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Women's Education and Their Fertility in Rural Upper Egypt

by: *Youssef Mostafa Mahgoub**

Introduction:

It has been widely known nationaly and imternationaly that education is the only factor among socio-economic variables that proved to have the stongest negative association with fertility. As for example, Ridker (1976) stated that: "parents with more education have smaller families and parents whose children have more education also have smaller families. These relationships hold in both cross sectional and time series studies at both national and family levels and whether or not other important variables ,such as income and place of residence are controlled. Some studies have found that the relationship is positive for families with only a few years of primary education suggesting the possibility that it is necessary to achieve a certain threshold before the negative impact takes hold". In this study, four data sets of Demographic Health Surveys for 'rural upper Egypt' are investigated using both weighted least squares and maximum likelihood estimates. Different models for global odds ratios are tested. We are concentrating here on 'rural upper Egypt' for two reasons. First; rural upper Egypt had proved consistently to have the highest fertility levels among different geographic regions of Egypt. For instance, total fertilitry rate reached 5.2 births / woman according to DHS(1995). Second; it has been noticed from earlier studies that rural upper Egypt has the lowest association between fertility and education among all geographic ares of Egypt (Mahgoub (1989;1990,1991) and Mahgoub & Hussein (1992)) .

Section 1: Global Odds Ratio Definition:

Global odds ratios and their interpretations are introduced below.

$$\Psi_{ij} = \frac{\{\sum_{a\le i}\sum_{b\le j}\Pi_{ab}\}^{*}\{\sum_{a>i}\sum_{b>j}\Pi_{ab}\}}{\{\sum_{a>i}\sum_{b\le j}\Pi_{ab}\}^{*}\{\sum_{a\le i}\sum_{b>j}\Pi_{ab}\}}$$

for i=1,21,..... ,r-1 (rows), j=1,2,....., c-1 (columns), where Πij denotes the population proportion in the cell (i,j) and

$$\sum_{i=1}^{r}\sum_{j=1}^{c}\Pi_{ij}=1$$

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* ***Youssef Mostafa Mahgoub*** ,associate Professor, ISSR, Cairo University

Each global odds ratio can be expressed as a ratio of odds of cumulation events as:

$$\Psi_{ij} = \frac{odds(c_1 \subseteq i / c_2 \subseteq j)}{odds(c_1 \subseteq i / c_2 \supset j)} = \frac{odds(c_2 \subseteq j / c_1 \subseteq i)}{odds(c_2 \subseteq j / c_1 \supset i)}$$

Odds for an event E are defined as:

$$\frac{p(E)}{1-p(E)}$$

The following is an example for global odds ratio interpretation. The global odds ratio at Secondary / Higher 4-5/6+ cutpoint (Table (1)) means the odds on having at most five living children given that the level of education is "Higher" is 2.64 times the odds on having at least six living children given that the level of education is "Higher".It also means :for those women whose level of education is "Higher" the odds on having at most five children is 2.64 times the odds on having at least six children. This means that women with "Higher" education are much less probable to have six or more children.

Table (1): Education and No. of Living Children (DHS, 1988)
Rural Upper Egypt

Level of Education	Number of Living Children			
	0-1	2-3	4-5	6+
Higher	6	3	1	1
	3.24	3.80	2.64	
Secondary	32	22	12	1
	2.66	3.68	10.41	
Primary	132	143	133	95
	1.16	1.24	1.44	
No Education	398	401	374	338

*: Global Odds Ratios

Section 2: Results:

Models of the form $\ln\Psi ij = X\beta$, where X is a design matrix. The null hypothesis is that each global odds ratio equals to one, which is equivalent to no association at the corresponding cutpoint.

Table A-1 shows the results for "First Row Effect" for global odds ratios in Table 1. All global odds ratios in this row are not significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of

2.97 (p-value =0.3955) meanining that the model is accepted. These results mean that women with education level 'Higher' are not different than women with other educational levels with respect to number of living children.

