generalised Gamma distribution, and Poisson distributions are mostly useful. In this paper, we explore various other distributions that can be used to model such a process. Some of the distributions that are found in the paper are specific forms derived from the Gamma family of distributions. For example, the Frechet distribution, which is found to characterise some subgroups of the study population, may be a variant of the Exponentiated Exponential distribution. Gupta and Kunda, (2007) defined the Exponentiated Frechet (EF) distribution as

$$F(x) = 1 - \left[1 - \exp\left\{ -\left(\frac{\sigma}{x} \right)^{\lambda} \right\} \right]^{\alpha}, \qquad \alpha > 0, x > 0, \sigma > 0, \lambda > 0, \tag{1}$$

with corresponding density function

$$f(x)=\alpha\lambda\sigma^{\lambda}\left[1-\exp\left\{-\left(\frac{\sigma}{x}\right)^{\lambda}\right\}\right]^{\alpha-1}x^{-(1+\lambda)}\exp\left\{-\left(\frac{\sigma}{x}\right)^{\lambda}\right\} \tag{2}$$

By putting $\alpha=1$ into Equation (2), we obtain

$$\begin{aligned} f(x)&=\frac{\lambda}{x}\left(\frac{\sigma}{x}\right)^{\lambda}\exp\left\{-\left(\frac{\sigma}{x}\right)^{\lambda}\right\} \\ &=\frac{\lambda}{\sigma}\left(\frac{\sigma}{x}\right)^{\lambda+1}\exp\left\{-\left(\frac{\sigma}{x}\right)^{\lambda}\right\}. \end{aligned} \tag{3}$$

This is the standard (two-parameter) Frechet distribution. This could be extended to a three-parameter distribution if the data is γ-corrected, for example. To conform to the usual presentations of this distribution, and in Table 6, take $\beta=\sigma$ and $\alpha^{*}=\lambda$, to distinguish from α in Equation (1). It is found necessary to specify to several decimal places the *p*-values of the test of goodness-of-fit to enable us determine the suitability of various distributions for a given sub-population in some cases. For brevity, we provide only the parameters of the identified distributions of the various sub-populations under study.

Multinomial logistic regression analysis is performed to determine actual factor that influence AFM among Ghanaians in urban southern Ghana. As in other forms of linear regression, multinomial logistic regression uses a linear predictor function, *f*, to predict the probability that observation *i* has outcome k of the form

$$f(\mathbf{x};k,i)=\beta_{k,0}+\sum_{j=1}^{m}\beta_{k,j}X_{j,i}\ , \tag{4}$$

where $\beta_{k,0}$ is the intercept of the *k*th outcome and $\beta_{k,j},\ j=1,\ 2,\ \ldots,m$ are the multinomial regression coefficients for the explanatory variables $X_{1,i},X_{2,i},\ldots,X_{m,i}$, respectively, and $k=1,2,\ldots,l;\ i=0,1,\ldots,m$. The intercept is the value of $Y_i=f(\mathbf{x};k,i)$ when all the explanatory variables in the model are evaluated at zero. Each of the regression coefficients describes the extent of influence on the probability of the outcome, with the sign suggesting the direction of change to the probability, relative to the reference outcome.

One fairly simple way to arrive at the multinomial logit model is to imagine, for *k* possible outcomes, running $k-1$ independent binary or continuous logistic regression models, in which one outcome is chosen as a "reference" and then the other $k-1$ outcomes are separately regressed over the reference outcome. Take outcome *k* (i.e., the last outcome) as the reference. Then,

$$\ln\left[\frac{\Pr(Y_i=j|\mathbf{x})}{\Pr(Y_i=k)}\right]=\beta_j x_i;\quad j=1,2,\ldots,k-1. \tag{5}$$

Thus, there is the introduction of separate sets of regression coefficients, one for each possible outcome. The probabilities are then obtained as

$$\Pr(Y_i=j|\mathbf{x})=\Pr(Y_i=k)\exp\left(\beta_j x_i\right);\quad j=1,2,\ldots,k-1. \tag{6}$$

Since $\sum_{j=1}^{k} \Pr(Y_i = j|\mathbf{x}) = 1$, then we have $\Pr(Y_i = k|\mathbf{x}) = \left(1 + \sum_{j=1}^{k-1} \exp(\beta_j x_i)\right)^{-1}$, and so Equation (6) becomes

$$\Pr(Y_i = j|\mathbf{x}) = \frac{\exp(\beta_j x_i)}{1 + \sum_{j=1}^{k-1} \exp(\beta_j x_i)}. \tag{7}$$

In this study, as in all logit models, we are interested in studying the effect on $\pi_i = \Pr(Y_i^* = 1|Y = j)$ of changes in $(X_1, X_2 \ldots, X_m)$ for the ith individual. For example, it will be of interest to determine the model for marriage at a specified time description: early, right-time or late. For this, we will obtain two separate models as $j = 1, 2$ with the level $j = 3$ used as the reference. For each of $j = 1, 2,$ we assess the probabilities $\Pr(Y_i^* = 1)$.

