Explaining the Ethnic Differentials in Fertility through Ethnic Differences in Socioeconomic Status in Nepal

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Paper Proposal Submitted for
2009 Annual Meeting of the Population Association of America

Abstract

This study examines whether fertility differentials among ethnic groups can be explained by the differential socioeconomic status (SES) of these groups using the Nepal DHS 2006 data. This paper improves upon the existing methods of examining the effects of sociodemographic variables on TFRs by calculating TFRs from parity-progression-ratios(PPRs) instead of age-specific-fertility-rates(ASFRs) and by using the complementary-log-log(CLL) discrete-time survival model. The model is effective in capturing time-varying effects of sociodemographic factors in progression of events in women's life time and allows for both left- and right-censoring while working with period data. Preliminary results show that fertility level of disadvantaged ethnic groups in Nepal could be explained by their socio-economic-status constituting of their residence, education level, and wealth. A step-wise CLL model will be used to analyze the factors behind ethnic differentials in TFRs and trends in this differential in the changing political and social context of Nepal from 1996 to 2006.

Extended Abstract

Nepal has been a popular site for fertility research because of its drastic transition from a country exhibiting high fertility level and low birth control usage to one with low fertility level and high birth control usage (Axinn and Yabiku 2001; Brauner-Otto, Axinn, and Ghimire 2007; Cleland 1985). Total Fertility Rate (TFR) in the country has decreased from 6.25 in the 1980s to 3.1 in 2006 (Retherford and Rele 1989, Macro International Inc. 2007). This decrease in TFR, however, is not uniform and varies drastically by educational level, residence, and ethnicity of women in Nepal. Although fertility research has examined differentials in fertility level attributed to education, residence, mass media, and provision of health services, very few studies have attempted to understand the presence of differential fertility rates among the different ethnic groups in Nepal.

Nepal has a very complex ethnic division owing to the overlap between ethnicity, caste, religion, and regional grouping of the population. Historically and socially some of the ethnic groups, particularly the high caste-Hindu- Indo-aryans in the hills and *Newars* in the capital city, have enjoyed better access to economic and political power in the country. In contrast, some ethnic groups such as the indigenous (*janajatis)*, the untouchables (*dalits)*, Muslims, and low- and middle-cast groups from the southern part of the country (*Terai)* have always struggled to have access to political and economic resources. A recent study done by World Bank on Gender and Social Exclusion (GSEA-2006) has shown that educational, health, socioeconomic outcomes are worst among the excluded ethnic groups in Nepal. The recent DHS data has shown that TFR is higher (greater than 3.8) among the lower-status ethnic groups such as the *dalits*, muslims, *terai* middle castes but lower among the higher-status groups such as the hill *Brahmins* and *newars* (~2.4).

This study examines whether this differential in TFRs among the ethnic groups can be explained by the differential socioeconomic status (SES) of these groups rather than the cultural differences between the groups using the Nepal DHS 2006 data which included nationally representative sample of 10,793 women aged 15-49.

This paper calculates TFR from parity progression rations (PPRs) instead of age-specific fertility rates (ASFRs) because the method using PPRs takes into consideration women's marital status, time elapsed since marriage until first birth, time elapsed since last birth, and the number of surviving children, thus making this method an improved method in calculating TFRs and examining the effect of sociodemographic factors on TFRs. The total fertility rate (TFR) and total marital fertility rate (TMFR) are estimated using parity progression ratios as specified in equation (1):

$$TFR=P_BP_M + P_BP_M P_1 + P_BP_M P_1P_2 + P_BP_M P_1 P_2P_3 + P_BP_M P_1 P_2P_3 P_4 + P_BP_M P_1 P_2P_3P_4P_5 + P_BP_M P_1 P_2P_3 P_4 P_5 P_6 + P_BP_M P_1 P_2P_3 P_4P_5 P_6 P_7 + P_BP_M P_1 P_2P_3P_4P_5P_6 P_7P_8 + P_BP_M P_1 P_2P_3 P_4P_5 P_6 P_7P_8 P_{9+}/(1- P_{9+}) \quad (1)$$

Total Marital Fertility Rate (TMFR) can be calculated by substituting $P_B=1$ in the equation (1).

The complementary log-log (CLL) model, a discrete- time survival model was utilized to estimate the time-varying effects of both time-variant and –invariant predictor variables such as education, residence, and ethnicity. The complementary log-log (CLL) model has advantages over other multivariate survival techniques (Cox regression, K-M method, discrete-time logit model) because of few reasons. First, it captures time-varying effects of sociodemographic factors for progression to first marriage and higher-order parities for calculating total TFRs.