Table A-2 presents the results for "Second Row Effect" for global odds ratios in Table 1. The first two global odds ratios in this row are highly significant, and the third global odds ratio is also significant. The test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 21.15 (p-value = 0.0001) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 1.10 (p-value=0.2954), meanining that the linear trend is accepted which means that globai odds ratios in this row increase linearly across number of living children..

Table A-1: First Row Effect, DHS 1988, Rural Upper Egypt

Source		DF	Chi-square	prob.
Intercept		3	2.97	0.3955
Residual		0		
	Analysis of Weighted		Least squares	
Effect	Parameter	Estimate	Std Error	Chi-square Prob.
	1	3.24	1.97	2.17 0.0998
	2	3 .80	2.98	1.63 0.2015
	3	2.64	2.77	.91 0.3410

Table A-3 presents the results for "Third Row Effect" for global odds ratios in Table 1. Obviously, all global ods ratios in this row are highly significant. Also, the test statistic for godness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 130.08 (p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 2.22 (p-value=0.1362), meanining that the linear trend is accepted which means again that global odds ratios here are increasing linearly.

Table A-2: Second Row Effect, DHS 1988, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	21.10	0.0001
Residual	0		

	Analysis of Weighted	Least squares		
Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	2.66	0.617	18.83	0.0000
	2	3.68	1.067	11.83	0.0006
	3	10.41	7.48	1.94	0.1639

	Analysis of Contrasts		
Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	1.10	0.2954

Table A-3: Third Row Effect, Rural Upper Egypt 1988

Source	DF	Chi-square	prob.
Intercept	3	130.08	0.0000
Residual	0		

	Analysis of Weighted	Least squares		
Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	1.16	0.1253	85.28	0.0000
	2	1.24	0.1233	102.78	0.0000
	3	1.44	0.1829	61.78	0.0000

	Analysis of Contrasts		
Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	2.22	0.1362

Section 3: Log Linear Models:

Log linear models are similar to multiple regression analysis for categorical data. In log linear models the dependent variable is the number of cases in a cell of the table while the independent variables are all variables that are used for classification. Models for the natural logarithms of the observed counts are as follows:

$$\ln \pi ij = \mu + \lambda i + \lambda j + \lambda ij$$

Where πij is the observed count in the cell (i,j), λi is the row effect,and λj is the column effect, and λij is the interaction effect for rows and columns. Maximum Likelihood (ML) procedure is used to fit and test for different loglinear models of the form shown above. Table (A-4) shows that the chi-square test statistic has a value of 33.67 with 9 degrees of freedom which means that the association between level of education and number of living children is highly significant (Appendix 1)..

Table (2): Education and No. of Living Children (DHS, 1995)
Rural Upper Egypt

Level of Education	Number of Living Children			
	0-1	2-3	4-5	6+
Hihger	15	10	4	1
		2.95	4.68	9.07
Secondary	247	209	78	16
		2.80	5.36	11.99
Primary	28	262	276	276
		1.45	.64	1.65
No Education	720	773	804	833

Table B-1 presents the results for "First Row Effect" for global odds ratios in Table 2. Obviously, the first two global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 8.92 (p-value = 0.0403) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is0.45 (p-value=0.5010), meanining that the linear trend is accepted.

Table B-2 presents the results for "Second Row Effect" for global odds ratios in Table 2. Obviously, all global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 140.82 (p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 9.70 (p-value=0.0018), meanining that the linear trend is rejected.

Table B-3 presents the results for "Third Row Effect" for global odds ratios in Table 2. Obviously, all global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 328.80 (p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is2.16 (p-value=0.1416), meanining that the linear trend is rejected.
Table (B-4) shows that the chi-square test statistic has a value of 283.29 with 9 degrees of freedom which means that the association between level of education and number of living children is highly significant (Appendix 2).