3. Analysis and Results

The analyses are guided by two main objectives: the distributions of AFM and IAM of sub-populations; and modelling of the AFM.

3.1 Distributions of Sub-populations

Tables 1 and 2 show the characteristics of AFM distributions of male and female workers, respectively. Each table displays the best four distributions which fit the data. The first in each table is selected as the best distribution. From Table 1, a two-parameter Frechet distribution provides the best fit with a much greater *p*-value than the others.

Table 1: Distribution Fit of AFM of Male Workers

Distribution	Parameter			*p*-value
Frechet (2P)	$\alpha = 11.109$	$\beta = 29.026$		0.052330000
Erlang (3P)	$m = 18$	$\beta = 0.83072$	$\gamma = 16.001$	0.000072198
Inv. Gaussian (3P)	$\lambda = 662.28$	$\mu = 20.137$	$\gamma = 10.667$	0.000071793
Hypersecant	$\sigma = 3.5767$	$\mu = 30.804$		0.000043735

Table 2 shows the distribution fit of AFM for Female Workers. In the table, all of the distributions have *p*-values less than 0.05. This indicates that none of the distributions best fits AFM of female workers. However, Cauchy distribution is the most suitable to approximate the distribution for the females.

Table 2: Distribution Fit of AFM of Female Workers

Distribution	Parameter			*p*-value
Cauchy	$\sigma = 2.1737$	$\mu = 27.419$		0.02866
Log-Logistic (3P)	$\alpha = 9.0855$	$\beta = 20.933$	$\gamma = 6.5824$	0.00118
Burr	$k = 0.7944$	$\alpha = 13.084$	$\beta = 26.814$	0.00117
Dagum	$k = 1.1289$	$\alpha = 11.493$	$\beta = 27.136$	0.00115

Table 3: Characteristics of AFM Distributions of Males and Females

Sex	Distribution	Expected Age	Variance	Skewness	Kurtosis
Male	Frechet	30.804	12.793	0.9165	2.5098
Female	Cauchy	27.968	20.36	1.0554	2.8839

Table 3 gives the descriptive statistics of the two best fit distributions for males and females in general. The statistics in the table is an indication that female workers in urban southern Ghana marry about three years earlier than their male counterparts. However, the variation in AFM of female workers is much higher than that of males, and the distribution of the two sub-groups are different.

Figure 1 is a graphical representation of distribution fits of AFM for male and female workers. Frechet (right, in red) and Cauchy (left, in blue) fit AFM's of male and female workers, respectively. The diagram indicates that there is a high likelihood of female workers to marry for the first time from ages of about 26 to 29 and much less likelihood from ages of about 35 to 48. The wider variation in the distribution is due to a few females with extreme AFM. On the other hand, there is a high likelihood for male workers to marry for the first time from ages of about 28 to 33 with less likelihood from ages 35 to 38. Males have a greater likelihood of marrying at higher ages than females but the chances are almost the same at very high ages of about 42 and higher. It is also worth noting that the probability of a male marrying at an age lower than about 25 is almost infinitesimal, though not unlikely. For the females, however, it appears that none marries below the age of about 18 years.

