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Research Article

Contraceptive intentions among Christian women in India: a multi-stage Logit model analysis

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ABSTRACT

Background: The main objective of this paper is to find how end level service providers of contraceptives can meet problems in identifying specific non-users at different stages of service delivery.
Methods: A multi-stage Logit model is developed from NFHS (2005-06) data for Christian women in India. The initial model is selected by Brown screening technique and for the final model, likelihood ratio statistic and Akaike information criterion is used. The study variables are age, number of living children, unmet need, infecundity, side effects of contraceptive use, education and place of residence, SLI and cash earning.
Results: Though spatial factors affect both Christian and non-Christian women, SLI directly affect Christian womens' intention while it operates through education for non-Christian women. The best model for future contraceptive intention among Christian women is affected by unmet need operating through standard of living.
Conclusions: The study finds two different paths of causation affecting future contraceptive intentions of Christian and non-Christian women with separate policy concerns and suggests that paths to future contraceptive intentions of Christian women may act as a social learning through diffusion process for non-Christian women.

Keywords: Christians, Contraception, Multi-stage Logit model, Diffusion, Social learning

INTRODUCTION

Emphasis on population development approach for different sections of population of India has left an indelible impression by creating a demographic gap. Consequently, some population groups of India are set on a distinctive demographic journey. There is very little variation in the fertility levels of Christian women in India or in the sex ratio of their births, which remains nearly constant.[1,2] This provides a window to understand factors affecting fertility of Christian women,[3] especially contraceptive use and its effect for social learning by enquiring into whether contraceptive intentions of Christian women have materialized into use. A significant dimension of contraceptive use that needs attention is future intentions regarding their use. Allowing and facilitating women to realize their own contraceptive choices and goals was one of the recommendations of ICPD (1994),[4] and meeting the needs of those who intend to use contraceptives goes to fulfill that objective.[5] It is shown that understanding of 'intentions not to use' contraceptives will help in identifying the factors for bringing change in attitude to practice of contraception.[6] Fear of side effects and understanding of unmet need and PPA are very important to convert non-users into users.[7] Studies on intention to use contraceptive[8] and found that constellation of services[9] for family planning and other contraceptive health concerns centre around the time of child birth and programs mostly concentrate on satisfaction of unmet needs rather than converting intending women into users.[10] If women are to gain greater control over their child bearing processes, it is found that perception of family size has a substantial effect on the decision to

initiate contraception.[11] Early contraceptive use depends on desired family size[12] which depends upon younger age, previous experience of child loss and education.[13] Unmet Need for contraception and its variants are statistically derived measures of potential demand of contraceptive intentions of non-users of contraception and intention to use contraception in future is a direct measure of potential demand. It may not always be possible for a woman to comprehend and synchronize her own statement and link "not having children" with use of contraception. It may, therefore, be difficult for End Level Service Providers (ELSP) to translate such woman's desire into action. In this context, the intention to use seems to be a very valid indicator of demand rather than the prevalence of unmet need, even allowing for some failure to use among those stating intentions to use. When it comes to end level service providers who counsel women (either who intend to or those who do not intend to) to convert their desires into practices, the time distribution and contraceptive practices of women such as whether she is in PPA, perceives herself as sub-fecund etcetera becomes very important.[5] In this context, this paper focuses on understanding how end level service providers of contraceptives can meet problems in identifying specific non-users at different stages of service delivery and how to identify the paths for converting non-users into users, if they intend to use contraceptives by applying a multi-stage Logit model. This model has been discussed[14] and earlier applied[15-17] in understanding effect of birth interval on infant survival on Thailand DLHS data and for understanding child bearing and infant survival from Korean data.[18] The study has made a substantial contribution in understanding policy concerns of contraceptive intentions of Christian women in India and its implications for non-Christians. Dichotomization of explanatory variables has allowed causal analysis,[19] which helped in direct presentation of the strength of the effects.