Table B-1: First Row Effect, Rural Upper Egypt 1995

Source	DF	Chi-square	prob.
Intercept	3	8.29	0.0403
Residual	0		

Effect	Analysis of Weighted Parameter	stimate	Least squares Std Error	Chi-square	Prob.
	1	2.95	1.0822	7.44	0.0064
	2	4.68	2.2969	4.15	0.0416
	3	9.07	9.2303	0.97	0.3258

Contrast	Analysis of DF	Contrasts Chi-square	Prob.
Test for Linear Trend	1	0.45	0.5010

Table B-2: Second Row Effect, Rural Upper Egypt 1995

Source	DF	Chi-square	prob.
Intercept	3	140.82	0.0000
Residual	0		

Analysis of Weighted Least squares

Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	2.80	0.2557	120.10	0.0000
	2	5.36	0.6148	76.10	0.0000
	3	11.99	2.9815	16.17	0.0001

Analysis of Contrasts

Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	9.70	0.0018

TAble B-3: Third Row Effect, Rural Upper Egypt 1995

Source	DF	Chi-square	prob.
Intercept	3	328.80	0.0000
Residual	0		

Analysis of Weighted Least squares

Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	1.45	0.0996	211.50	0.0000
	2	1.64	0.1014	259.97	0.0000
	3	1.65	0.1253	172.38	0.0000

Analysis of Contrasts

Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	2.16	0.1416

Table (3): Education and No. of Living Children (DHS, 1997)
Rural Upper Egypt

Level of Education	Number of Living Children			
	0-1	2-3	4-5	6+
Higher.	6	5	1	1
		2.78 *	543	3.69
Secondary	81	57	20	6
		3.82	6.29	8.60
Primary	53	84	87	74
		1.58	1.79	1.76
No Education	197	234	260	250

*: Global Odds Ratios

Table C-1 presents the results for "First Row Effect" for global odds ratios in Table 3. Only the first global odds ratio in this row is significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 3.62 (p-value = 0.3095 meanining that the model is accepted. Table C-2 presents the results for "Second Row Effect" for global odds ratios in Table 3. All global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 41.76(p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 2.10 (p-value=.1473), meaning that the linear trend is accepted.

Table C-3 presents the results for "Third Row Effect" for global odds ratios in Table 3. Obviously, all global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 96.61 (p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 0.45 (p-value=.5046), meaning that the linear trend is accepted.

Table C-1: First Row Effect, DHS 1997, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	3.62	0.3059
Residual	0		

Analysis of Weighted Least squares

Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	2.78	1.5543	3.19	0.0741
	2	5.43	4.1840	1.68	0.1944
	3	3.69	3.8483	0.92	0.3376

Table C-2: Second Row Effect, DHS 1997, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	41.67	0.0000
Residual	0		

Analysis of Weighted Least squares

Effect	Parameter	Estimate	St Error	Chi-square	Prob.
	1	3.82	0.6355	36.21	0.0000
	2	6.29	1.3435	21.89	0.0000
	3	8.60	3.3628	6.54	0.0106

Analysis of Contrasts

Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	2.10	0.1473

Table C-3: Third Row Effect, DHS 1997, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	96.61	0.0000
Residual	0		

Analysis of Weighted Least squares

Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	1.58	0.2030	60.43	0.0000
	2	1.79	0.2047	76.52	0.0000
	3	1.76	0.2509	49.19	0.0000
	4				

Analysis of Contrasts

Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	0.45	0.5046

Table (C-4) shows that the chi-square test statistic has a value of 110.53 with 9 degrees of freedom which means that the association between level of education and number of living children is highly significant (Appendix 3).

Table (4): Education and No. of Living Children (DHS, 1998)
Rural Upper Egypt

Level of Education	Number of Living Children			
	0-1	2-3	4-5	6+
Higher	10	8	5	1
		1.90	2.52	6.09
Secondary	120	105	30	6
		2.70	6.21	12.90
Primary	73	91	89	73
		1.56	2.20	2.24
No Education	249	242	281	260

*: Global Odds Ratios

Table D-1: First Row Effect, DHS 1998, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	6.94	0.0738
Residual	0		

Analysis of Weighted Least squares

Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	1.90	0.7949	5.73	0.0167
	2	2.52	1.1943	4.45	0.0349
	3	6.09	6.2335	0.95	0.3285

Table D-2: Second Row Effect, DHS 1998, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	63.82	0.0000
Residual	0		