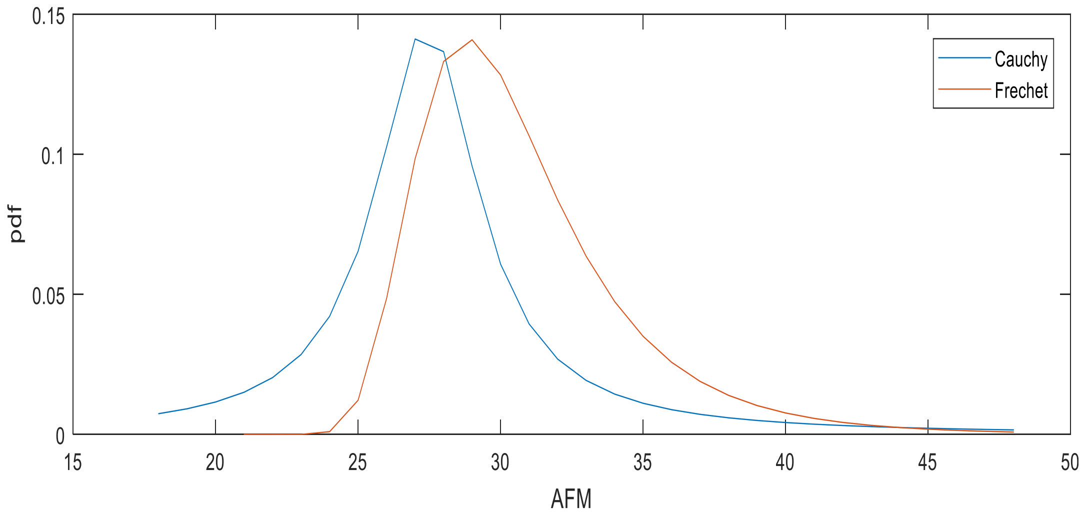

Figure 1: Distribution Fits of AFM for Male and Female Workers

Table 4: Characteristics of AFM Distributions for Male Sub-Populations

Sub-Population	Distribution	Expected Age	Variance	Skewness	Kurtosis
Teachers	Laplace	30.67	9.5161	0.7225	0.2006
Lecturers	Gen. Gamma (3P)	33.48	8.7600	0.7345	1.4512
Traders	Gen. Gamma (4P)	32.00	32.2780	1.4988	1.6889
Serv. Providers	Frechet	30.58	11.7640	0.1758	-0.1969
Health Workers	Kumaraswamy	30.46	6.6616	0.9714	3.2688
Other Gov't	Hypersecant	30.72	17.2100	0.1379	0.3997

Distributions of Male Sub-Populations

Table 4 shows the AFM distributions of six male sub-populations considered in the study and their characteristics. From the table, all the sub-populations have expected AFM of at least 30 years. Lecturers have the highest expected AFM (33.48), followed by traders (32.0) while health workers have the least expected AFM (30.46) with the least variation. The distribution of traders, however, has the highest variation.

Figure 2 is a graphical representation of distribution fits of AFM for males of various occupations in urban southern Ghana. Laplace (blue curve), Hypersecant (red curve), Frechet (orange curve), Generalised Gamma with four parameters (purple curve), Kumaraswamy (green curve), and Generalised Gamma with three parameters (sea blue curve) fit AFM of teachers, other government workers, service providers, traders, health workers, and lecturers, respectively. The diagram shows that although males generally have a Frechet distribution, the various sub-populations have different distriutions, which are not necessarily Frechet. Only male service providers have a distribution that coincides with the overall male Frechet distribution. An obvious observation from the graph is the high skewness of the distribution for traders. It shows that some traders could marry at an age as late as more than 45 years. With exception of the high skewness for the traders, the distribution is similar to that of the Lecturers.