Demographic profile of Christian women in India and context

Christians in India have been found to be highly developed on the demographic indicators. Despite a high increase in Christian population,[31] this group is efficiently managing to remain near the replacement level fertility (NHFS, 2005-06).[20] The number of Christians in the total population increased from 0.71 percent in 1891 to 2.3 percent in 2011 and NFHS (2005-06) shows the Christian population to be 2.2 percent, though spatial aspects of population distribution have not changed much from 1891 up to now.[1,2,21] The Indian national family health survey (2005-06) has collected information on future contraceptive intentions of all eligible women. Among Christians in India, it was found that 80 percent are literate, 80 percent are regularly exposed to any mass media. More than 80 percent of Christians are marrying over the age of 20; mean number of children born per ever married Christian women is 3.32. With the knowledge of these facts at the ground level, one could easily predict the pathways to future levels of contraception and monitor the programme.

METHODS

Multi-stage factor response model

The development of the Logit model and the test of goodness of fit which have been applied in the present study, are briefly described here.

It is found that while working with more than three categorical variables we must take care in carrying out analyses leading to the preparation of path diagrams.[14] Implicit in the methods is the causal ordering of variables in the form of a multistage factor response model.[22] Suppose, for example, that we have four variables: A, B, C and D. If the causal ordering is

{A precedes B precedes C precedes D}---------- (i)

Then we should construct a diagram based on Logit models for (1) B given A (2) C given A and B, and (3) D given A, B and C. This set of three Logit models, when combined, characterizes the conditional joint probability of B, C and D, given A. If the causal ordering is

{A and B} precede C precedes D, ---------- (ii)

It is suggested that the relationship between A and B can be measured on the basis of the corresponding marginal table,[22] and the links between the remaining variables then can be based on Logit models for C given A and B for D given A, B and C. This pair of Logit models characterizes the conditional joint probability of C and D given A and B. When we combine the two marginal probabilities of A and B, we get a characterization of the joint probabilities associated with all four variables. Both the systems of equation (i) and (ii) are systems of recursive models and their parameters can be measured with Likelihood –Ratio Statistics for Component models.

Causal analysis involving Logit and log-linear models

For quantitative variables, the method of path analysis has been used to provide an interpretation of linear model systems.[23,24] Path analysis is not a method for discovering causal links among variables from the values of correlation coefficients, rather its role is (1) to provide a causal interpretation for a given system of linear relationships and (2) to make substantive assumptions regarding causal relationships explicit, thus avoiding internal consistencies. With regard to point (1) since the causal models are consistent with a given set of relationships, only additional information, substantive theory or further research can help us to choose among other models. It has been used an analog to path analysis for qualitative variables for cross-classified data which helps in creation of path diagrams,[22] based on one or more log-linear or Logit models, those used in the

analysis of quantitative variables, where Logit coefficients becomes path coefficients and such models are applied[18] and in demographic analysis.[17]

Akaike information criterion (AIC)

The Akaike information criterion,[25] developed is a statistical model fit measure with the lowest value to avoid over-fitting. It quantifies the relative goodness of fit of various previously derived statistical models. It uses a rigorous framework of information analysis based on the concept of entropy. The driving idea behind AIC is to examine the complexity of the model together with goodness of its fit to the sample data and to produce measure which balances between the both:

AIC= 2k-ln (L),
Where K: number of parameters,
L: Likelihood ratio chi-square

Data sources and selection of variables influencing contraceptive intentions

Table 1: Description of variables.

Notation	Explanatory variables	Category
A	Current age	A_1: ≤25 years of age A_2 :>25 years of age
B	Standard of living (SLI)	B_1: low B_2: high
C	Number of currently living child	C_1: ≤2 child C_2: 2 child
D	Declared infecund	D_1: infecund D_2: not infecund
E	Intentions to use contraceptives within next 12 months	E_1: intends to E_2: does not intend
F	Health concerns-side effects of contraceptive use	F_1: health concerns F_2: others
G	Wants more children	G_1:wants more children G_2: others
H	Use of any method	H_1: used any method H_2:others
I	Unmet need	I_1: in unmet need I_2: not in unmet need
J	Education	J_1: educated J_2: illiterate
R	Place of residence	R_1: urban R_2: rural
W	Earns for cash	W_1: no W_2: yes
M	Currently amenorrheic	No: M_1 Yes: M_2

This study has used data from 2005-06 National Family Health Survey (NFHS-3),[21] which is a nationally representative sample survey of around 1, 24385 ever-married women in the age group of 15-49 conducted by IIPS, Mumbai. NFHS-3 is an excellent survey data available to researchers on socio-economic and demographic characteristics, family planning and fertility characteristics, immunization and child health, knowledge and misconceptions of HIV/AIDS, MCH and quality of health care. The sample of women who intend to use contraceptives in the 12 months consists of 578 Christian and 6313 non-Christian women. This analysis has been performed both for Christian and non-Christian women. Explanatory variables have been taken as shown as in Table 1.