Second, the model allows for both left- and right-censoring particularly working with period data like DHS data such that we can censor individual's exposure to an event of birth before and after the period (left- and right-censoring). Third, this method allows us to calculate baseline hazard function (P_{0t}) which is necessary for estimating the model-predicted risk of failure for specified values of the predictor variables. The predicted values of life table parameters such as PPR, and mean and median failure times for specified values of predictors can then be calculated using the value of coefficients of predictor variables and model-predicted risk of failure.

The general form of the model is specified as in equation (2)

$$\text{Log}[-\log(1-P_{it})] = a_t + b_1 X_{i1} + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + b_k X_k \quad (2)$$

where i denotes the ith observation, t is count variable denoting the t^{th} life table time interval (t=1,2,…….), P_{it} is the discrete hazard function or probability of failure during the t^{th} life table time interval, a_t is a function of t, b_i and X_i are sets of coefficients and predictor variables respectively.

To carry out the CLL model, the original person sample was expanded to a sample of person-year observations created from each person's observation starting from exposure to event until occurrence of event (failure) or end of calendar time period of interest (censor). Separate expanded data sets of person-year observations were created for each parity transition. For example, to examine the 1^{st} birth to 2^{nd} birth parity transition, the observation started after the first birth until second birth occurred or until survey year. In addition, the observations were limited to birth occurring during the last five years prior to the survey.

Preliminary and Proposed Analysis:

In the preliminary analysis, the PPRs, mean and median failure time for the 1^{st} to 2^{nd}, 2^{nd} to 3^{rd}, and 3^{rd} to 4^{th} birth transitions were calculated. To examine the ethnic variation in parity progression, a separate model with ethnicity as predictor variable was estimated (Unadjusted model). Then, education, residence, and wealth index were added to this model to examine whether PPRs calculated from the first model would change with the addition of these socioeconomic status variables (adjusted model). Two separate models for education and residence were also estimated to examine the effects of these variables on fertility.

Residence was divided into urban and rural residence, and education was categorized into no education, primary completed, and secondary completed and higher. Capturing the variation in ethnic groups in Nepal into smaller and effective categories was challenging. The DHS data has information on 103 social groups which was reduced to seven main ethnic groups identified by the GESA-2006. However, the number of observations in the minority ethnic groups would have been problematic in achieving convergence for higher-order PPRs from the CLL model. Therefore, ethnicity was further collapsed into three groups: 'majority' ethnic group including all *brahman, chhetri, newar* who are majority in numbers and have greater access to resources; 'southern' ethnic group including all *Madhesi, terai's castes, and muslim* who reside mostly in the southern party of the country, have lower access to resources than 'majority' but higher access than the *dalits* and indigenous groups and are culturally different, 'disadvantaged' ethnic group including all indigenous groups and the *dalits* who are marginal groups in the society. The wealth index was divided into three equal groups based on 33.3^{rd} and 66.6^{th} percentile.

Table 1 provides the unadjusted and adjusted value of PPRs, mean and median failure time for each of the predictor variable for the three transitions. There is a variation among the ethnic groups in their PPRs but the most dramatic difference from 1^{st}-2^{nd} to 2^{nd}-3^{rd} PPRs is

observed among the Southern ethnic group whose PPR does not decrease that dramatically from 1^{st}-2^{nd} to 2^{nd}-3^{rd} birth transition. As expected, after adjustment PPR increases for major ethnic group but decreases for the other two groups. Similar effect is noticed for educational level and residence. The decline of PPR for education is most remarkable for the highest level of education.

To further understand the role of SES in the fertility difference among the ethnic groups, a step-wise model will be estimated such that the first model will calculate TFR with just ethnicity and then each SES variable will be added subsequently and separately to the model to understand the effects of each SES variables on ethnic fertility differentials. For preliminary analysis, similar step-wise CLL model was carried out on three birth transitions to calculate the likelihood of transition from one birth to the next. As shown in Table 2, the likelihood of transitioning from second to third birth is highest for the disadvantaged ethnic group and this effect remains significant with addition of any SES variable. In particular, it increases after the addition of wealth index indicating a strong association between economic resources and fertility for this ethnic group. However, although the probability of having 3^{rd} child is high for the southern group in comparison to the majority group, the likelihood is not significant and does not change with the addition of other SES variables indicating less effect of SES on fertility transitions among the southern ethnic groups. This result suggests possibility of culture informing perception of fertility among these ethnic groups and needs further examiniation.