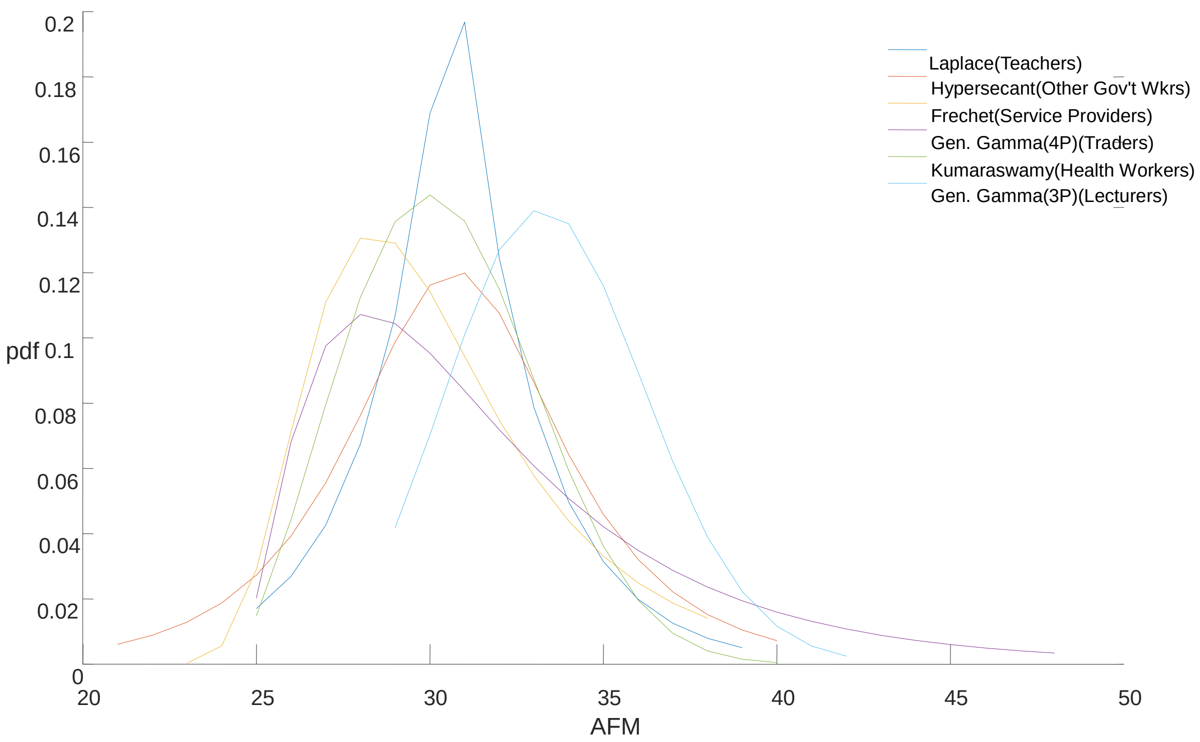

Figure 2: Distribution Fits of AFM for Male Sub-Populations

We note that the probability of a male service provider, teacher, health worker, trader marrying at an age lower than about 25 is almost infinitesimal, though not unlikely. Lecturers, generally, have a much more delayed AFM. It is also obvious that teachers are most likely to maryy around the age of 30. The parameters of the distributions for the male sub-populations in Table 4 are provided in Table 5.

Table 5: Distribution Fitting of AFM of Male Sub-Populations

Sub-population	Distribution	Parameter				P-Value
Teachers	Laplace	$\lambda = 0.4584$	$\mu = 30.667$			0.31195
Lecturers	Gen. Gamma (3P)	$k = 1.0098$	$\alpha = 134.18$	$\beta = 0.2617$		0.97005
Service Providers	Frechet	$\alpha = 10.248$	$\beta = 28.653$			0.81596
Health Workers	Kumaraswamy	$\alpha_1 = 2.5778$	$\alpha_2 = 508.51$	$a = 24.038$	$b = 104.84$	8.7192E-4
Traders	Gen. Gamma (4P)	$k = 0.4781$	$\alpha = 9.0081$	$\beta = 0.0693$	$\gamma = 24.233$	0.96964
Other Govt.Workers	Hypersecant	$\sigma = 4.1485$	$\mu = 30.72$			0.91981

Distributions of Female Sub-Populations

Table 6 shows the AFM distributions of six female sub-populations and their characteristics. From the table, all the sub-populations have expected AFM of at least 26 years. Female lecturers have the highest expected AFM (30.48), followed by service providers (27.95) whereas traders have the least expected AFM (26.42). Also, service providers have the highest variation whilst health workers have the least.

Table 6: Characteristics of AFM Distributions for Female Sub-Populations

Sub-Population	Distribution	Expected Age	Variance	Skewness	Kurtosis
Teachers	Weibull (3P)	27.53	12.19	0.9749	2.1561
Lecturers	Rayleigh	30.48	10.93	0.4108	-1.2868
Traders	Weibull	26.42	25.98	0.7068	1.1476
Serv. Providers	Error	27.95	34.55	1.5036	3.4014
Health Wks	Gen. Ext. Val.	27.78	9.81	0.2040	0.4510
Other Govt Workers	Log-Logistic	26.92	14.74	0.8968	1.7007

Figure 3 is a graphical representation of distribution fits of AFM for females of various occupations. The diagram shows that although females generally have a Cauchy distribution, the various sub-populations have different distributions which are not necessarily Cauchy. An obvious observation from the graph is the high skewness and peakedness of the distribution for service providers. It indicates that some service providers could marry at an age as late as more than forty (40) years, with age of about 27 being their highly likely AFM. Also, health workers have a distribution with a low skewness.