For simplicity, all the variables have been considered binary. Womens' age, SLI, numbers of living children, side effects of contraceptive use, unmet need and education have been considered to be generally affecting womens' contraceptive intentions.[13] SLI variable is available into low, medium and high category. For this paper medium category have been merged with high category and has been said as high category. We found that current amenorrheic status, previous use experience of any contraceptive methods, earning cash and 'declared fecund' were not very significant in determining the future contraceptive intentions of the women either for Christians or non-Christians, either by partial or marginal association.[26] In our initial model, the selection process included all the variables except SLI as it was not found significant either for Christians or non-Christians; therefore, SLI (B) has been included in the model at the second stage. As all the nine variables were categorized, a 2^9 cross-classified table was created and log-linear model analysis was applied. For the causal ordering, it is considered that women's future contraceptive intention was preceded by SLI, which was in turn preceded by the remaining eight variables. Analytically, this is equivalent to a two-stage log-linear analysis, first analyzing on a 2^8 cross-classified table collapsing over the variable of SLI and then on a full 2^9 table.[14] The best fit log-linear model was selected by standard stepwise procedure. We also considered Akaike information criterion[25] in the selection procedure. The multistage logistic model thus performed is equivalent to the path analysis for qualitative data.[22]

RESULTS

Univariate and bi-variate analysis

We first examined the odds ratio of a given variable – differences in the odds of future contraceptive intention between the two categories of the factors without controlling other factors. All the factors considered are significant at 5 percent level of significance. If the value of an odds ratio covers unity, then there is no evidence that future contraceptive intention is different by category of the factors. The larger the deviation from unity in the ratio, the stronger the association between future contraceptive intention and the factors. Among all the factors, all but previous use of any method yielded significant findings both for Christians and non-Christians. Womens' age, SLI, number of current living

child both for Christians and non-Christians are producing nearly the same effect in explaining womens' future contraceptive intention while side effects of contraceptive use are of more concern to non-Christians though unmet need is more explanatory of future contraceptive intention in case of non-Christians, urban stay of Christians is more contributory to explaining future contraceptive intention. Previous use of contraceptives does not affect intentions much either of Christians or non-Christians. Though health concerns is more affecting to non-Christians women than low SLI Christians women. Though, high SLI non-Christian women are more bothered about side effects of contraceptive use as may be that they previously had bad experiences. Illiterate non-Christians with unmet need show a very strong contraceptive intention as compared to literate non-Christians, which may be the result of social learning. Christians with low SLI, having at least two living children (OR=3.35) and are in unmet need, have a very strong future contraceptive intention which shows why near replacement level fertility have been maintained by Christians since long? Thus, it appears that many factors are associated with future contraceptive intentions of Christian women, whose effects are very much pronounced even for Christian women with low education and SLI compared to non-Christian women.

Selection of best fit model for Christian and non-Christina women

The hierarchical log-linear model gives many models[14] and we need to select the most appropriate casual model in terms of parsimoniousness, goodness of fit, and the amount of information the model could offer.

To reach such a model for Christian and non- Christian women both from the NFHS (2005-06) data, a series of nested models as listed in Tables 2 and 3 was sequentially examined.

Table 2: Selection of log-linear models for non-Christian women, India; NFHS (2005-06).