Analysis of Weighted Least squares

Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	2.70	0.3642	54.90	0.0000
	2	6.21	0.0911	32.39	0.0000
	3	12.90	5.0042	6.65	0.0099

Analysis of Contrasts

Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	4.32	0.0398

Table D-3: Third Row Effect, DHS 1998, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	115.51	0.0000
Residual	0		

Effect	Analysis of Weighted Least squares Parameter	stimate	Std Error	Chi-square	Prob.
	1	1.56	0.1761	78.92	0.0000
	2	2.20	0.2331	88.94	0.0000
	3	2.24	0.3124	5.22	0.0000

Contrast	Analysis of Contrasts DF	Chi-square	Prob.
Test for Linear Trend	1	4.64	0.0312

Table D-1 presents the results for "First Row Effect" for global odds ratios in Table 4. Only the first two global odds ratio in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 6.94 (p-value = 0.0738) meanining that the model is accepted.

Table D-2 presents the results for "Second Row Effect" for global odds ratios in Table 4. The first two global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 63.82 (p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is4.32 (p-value=0.0398), meanining that the linear trend is rejected.

Table D-3 presents the results for "Third Row Effect" for global odds ratios in Table 4. Obviously, all global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 15.15 (p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 4.64 (p-value=0.0312), meanining that the linear trend is rejected.

Table (D-4) shows that the chi-square test statistic has a value of 99.99 with 9 degrees of freedom which means that the association between level of education and number of living children is highly significant (Appendix 4).

Table (5): Education and No. of Living Children (DHS, 2000)
Rural Upper Egypt

Level of Education	Number of Living Children			
	0-1	2-3	4-5	6+
Sec.&Higher	184	187	73	6
	2.96	5.40	25.23	
Prim. & some Sec.	136	138	82	36
	4.28	4.28	7.27	
Primary incomplete	91	159	159	143
	2.39	2.39	2.55	
No Education	445	561	681	657

Table E-1: First Row Effect, DHS 2000, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	109.50	0.0000
Residual	0		

Analysis of Weighted Least squares

Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	2.69	0.2833	90.38	0.0000
	2	5.40	0.6947	60.33	0.0000
	3	25.23	10.4186	5.86	0.0155

Table E-2: Second Row Effect, DHS 2000, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	182.26	0.0000
Residual	0		

	Analysis of Weighted	Least squares		
Effect	Parameter	Estimate	St Error	Chi-square	Prob.
	1	2.70	0.2311	136.42	0.0000
	2	4.28	0.3832	124.49	0.0000
	3	7.27	1.1899	73.33	0.0000

	Analysis of Contrasts		
Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	15.28	0.0001

Table E-3: Third Row Effect, DHS 2000, Rural Upper Egypt

Source	DF	Chi-square	prob.
Intercept	3	260.68	0.0000
Residual	0		

	Analysis of Weighted	Least squares		
Effect	Parameter	Estimate	Std Error	Chi-square	Prob.
	1	1.78	0.1408	160.66	0.0000
	2	2.39	0.1663	205.65	0.0000
	3	2.55	0.2325	119.80	0.0000

	Analysis of Contrasts		
Contrast	DF	Chi-square	Prob.
Test for Linear Trend	1	10.23	0.0014

Table E-1 presents the results for "First Row Effect" for global odds ratios in Table 5. All global odds ratio in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of
109.50 (p-value = 0.0000) meaning that the model is rejected. Therefore,

testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 4.70 (p-value=0.0301), meanining that the linear trend is rejected.

Table E-2 presents the results for "Second Row Effect" for global odds ratios in Table 5. All global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 182.26 (p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 15.28 (p-value=0.0001), meanining that the linear trend is rejected.

Table E-3 presents the results for "Third Row Effect" for global odds ratios in Table 4. Obviously, all global odds ratios in this row are highly significant. Also, the test statistic for goodness of fit for equal global odds ratios for this row, which follows a chi-square distribution with 3 degrees of freedom, has a value of 260.68 (p-value = 0.0000) meanining that the model is rejected. Therefore, testing for linear trend is suggested. The chi-square test for linear trend with one degree of freedom is 10.23 (p-value=0.0014), meanining that the linear trend is rejected

Table (E-4) shows that the chi-square test statistic has a value of 348.14 with 9 degrees of freedom which means that the association between level of education and number of living children is highly significant (Appendix 5).