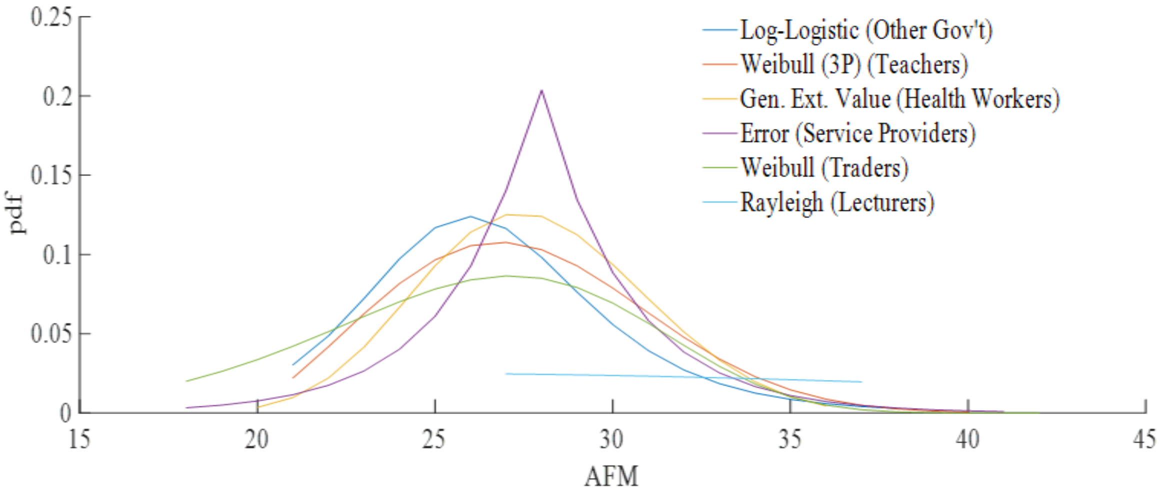

Figure 3: Distribution Fits of AFM for Female Sub-Populations

What is also striking is the distribution of the AFM of female lecturers. It is Raleigh with almost uniform low probability between the age interval (27, 37).

The parameters of the distributions for the female sub-populations in Table 6 are provided in Table 7.

Table 7: Distribution Fitting of AFM of Female Sub-Populations.

Sub-Population	Distribution	Parameter	P-Value
Teachers	Weibull (3P)	$\alpha = 2.4699$ $\beta = 9.2784$ $\gamma = 19.277$	0.87778
Lecturers	Rayleigh	$\sigma = 24.32$	0.95701
Service provider	Error	$k = 1.0$ $\sigma = 5.8781$ $\mu = 27.946$	0.76081
Health Workers	Gen. Ext. Val.	$k = 0.2359$ $\sigma = 3.006$ $\mu = 26.626$	0.66800
Traders	Weibull	$\alpha = 6.474$ $\beta = 27.861$	0.87939
Other Gov't	Log-Logistic	$\alpha = 12.957$ $\beta = 26.279$	0.99806

Tables 8 and 9 show the characteristics of intended age of marriage (IAM) distributions of male and female workers, respectively. Each table displays the best four distributions which fit the data. We observe that in both tables, all the distributions have *p*-values less than 0.05, indicating that none of the distributions best fits IAM of both male female workers. However, Gumbel Max and Laplace distributions most suitably approximate the distribution for males and females, respectively.

Table 8: Distribution Fit of IAM of Male Workers

Distribution	Parameter	*p*-value
Gumbel Max	$\alpha = 11.652$ $\beta = 29.9$	1.8823E-6
Burr	$k = 0.8872$ $\alpha = 18.655$ $\beta = 28.202$	1.8612E-6
Nakagami	$m = 21.211$ $\Omega = 830.58$	1.7007E-6
Log-Logistic	$\alpha = 10.89$ $\beta = 17.366$ $\gamma = 11.075$	1.6265E-6

Table 9: Distribution Fit of IAM of Female Workers

Distribution	Parameter	*p*-value
Laplace	$\lambda = 0.4584$ $\mu = 30.6678$	1.7694E-3
Burr(4P)	$k = 0.52588$ $\alpha = 1.505E+7$ $\beta = 1.505E+7$ $\gamma = -1.505E+7$	1.3580E-7
Dagum	$k = 1.3337$ $\alpha = 18.455$ $\beta = 25.458$	7.9622E-8
Log-Logistic	$\alpha = 12.382$ $\beta = 16.029$ $\gamma = 9.9479$	4.3375E-8

3.2 Logistic Models for AFM

We present four models for determining the likelihood of marriage under various conditions. A fifth model examines the likelihood of socio-economic change necessitated by marriage. Other models are provided in the Appendix. The following are reference variables for all the models examined.