Model					Effect under test		
No. of description	**df**	**G^2**	**P**	**AIC**	**Effect**	**df**	**G^2**
First stage							
(A C F I J R M)**	1	0.35	0.554	2.05			
(A C F I J R)	2	0.3712	0.831	8.99	M	1	0.947
(A C F I J)	3	0.39	0.940	9.94	R	1	1.006
(A F I J)	4	0.533	0.970	10.62	C	1	0.0646
(A I J)	5	0.88345	0.971	12.12	F	1	0.0452
(A J R)	6	1.42992	0.964	13.64	I	1	0.4592
(C I J R)	7	1.67559	0.976	15.48	A	1	0.1811
Second stage							
(A B C F I J R M)**	4	0.00809	0.4548	14.81			
(B C F I J R)	5	0.0083	0.4558	15.79	A	1	0.556
(C F I J R)	6	0.02009	0.2545	17.91	B	1	1.298
(F I J R M)	7	0.02456	0.1625	19.50	C	1	1.951
(B F I J M)	8	0.08707	0.4950	20.52	R	1	0.466
(I J M)	9	0.08450	0.7631	22.46	F	1	0.091
(C I J)	10	0.17531	0.2652	23.84	M	1	1.242
(B C I)	11	0.15861	0.900	25.83	J	1	2.875
(F J)	12	0.74851	0.4970	25.28	I	1	0.461

Note: All values have been taken at P <0.05, df: degrees of freedom; G^2: Likelihood ratio Chi-square; P: probability, AIC: Akiake information function; **: the best fit model

Each capital letter indicates the main effect of the variables, as denoted in Table 1, omitting full interaction effect of the explanatory variables as it must be included anyway by theory. On applying Brown screening technique,[26] for initial model selection process for the best fit model, it included all the effects except for standard of living as it was not significant either by partial or marginal associations both for Christians and non-Christians.

The importance of an effect in the model was evaluated by examining the difference in the chi-square (G^2) value between two models, one including the effect and the other excluding it.

We selected the effect if G^2 was significant for this, i.e., the effect was too large to ignore. The procedure was repeated until no more individual effect could be eliminated.

Table 3: Selection of log-linear models for Christian women, India; NFHS (2005-06).

Model					Effect under test		
No. of description	**df**	**G^2**	**P**	**AIC**	**Effect**	**df**	**G^2**
First stage							
(A C F I J R M)**	10	0.19600	0.7110	23.62			
(A C F I J R)	11	0.21101	0.7112	25.55	M	1	0.8025
(A C F I)	12	0.27360	0.7533	27.29	R	1	0.3171
(A C F J)	13	0.31600	0.4839	29.15	I	1	0.4748
(A C J)	14	0.54474	0.6285	40.60	F	1	0.1800
(A J R)	15	0.7746	0.3386	42.25	C	1	0.1537
(F J R M)	16	0.74596	0.3717	34.29	A	1	0.3386
(F R M)	17	0.7923	0.2156	45.23	J	1	0.2628
Second stage							
(A B C F I R M)**	2	0.00059	1	10.43			
(A B C F J R M)	3	0.00033	0.8352	16.01	I	1	0.43
(A B C F I R)	4	0.00045	0.9047	17.75	J	1	0.14
(B C F I J R)	5	0.00043	0.3211	19.75	A	1	0.985
(B C R M)	6	0.00051	0.96	21.58	F	1	0.9657
(C R M)	7	0.00046	0.9833	23.68	B	1	0.9305
(B C R)	8	0.00047	0.9061	25.66	R	1	0.14
(C F I)	9	0.00058	0.3210	27.45	M	1	0.985

Note: All values have been taken at P <0.05, df: degrees of freedom; G^2: Likelihood ratio Chi-square; P: probability, AIC: Akiake information function; **: the best fit model

As shown in table 3 that for the first stage, we could ignore the effect of J but not of others in the case of Christians. In terms of AIC, however, model 1, which included the effect of J presented the smallest value and its goodness of fit was significant and it is more parsimonious than model 2, so model 1 was accepted as the best fit model for the first stage of causation. By undergoing a similar procedure for the second stage, model (A, B, C, F, I, R, M) was selected. Combining these two stages, the overall interpretation for intentions to use contraceptives becomes that future contraceptive intention of Christian women is directly affected by their SLI and education but indirectly affected by place of residence and present surviving child through education and SLI.

Table 4: Estimates of the Logit parameters and odds ratio for the effects in the best fit causal model for Indian non-Christians women, NFHS (2005-06).