Section 3: Conclusion:

1- Both Weighted least squqres and maximum likelihood approaches showed that there is a strong association between education and fertility measured by number of living children in "Rural Upper Egypt".Moreover, this relationship is increasing through time. Global odds ratios for DHS 2000 (Table (5)). are the largest and more significant among their counterparts in the previous four data sets.

2- Overall, all global odds ratios for all data sets are highly significant except the third global odds ratio in the first row because the cell (1,3) always has a low number of frequencies. This low number of frequencies shows that women with "Higher" education are less likely to have six or more living children.

3- Table (5) which represents DHS 2000 shows that 28% (657 out of 2344) of uneducated women have six or more living children.while only 1% (6 out of 450) of women whose educational level is "Sec.& Higher" have six or more living children.

4- From table (5) we can conclude that:

a- If the target would be to reduce number of living children to at most five , women shoud have some education ("Primary Incomplete") since global odds ratio at this location is greatly higher than the previous ones in this row (7.27).

b- If the target would be to reduce number of living children to at most three, women should reach at least some secondary since global odds ratio at this location is almost two-fold the preceeding one in this row (5.40).

5- From the above results we conclude that women's education in "Rural Upper Egypt" is necessary to control women's fertility as measured by number of living children.

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Appendix 1: Table (A-4): Loglinear results (DHS 1988)

Chi - square	D.F.	Significance	Min E.F.	Cells with E.F.<5
33.67	9	0.0001	2.287	4 of 16 (25%)

FACTOR	Code	OBS count	EXP count	Residual	Std Resi
EDLEVEL	1				
NOLCH	1	6	2.99	3.013	1.74
NOLCH	2	3	2.99	0.008	0.005
NOLCH	3	1	2.73	-1.734	-1.049
NOLCH	4	1	2.29	-1.2873	- 0.851
EDLEVEL	2				
NOLCH	1	32	18.19	13.809	3.238
NOLCH	2	22	18.22	3.777	0.885
NOLCH	3	12	16.65	-4.65	-1.140
NOLCH	4	1	13.93	-12.93	-3.460
EDLEVE	3				
NOLCH	1	132	136.57	-4.57	-0.39
NOLCH	2	143	135.81	6.19	0 .53
NOLCH	3	133	125.03	7.97	0.71
NOLCH	4	95	104.59	-9.59	-0.94
EDLEVE	4				
NOLCH	1	398	410.25	-12.252	-0.605
NOLCH	2	401	410.97	- 9.970	- 0.492
NOLCH	3	374	375.58	-1.580	-0.082
NOLCH	4	338	314.19	23.81	1.343

Appendix 2 Table (B-4): Loglinear results (DHS 1995)

Chi - square	D.F.	Significance	Min E.F.	Cells with E.F.<5
283.29	9	0.0000	7.11	None

Factor	Code	OBS count	EXP count	Residual	Std Resi
EDLEVEL	1				
NOLCH	1	15	7.64	7.36	2.66
NOLCH	2	10	7.92	2.08	0.74
NOLCH	3	4	7.34	-3.34	-1.23
NOLCH	4	1	7.11	-6.11	-2.29
EDLEVEL	2				
NOLCH	1	247	140.05	106.95	9.04
NOLCH	2	209	145.14	63.86	5.31
NOLCH	3	78	134.49	-56.49	-4.87
NOLCH	4	16	130.32	-114.32	-10.01
EDLEVEL	3				
NOLCH	1	282	265.32	-37.32	-2.29
NOLCH	2	262	274.97	-12.97	- 0.78
NOLCH	3	276	254.80	21.20	1.33
NOLCH	4	276	246.90	29.10	1.85
EDLEVEL	4				
NOLCH	1	720	796.99	-76.99	-2.73
NOLCH	2	773	825.97	-52.97	-1.84
NOLCH	3	804	765.37	38.63	1.40
NOLCH	4	833	741.66	91.34	3.35