The reference categories for the independent variables are as follows:

Gender: Female
Ethnicity: Other
Religion: Other religion
Stayed with both parents: No
Number of children of parents: 7 or more children
Mode of entry into marriage: Pressure from family and friends
Intended number of children: 7 or more children
Education level at first marriage: Primary
Level of extended responsibility: High
Wealth type: Rich
Time for achieved goals: No, did not achieve ambition
Order of birth: “Fourth born or after”

Table 10: Logistic Model for Early Marriage

Variables	B	Std. Error	Wald	Sig.	Exp(B)	95% C I for Exp(B) Lower	Upper
Intercept	23.003	2.938	61.297	0.000			
Gender (1)	-1.278	0.407	9.863	0.002	0.279	0.126	0.619
Ethnicity (8)	0.026	0.157	0.027	0.870	1.026	0.754	1.396
Religion (1)	1.226	0.566	4.685	0.030	3.408	1.123	10.343
Stayed with both par. (1)	0.153	0.401	0.145	0.703	1.165	0.531	2.555
No. of children of par. (2)	-0.279	0.291	0.917	0.338	0.757	0.428	1.339
Age at first marriage (2)	-0.706	0.077	85.225	0.000	0.493	0.425	0.573
Mode of entry (2)	-0.688	0.231	8.881	0.003	0.503	0.320	0.790
Intended no. of chil. (1)	-0.185	0.159	1.361	0.243	0.831	0.609	1.134
Education lev. at FM (2)	-0.454	0.301	2.263	0.132	0.635	0.352	1.147
Level of extend resp. (3)	0.417	0.217	3.681	0.055	1.518	0.991	2.324
Wealth Type (1)	-0.437	0.290	2.272	0.132	0.646	0.366	1.140
Time for achiev.goals(1)	-0.005	0.010	0.266	0.606	0.995	0.975	1.015
Order of birth (3)	0.112	0.188	0.355	0.551	1.118	0.774	1.616
Occupation at FM (4)	0.181	0.139	1.689	0.194	1.198	0.912	1.574

Reference category: Late

Table 10 presents a logistic model for marrying early relative to marrying late. Out of fourteen variables, four of them, namely, Gender, Religion, AFM, and Mode of entry, are significant predictors of likelihood of early marriage. The level of extended responsibility is barely significant at 5% significance level. The odds of a male marrying early are 0.279 times marrying late compared to female (i.e. it is less likely for a male to marry early than late compared to female). The odds of a Christian marrying early are 3.408 times marrying late compared to other religion (i.e. it is more likely for a Christian to marry early than late compared to other religion). The odds of entering marriage by volition producing early marriage is 0.503 times producing late marriage compared to entering into marriage by pressure from family and friends (i.e. it is about one-half less likely for one to marry early than late, if one were to enter marriage by volition compared to entry by pressure from family and friends). The odds of a low level of responsibility towards extended family before marriage leading to an early marriage is 1.518 times producing late marriage compared to high level of responsibility (i.e. it is about one and half times more likely for someone with a low level of responsibility towards the extended family before marriage to marry early than late compared to someone with high level of responsibility).

Table 11 presents the model for marrying at the right time relative to marrying late. Three of the variables, namely, Gender, Religion, and AFM, are significant predictors of likelihood of right-time marriage. The odds of a male marrying at the right time are 0.543 times marrying late compared to female (i.e. it is less likely for a male to marry at the right time than late compared to female). The odds of a Christian marrying at the right time are 2.170 times marrying late compared to other religion (i.e. it is about twice more likely for a Christian to marry at the right time than late compared to other religion). The odds for the other variables may be interpreted similarly.

Table 11: Logistic Model for Marrying at the Right Time

						95% C I for Exp(B)	
Variables	B	SE	Wald	Sig.	Exp(B)	Lower	Upper
Intercept	12.258	2.006	37.356	0.000			
Gender (1)	-0.610	0.253	5.829	0.016	0.543	0.331	0.891
Ethnicity (8)	-0.065	0.101	0.415	0.520	0.937	0.769	1.142
Religion (1)	0.775	0.370	4.386	0.036	2.170	1.051	4.482
Stayed with both par. (1)	0.217	0.265	0.666	0.414	1.242	0.738	2.089
No. of children of par. (1)	0.212	0.197	1.157	0.282	1.237	0.840	1.821
Age at first marriage (1)	-0.340	0.041	67.730	0.000	0.711	0.656	0.772
Mode of entry (2)	-0.189	0.137	1.900	0.168	0.828	0.633	1.083
Intended no. of chil. (3)	-0.025	0.104	0.060	0.807	0.975	0.796	1.194
Education lev. at FM (3)	-0.256	0.213	1.446	0.229	0.774	0.510	1.175
Level of extend resp. (3)	-0.222	0.150	2.184	0.139	0.801	0.596	1.075
Wealth Type (2)	0.033	0.184	0.031	0.859	1.033	0.721	1.481
Time for achiev. goals (2)	0.000	0.001	0.084	0.771	1.000	0.998	1.001
Order of birth (3)	-0.074	0.120	0.375	0.540	0.929	0.734	1.175
Occupation at FM (4)	-0.019	0.096	0.038	0.845	0.981	0.813	1.185