Determinants	Logit parameter	Odds ratio
First stage effects-effects on PPA (Intends in PPA vs. does not)		
Women's age (young vs. old)	-0.751	0.222
Currently living child (two child vs. more child)	-0.507	2.756
Side effects of contraceptive use (has vs. does not have)	-0.655	0.269
Education (literate vs. illiterate)	-0.562	0.324
Unmet need (unmet need vs. no unmet need)	-0.567	0.321
Place of residence (urban vs. rural)	0.369	2.091
Amenorrhea (yes vs. no)	-0.569	0.320
Second stage effects-effects on intentions (Intends to vs. does not intend to)		
Women's age (young vs. old)	-0.746	0.224
Standard of living (low vs. high)	0.086	1.187
Currently living child (two child vs. more child)	-0.509	0.361
Side effects of contraceptive use (has vs. does not have)	-0.653	0.270
Unmet need (unmet need vs. no unmet need)	-0.569	0.321
Education (literate vs. illiterate)	-0.486	0.378
Place of residence (urban vs. rural)	0.362	2.062
Amenorrhea (yes vs. no)	-0.599	0.301

Applying the same procedure for non-Christians, model (A C F I J RM) was selected with lowest AIC value with high goodness of fit and it is more parsimonious than that which was selected at the second stage. Combining both the stages the interpretation of the causal model for the non-Christian becomes that future contraceptive intention of non-Christians women is directly affected by their SLI but is indirectly affected by amenorrhea; education, unmet need, urban residence and current surviving child operate through their standard of living.

Strength of effects in the selected model

The Logit parameter is useful in evaluating the strength and direction of a determinant. As our Logit models are derived from Log-linear model, the parameter represents the deviate from the mean Logit owing to the case belonging to the first category of the factor. Then ratio of a determinant is measured by the exponential of twice its Logit parameter.[19] For example odds of future contraceptive intentions would be decreased by exp (-2*0.914) for Christian women if women are under age 25 rather than older. Conversely, the odds ratio of older women to younger women would be 1/1.828 = 0.59. These odds ratios are shown in table 4 and 5. For non-Christians in the first stage of causation, the effect of urban residence compared to rural was very strong for younger women to intend to use contraceptives in future, and having two living children also makes for a strong possibility of their intention to use contraceptive in future.

Table 5: Estimates of the Logit parameters and odds ratio for the effects in the best fit causal model for Indian Christians women, NFHS (2005-06).

Determinants	Logit parameter	Odds ratio
First stage effects-effects on PPA (Intends in PPA vs. does not)		
Women's age (young vs. old)	-0.914	0.160
Currently living child (two child vs. more child)	-0.342	0.504
Side effects of contraceptive use (has vs. does not have)	-0.232	0.628
Unmet need (Unmet need vs. no unmet need)	0.046	1.096
Education (literate vs. illiterate)	-0.231	0.630
Place of residence (urban vs. rural)	0.031	1.063
Amenorrhea (yes vs. no)	-0.191	0.682
Second stage effects-effects on intentions (Intends to vs. does not intend to)		
Women's age (young vs. old)	-0.895	0.166
Standard of living (low vs. high)	0.042	1.087
Currently living child (two child vs. more child)	-0.352	0.494
Side effects of contraceptive use (has vs. does not have)	-0.254	0.601
Unmet need (unmet need vs. no unmet need)	-0.39	0.458
Place of residence (urban vs. rural)	-0.238	0.621
Amenorrhea (yes vs. no)	-0.234	0.626

Table 6: Higher order odds ratios for combination of factors for Indian non-Christians, NFHS (2005-06).