Appendix 3: Table (C-4): Loglinear results (DHS 1997)

Chi - square	D.F.	Significance	Min E.F.	Cells with E.F.<5
110.53 .	9	0.00000	3.039	4of 16 (25%)

Factor	Code	OBS count	EXP count	Residual	Std Resi
EDLEVEL	1				
NOLCH	1	6	3.09	2.91	1.65
NOLCH	2	5	3.49	1.51	0.81
NOLCH	3	1	3.38	-2.38	-1.29
NOLCH	4	1	3.04	-2.04	- 1.17
EDLEVEL	2				
NOLCH	1	81	39.03	41.97	6.72
NOLCH	2	57	44.01	12.99	1.96
NOLCH	3	20	42.62	-22.62	-3.47
NOLCH	4	6	38.34	-32.34	-5.22
EDLEVEL	3				
NOLCH	1	53	70.92	-17.92	-2.13
NOLCH	2	84	79.97	4.03	0.45
NOLCH	3	87	77.45	9.55	1.09
NOLCH	4	74	69.66	-4.34	0.52
EDLEVEL	4				
NOLCH	1	197	223.95	-26.95	-1.80
NOLCH	2	234	252.53	-18.53	- 1.17
NOLCH	3	260	244.55	15.45	0.99
NOLCH	4	250	219.97	30.03	2.03

Appendix 4 Table (D-4): Loglinear results (DHS 1998)

Chi - square	D.F.	Significance	Min E.F.	Cells with E.F.<5
99.9919	9	0.00000	4.190	1 of 16 (6.3%)

FACTOR	Code	OBS count	EXP count	Residual	Std Resi
EDLEVEL	1				
NOLCH	1	10	6.60	3.40	1.32
NOLCH	2	8	6.51	1 49	0.58
NOLCH	3	5	5.92	-0.92	- 0.38
NOLCH	4	1	4.97	-3.97	-1.78
EDLEVEL	2				
NOLCH	1	120	71.80	48.20	5.69
NOLCH	2	105	70.85	34.15	4.06
NOLCH	3	30	64.34	-34.34	-4.28
NOLCH	4	6	54.01	-48.01	-6.53
EDLEVEL	3				
NOLCH	1	73	89.68	-16.68	-1.76
NOLCH	2	91	88.49	2.51	0.27
NOLCH	3	89	80.36	8.64	0.96
NOLCH	4	73	67.46	5.54	0.67
EDLEVEL	4				
NOLCH	1	249	283.91	-34.91	-2.07
NOLCH	2	242	280.14	-38.14	-2.28
NOLCH	3	281	254.39	26.61	1.67
NOLCH	4	260	213.56	46.94	3.18

Appendix 5: Table (E-4): Loglinear results (DHS 2000)

Chi - square	D.F.	Significance	Min E.F.	Cells with E.F.<5
348.14 .	9	0.00000	189.66	None

Factor	Code	OBS count	EXP count	Residual	Std Resi
EDLEVEL	1				
NOLCH	1	184	103.05	80.95	7.97
NOLCH	2	187	125.80	61.20	5.46
NOLCH	3	73	119.78	-46.78	-4.27
NOLCH	4	6	101.36	-95.36	- 9.47
EDLEVEL	2				
NOLCH	1	136	89.77	46923	4.88
NOLCH	2	138	109.59	28.41	2.71
NOLCH	3	82	104.34	-22.34	-2.19
NOLCH	4	36	88.30	-52.30	-5.57
EDLEVEL	3				
NOLCH	1	91	126.41	-35.41	-3.15
NOLCH	2	159	154.32	4.68	0.38
NOLCH	3	159	146.93	12.07	1.00
NOLCH	4	143	124.34	18.66	1.67
EDLEVEL	4				
NOLCH	1	445	536.77	-91.77	-3.96
NOLCH	2	561	655.29	-94.29	- 3.68
NOLCH	3	681	623.94	57.06	2.28
NOLCH	4	657	528.00	129.00	5.61