Reference category: Late

Table 12 represents a model for entering into marriage compelled by circumstances relative to entry by pressure from family and friends. There are only two variables that significantly determine this mode of entry. These are the Timing of the marriage and Religion. The odds of a Muslim being compelled by circumstances to enter into marriage is 0.322 times entering into marriage by pressure from family and friends compared to other religion (i.e. it is less likely for a Muslim to be compelled by circumstances to enter into marriage than to enter into marriage by pressure from family and friends compared to other religion). Similarly, it is less likely for one who enters marriage at the right time to have done so by compulsion from circumstances than by pressure from relations compared to one who married late. It is interesting to observe that 'Gender' is highly not significant in this model. It shows that males are as likely $(Exp(B) = 1.045)$ to enter marriage compelled by circumstances as by pressure from relations, compared to females.

Table 12: Logistic Model for Marriage Compelled by Circumstances

						95% C I for Exp(B)	
Variables	B	SE	Wald	Sig.	Exp(B)	Lower	Upper
Intercept	6.119	2.272	7.250	0.007			
Gender (1)	0.044	0.397	0.012	0.912	1.045	0.480	2.274
Ethnicity (3)	0.112	0.168	0.445	0.505	1.119	0.805	1.555
Religion (2)	-1.134	0.572	3.932	0.047	0.322	0.105	0.987
Occupation at FM (5)	0.276	0.298	0.859	0.354	1.318	0.735	2.362
Timing of marriage (2)	-1.397	0.338	17.106	0.000	0.247	0.128	0.479
AFM (2)	-0.035	0.055	0.401	0.527	0.966	0.867	1.076
Edu. level at FM (4)	-0.177	0.281	0.396	0.529	0.838	0.484	1.452
Wealth type (3)	0.441	0.299	2.179	0.140	1.554	0.865	2.790
Order of birth (1)	-0.294	0.194	2.299	0.129	0.745	0.509	1.090
Level of ext. resp. (3)	-0.318	0.227	1.949	0.163	0.728	0.466	1.137

Reference category: Pressure from family and friends

In Table 13, we have the model for Marriage by volition. Ten variables are considered in this model. Only the level of extended responsibility of the individual is found to be significant. The level of education and religion are barely significant. We deduce that the odds of one with moderate level of responsibility towards the extended family entering into marriage by volition are 0.646 times entering into marriage by pressure from relations compared to someone with high level of responsibility. Thus, it is less likely for one with moderate responsibility to marry by volition than by pressure from relations compared to one with high responsibility. Similarly, it is about one and half times more likely to marry by volition for one with junior secondary or middle school level education than by pressure from relations compared to someone with primary education.

Table 13: Logistic Model for Marriage by volition

Variables	B	SE	Wald	Sig.	Exp(B)	95% C I for Exp(B) Lower	Upper
Intercept	2.807	1.922	2.133	0.144			
Gender (1)	0.318	0.322	0.974	0.324	1.374	0.731	2.583
Ethnicity (3)	0.081	0.136	0.349	0.554	1.084	0.830	1.416
Religion (2)	-0.760	0.427	3.163	0.075	0.468	0.202	1.081
Occupation at FM (3)	0.098	0.245	0.159	0.690	1.103	0.683	1.781
Timing of marr. (2)	-0.329	0.275	1.423	0.233	0.720	0.420	1.235
AFM (2)	-0.043	0.045	0.948	0.330	0.957	0.877	1.045
Edu. level at FM (2)	0.459	0.241	3.627	0.057	1.583	0.987	2.540
Wealth type (1)	0.091	0.251	0.130	0.718	1.095	0.669	1.791
Order of birth (2)	0.065	0.158	0.168	0.682	1.067	0.782	1.455
Level of ext. resp.(2)	-0.436	0.192	5.174	0.023	0.646	0.444	0.941

Reference category: Pressure from family and friends

The odds of a Muslim entering into marriage by volition are 0.468 times entering into marriage by pressure from relations compared to other religion (i.e. it is less likely for a Muslim to enter into marriage by volition than to enter into marriage by pressure from family and friends compared to other religion).

In Table 14, we examine the model for change of location that is necessitated by marriage. Three variables were found useful predictors. Of these, gender and change of job are significant predictors of change in location. (The Appendix gives the model for change in job after marriage. In the model, only gender and education level after marriage are found barely significant.)