Contrast of factors	Odds ratio	Contrast of factors	Odds ratio
First sage		**Second stage**	
$A_2C_1I_1J_1R_1M_1/A_1C_2F_2J_2R_2M_2$	0.94	$A_1F_1I_1J_1M_1R_2/A_2C_2R_2F_2J_2M_2$	0.79
$C_1F_1J_1R_1M_1/C_2F_1I_1R_1M_1$	3.01	$A_2C_1R_1F_2J_1B_2/C_2R_1F_1I_1J_1B_2$	1.005
$A_2F_2J_2R_2M_1/A_1C_1J_1R_1M_2$	1.16	$A_1C_2F_2I_2R_2/A_2C_1M_1I_2R_1$	1.09
$A_2C_1I_1/A_1C_2F_2$	0.76	$C_2F_2I_2J_1B_2/C_1F_2I_1J_2B_1$	25.73
$C_2F_1I_1/A_1F_1I_2$	0.85	$C_1I_2J_2R_2M_2/A_1I_1J_2R_2M_1$	1.41
$A_2F_2J_2/A_1C_1J_2$	2.82	$A_1C_2F_2J_2R_2/A_2C_1I_1J_1R_2$	2.22
$A_1F_2R_2/A_2C_1R_1$	2.18	$A_2C_1F_1R_1M_1/A_1C_2I_2R_2M_1$	24.07
$A_1I_2R_1/C_2F_1R_2$	7.13	$A_1C_2M_2I_2B_1/A_1C_2R_2F_1B_1$	2.30
$F_2I_1R_1/C_2I_1R_2$	0.90	$A_2F_2J_1R_1/A_1F_1I_1R_2$	0.34
$C_1J_2R_2/A_2J_1R_2$	2.29	$C_1F_1J_1R_2/C_2F_1I_1R_2$	11.38
$I_2J_2R_1/F_1J_2R_1$	1.64	$A_2C_2J_1R_1/A_1F_1J_2R_1$	0.32
$C_1R_2M_2/A_1C_1M_2$	0.63	$A_2C_2R_1M_2/A_2F_1C_1R_2$	34.86
$J_2R_2M_1/I_1R_2M_2$	1.03	$C_1F_1R_1M_1/C_2I_1R_2M_1$	7.14
A_2F_1/A_1C_2	0.39	$A_2C_2F_2J_2/A_1C_1M_1J_1$	1.02
A_2C_2/A_2I_1	22.87	$C_2B_2F_1J_1/A_1I_1F_2J_2$	7.69
C_2F_1/C_1I_1	0.13	$A_1R_1I_2J_2$ /$A_2C_2I_1J_1$	0.26
		$A_2F_1I_1J_1/C_2M_1I_1J_2$	8.15
		$C_2F_1I_2J_2/C_1F_2I_2J_1$	3.10
		$A_1C_2F_1/A_1C_2F_1$	1.02
		$C_1B_1F_1$ /$A_2R_1F_1$	4.0
		$A_2M_2I_1/A_1C_1I_2$	1.13

Literate Christian women have a strong likelihood of adopting contraceptives compared to their illiterate counterparts. Similarly, in their second stage of causation, the direct effect of SLI of non-Christians women for future adoption of contraceptives use is very strong and education and place of residence, side effects of contraceptive use are showing a strong effect on future contraceptive intention, operating through SLI.

Both for Christian and non-Christian women, being in unmet need and amenorrhea have a strong association with future contraceptive intentions. In the same vein, for the Christian women, at the first stage of causation, urban place of residence and being in unmet need have a very strong association with future contraceptive intention, though side effects of contraceptive use deter them from future contraceptive intentions. In the same way, standard of living emerges as the most important factor for future contraceptive intention. It is supportive to find that amenorrheic Christian women have stronger future contraceptive intention than their non-Christian counterparts. The two-child norm effect appears to be fairly strong for Christian women; higher SLI of Christians would reduce the chances of higher number of births through strong future contraceptive intentions.

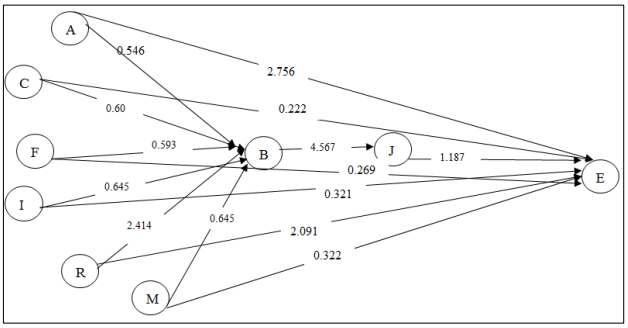

Figure 1: Path diagram for contraceptive intentions for non-Christian women, 2005-06.

Table 7: Higher order odds ratios for combination of factors for Indian Christians, NFHS (2005-06).