In subsequent analysis, this step-wise CLL model will be expanded to calculate TFR. In addition, the analysis will be carried out on the 1996 and 2001 Nepal DHS data to examine the trends of TFR among the ethnic groups in the country. The trends may reflect the continuing struggle among the ethnic groups and NGOs to provide the marginalized ethnic groups with equal access to healthcare and education since democratization in Nepal in 1990.

Overall, this paper will address an important debate on social exclusion of ethnic groups and their fertility outcomes that is currently influencing policy reforms in the changing political situation in Nepal.

Table 1. PPRs and Mean and Median Failure time for three transitions. DHS 2006, Females ages 15-49.

	1st to 2nd		2nd to 3rd		3rd to 4th	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Ethnicity						
Major Ethnic						
PPR	0.92	0.93	0.62	0.64	0.51	0.49
Mean Interval	3.71	3.58	3.96	3.92	3.68	3.60
Median Interval	3.40	3.31	3.57	3.53	3.45	3.38
Southern Ethnic						
PPR	0.97	0.95	0.87	0.83	0.66	0.64
Mean Interval	3.27	3.42	3.46	3.60	3.55	3.53
Median Interval	2.97	3.06	3.12	3.25	3.30	3.29
Disadv Ethnic						
PPR	0.91	0.89	0.65	0.59	0.63	0.56
Mean Interval	3.67	3.74	3.88	3.96	3.77	3.74
Median Interval	3.36	3.40	3.36	3.42	3.46	3.44
Education						
No Education						
PPR	0.96	0.94	0.77	0.71	0.66	0.58
Mean Interval	3.45	3.51	3.59	3.70	3.64	3.59
Median Interval	3.17	3.25	3.17	3.26	3.38	3.34
Primary Education						
PPR	0.93	0.92	0.61	0.61	0.53	0.54
Mean Interval	3.63	3.63	4.09	4.08	3.73	3.64
Median Interval	3.29	3.30	3.63	3.63	3.44	3.39
Secondary and Higher Education						
PPR	0.85	0.88	0.46	0.51	0.34	0.42
Mean Interval	3.87	3.82	4.23	4.06	3.84	3.87
Median Interval	3.49	3.43	3.73	3.59	3.51	3.52
Residence						
Urban						
PPR	0.86	0.92	0.56	0.67	0.48	0.59
Mean Interval	4.01	3.86	4.40	4.18	3.88	3.92
Median Interval	3.65	3.53	3.91	3.75	3.59	3.60
Rural						
PPR	0.94	0.92	0.70	0.63	0.62	0.54
Mean Interval	3.54	3.57	3.71	3.79	3.67	3.59
Median Interval	3.24	3.27	3.29	3.33	3.40	3.34
All						
PPR	0.92	0.92	0.68	0.64	0.60	0.55
Mean Interval	3.62	3.63	3.80	3.87	3.70	3.63
Median Interval	3.31	3.31	3.37	3.41	3.42	3.37

Table 2. Odds Ratios from CLL Model Predicting Transition from 2nd to 3rd Birth, DHS 2006, Females ages 15-49.

	Model I	Model II	Model III	Model IV	Model V
Ethnicity					
Major (ref)	1.00	1.00	1.00	1.00	1.00
Southern	1.78	1.25	1.74	2.24	1.45
	(1.39)	(1.01)	(1.35)	(1.81)	(1.17)
Disadvantaged	3.80**	3.25*	3.69**	4.11**	3.24*
	(2.20)	(2.03)	(2.14)	(2.49)	(2.00)
Education					
No educ (Ref)		1.00			1.00
Primary educ		0.40			0.37
		(0.31)			(0.29)
Secondary and Higher educ		0.51			0.43
		(0.41)			(0.41)
Residence					
Rural (ref)			1.00		1.00
Urban			0.31*		0.23*
			(0.21)		(0.18)
Wealth Index					
Low (Ref)				1.00	1.00
Medium				0.78	0.93
				(0.48)	(0.58)
High				0.98	2.22
				(0.71)	(1.90)
Observations	7586	7586	7586	7586	7586
chi-square test	366.5	418.5	393.0	448.2	484.5

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1