Table 14: Logistic Model for Change of Location necessitated by Marriage

Variables	B	S.E.	Wald	Sig.	Exp(B)	95% C I for Exp(B) Lower	Upper
Gender (1)	-0.610	0.195	9.808	0.002	0.543	0.371	0.796
AFM (1)	0.013	0.023	0.313	0.576	1.013	0.969	1.059
Change of job (1)	0.724	0.304	5.682	0.017	2.063	1.137	3.740
Constant	-1.110	0.977	1.290	0.256	0.330		

Reference category: No change of location after marriage

Table 14 shows that the odds of a male changing location after marriage are 0.543 times not changing location compared to female (i.e. it is about one-half less likely for a male to change location after marriage than female). The odds of change of job after marriage leading to change of location after marriage are about twice it producing no change of location after marriage. That is, it is more likely for one to change location after marriage as a result of a change of job.

5. Conclusion

The study has first focused on identifying the distribution fit for various sub-populations of workers in urban southern Ghana. Secondly, logistic models have been determined for marriage under various conditions as well as socio-economic changes that are necessitated by marriage. The results show that female workers marry three years earlier than their male counterparts, but their intended ages of marriage (IAM) are almost the same. In both male and female sub-populations, lecturers are found to marry much later. Among males, health workers marry early, whiles traders marry early among females. Frechet distribution fits AFM for male workers in general though literature indicates that none of the theoretical probability distributions fit AFM. On the other hand, the Cauchy distribution fits AFM of female workers which is in line with literature. Expected age at first marriage for males is found to be 30.8, whiles female workers have an expected AFM of 28.0. The variation in AFM for females (20.4) is however, much greater than for males (12.8). The findings thus support an increase in AFM rather than a decrease along southern Ghana.

Four models have been examined regarding marriage under various circumstances. Regarding the timing of marriage models, four variables are generally influential. These are gender, religion, the age of the individual, and the mode of entry. Significant variables that influence marriage under circumstances of volition and compulsion are level of extended responsibility, level of education, religion and timing of the marriage. It is clear that in all models, the religion is a dominant predictor. These findings are quite different from those of the literature which identifies place of residence, religion, region of birth, wealth index, education and occupation are significantly important factors for determining AFM.

The study has also identified the likelihood of socio-economic changes that are as a result of marriage. These changes are mainly influenced by the gender of the individual, as well as change in job. The study shows that the type of job (perhaps one intends to pursue in the future), depending on its nature, is highly likely to delay marriage. It is also inferred that the effect of education in determining age at first marriage can be felt beyond attaining the junior secondary education level. Thus, issues regarding future job should be clearly communicated to young people to make informed decisions. Since religion is found to be an overriding predictor of marriage under various circumstances, the practice of one's religion should be well guided.

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APPENDIX

Models for marriage under some other circumstances and necessitated socio-economic changes

Table A1: Logistic Model for Arranged Marriage

Variables	B	SE	Wald	Sig.	Exp(B)	95% C I for Exp(B) Lower	Upper
Intercept	3.888	2.124	3.350	0.067			
Gender (1)	0.123	0.365	0.114	0.736	1.131	0.553	2.314
Ethnicity (4)	0.054	0.153	0.124	0.725	1.055	0.782	1.423
Religion (2)	-0.036	0.446	0.007	0.935	0.964	0.402	2.313
Occupation at FM (1)	-0.192	0.282	0.463	0.496	0.825	0.475	1.435
Timing of marriage (2)	-0.482	0.310	2.409	0.121	0.618	0.336	1.135
AFM (2)	-0.020	0.049	0.176	0.675	0.980	0.890	1.078
Edu. level at FM (2)	-0.002	0.263	0.000	0.994	0.998	0.596	1.671
Wealth type (1)	-0.319	0.296	1.165	0.280	0.727	0.407	1.298
Order of birth (3)	0.106	0.180	0.345	0.557	1.111	0.781	1.581
Level of ext. resp. (2)	-0.562	0.222	6.443	0.011	0.570	0.369	0.880

Reference category: Pressure from family and friends

Table A2: Logistic Model for Change of Job necessitated by marriage

Variables	B	S.E.	Wald	Sig.	Exp(B)	95.0% C I for EXP(B) Lower	Upper
Gender (1)	-0.603	0.302	3.991	0.046	0.547	0.303	0.989
AFM (1)	0.058	0.035	2.803	0.094	1.060	0.990	1.135
Edu. level after marriage (4)	0.328	0.176	3.461	0.063	1.388	0.983	1.960
Level of ext. responsibility in marriage (3)	0.251	0.194	1.678	0.195	1.285	0.879	1.878
Constant	-0.521	1.447	0.130	0.719	0.594		

Reference category: No change of job after marriage