Contrast of factors	Odds ratio	Contrast of factors	Odds ratio
First stage		**Second stage**	
$A_1C_1F_1I_1J_1R_1/A_2C_2F_2I_2J_2R_2$	2.15	$A_2C_2F_2I_2R_2B_2/A_1C_1F_1I_1M_1B_1$	0.82
$A_1C_1F_1I_1R_1/A_2C_2F_2I_2R_2$	6.25	$A_1C_2F_2I_1B_1/A_2C_1I_1R_2B_2$	1.48
$A_1C_1F_1I_1R_1M_1/A_2C_2F_2I_2R_2M_2$	2.85	$A_1C_2F_21_2/A_2F_1I_1R_1$	7.76
$A_1F_2I_2J_2R_2/A_2F_2I_2J_2M_2$	0.34	$C_1I_2R_2/C_2I_1R_1$	1.00
$C_1F_1I_2J_2M_1/C_2F_2I_1J_1R_2$	0.55	$A_2C_2B_1R_2/A_1I_2B_1R_1$	1.84
$A_1C_1F_1I_1/A_2C_2F_2J_2$	0.83	$C_2B_1R_1/A_1B_2R_2$	0.25
$A_1C_1I_1J_1/A_2F_2I_2J_2$	0.84	$A_1F_2C_1R_2/C_1F_2B_1R_1$	4.29
$C_2F_1I_2R_1/C_1F_2I_1J_2$	3.53	$I_2M_2R_2/F_1M_1R_1$	1.13
$A_2C_2F_1R_1/A_1C_2I_1R_2$	1.89	$C_2I_1R_2M_1/F_2I_1B_2R_1$	1.19
$A_2F_1I_1R_2/A_2C_1J_1R_2$	1.12	$A_2C_2B_2/A_1C_2B_2$	1.06
$A_1I_2R_1M_1/F_1I_2J_2R_1$	3.20	I_2C_1/F_2C_2	0.60
$F_2I_2R_1/F_1J_1R_1$	0.57	$A_1I_2R_2/A_1C_2R_2$	4.99
A_1C_2/A_2F_2	0.29	$C_1B_2R_2/C_1I_1R_2$	0.26
C_2F_1/A_1I_1	0.09	$A_2F_2R_1/A_2C_1M_2$	1.35
C_2R_1/C_2I_1	0.96	$F_1B_2R_2/M_2C_1R_1$	8.17
F_2R_1/F_1I_2	1.30	$A_2C_1B_2/A_1C_2B_1$	0.86
I_2R_1/A_2R_2	0.02	A_2F_1/C_1F_2	6.54
		M_2F_1/C_1F_2	0.20
		F_2B_1/R_2B_2	1.08

As there are no significant interactions in the finally chosen model, the combined effect of two or more variables on the response variable may be estimated by the sum of the respective Logit parameters. For example, the odds of future contraceptive intentions of Christians would be increased by exp 2 (-0.191) = 0.68 times, if the women is in amenorrhea and is staying in urban areas. In the same way, there are multifactor contrasts $A_1C_1I_1J_1F_1R_1/A_2C_2I_2F_2J_2R_2$ and others. These higher order odds ratios are presented in table 6 for Christians and in Table 7 for non-Christians. Depending on the contrast, the magnitude of a multifactor odds ratio can be very large. In the first stage of causation, for Christians, womens' age (A), number of surviving child (C), side effects of contraceptive use (F), being in Unmet need (I) and urban place of residence (R) are causing a high change in odds ratio. The odds of $A_1C_1F_1I_1R_1/A_2C_2F_2R_2I_2$ has a odds ratio of 6.25 showing that the younger women with two living children, having side effects of contraceptive use and living in urban areas, will have a

strong desire for future contraceptive use. Similarly, the multifactor odds ratios for non-Christians have been presented and these odds ratios can be as high as 34, showing that the interaction of the factors increases manifold the possibility of future contraceptive intentions. This second stage of causal model of future contraceptive intentions is schematically shown in Figure 1 and 2 akin to the path diagram. In the figure, the arrow shows the causal relationship between the connected variable and the number by an arrow show the pertaining odds ratios, corresponding to the path coefficient in a diagram.

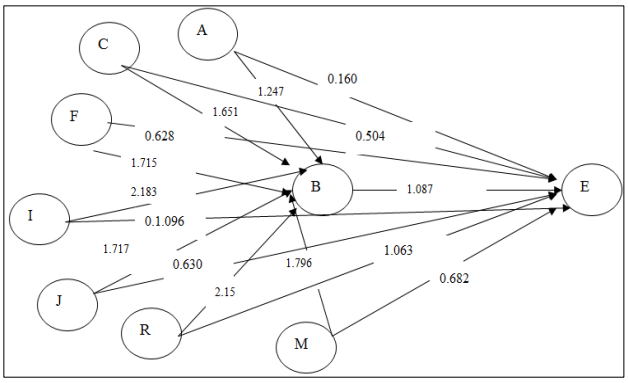

Figure 2: Path Diagram for contraceptive intentions for Christian women, 2005-06.

DISCUSSION

In this paper, a multi-tier causal model for contraceptive intentions of Christian women in India using NFHS (2005-06) data is formulated and two types of multi-stage factor response model has been developed to show the differential effect for both the Christian and non-Christian women.

The best model for future contraceptive intentions of non-Christian women is operating through Standard of Living and education, both of which are highly affected by rural urban stay of these women as shown by the largest path coefficient of rural urban category of predictor. There is a high indication of contraceptive intentions among illiterate non-Christian women which supports earlier findings that the substantial reduction in fertility in India can be expected among illiterate women.[27,28]

(R ⟶ B ⟶ J ⟶ E)

Similarly, future contraceptive intention among Christian is affected by unmet need operating through standard of living.

(I ⟶ B ⟶ E)

Since Christians are highly educated, it may be that unmet need is very much pronounced among them which is highly affected by their standard of living for future contraceptive intentions. Among the eight explanatory variables selected as predictors of contraceptive intentions, we considered education and SLI as proximate variables and the other six variables current age, number of currently living children, health concerns about side effects, unmet need, place of residence and amenorrhea as background variables. Their causal ordering should be reasonable as contraceptive intention is very much associated with education and SLI.[8] This education and SLI may affect apriori future contraceptive intentions or posteriori, as continuation of contraceptive use depends on SLI and education or both.[13] Hence, SLI has affected apriori the contraceptive intentions of Christian women, probably because Christians with a high educational level may intend fewer children to at least maintain their given standard of living.

Findings indicate that currently amenorrheic Christian women with unmet need have a stronger intention to use contraceptive in future than their non-Christian counterparts. Also, the side effects of contraceptive use are of more concern to the Christian women because they are more aware of health consequences of side effects, which may be a hindrance in using contraception without satisfactory follow-up services after adoption. The number of currently living children is an important factor in converting non-user Christian women into contraceptive users as compared to non-Christians, as evidenced by the lower path coefficient for non-Christians. As effect of education is both direct and indirect for converting both Christians and non-Christians into users of contraception, indirect effect of education is strongly operating through other factors to affect the future contraceptive intentions of both the groups. This also suggests that indirectly diffusion effect of education is prominent in converting non-users into users of contraceptives. Therefore, universalisation of population education of specific groups will ultimately help in reducing TFR as envisaged in national population policy[29] and national health policy[30] through converting intending non-users into users.

Concentrating by investment on younger and uneducated women would be more helpful in converting non-users of contraception to users and to strengthen the demographics of generic community. For Christian women, unmet need operating through standard of living has emerged as the best path affecting their future contraceptive intention, which strengthens the impact of development on fertility reduction. The main factors for converting Christian women into users of contraceptives are urban residence and standard of living, while for non-Christians their future intentions to use contraceptives operate primarily through standard of living which is highly affected by their educational status.

The differences in the stages in future contraceptive intentions of both groups of women can act as social learning through diffusions processes[32] with policy implication for converting non-users of contraception into users. Therefore, for non-Christian womens' educational awareness in combination with standard of living is an

important factor for future contraceptive intentions and hence, of being users. These issues may be taken into account by population policy and program managers for converting non-users of contraception into users and the results shown in higher order interactions can be suitable paths for specific programmes and policies. Christians stand better on demographic indicators which may help non-Christians as a source of social learning in improving their fertility behavior.

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