Contraceptive Use in Yemen: A Component Analysis

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Abstract
The objective of this paper is to examine the role of modernization on current use of modern contraception in the Republic of Yemen. We used modernization theory as well as Ryder's cohort-historical model to investigate the change in fertility variables across cohorts. Data from Demographic and Health Surveys conducted in 1991 and 1997 in Yemen are used. It has been argued that in Islamic societies such as Yemen, the extent of contraceptive use is more likely to be determined by religious values than by external forces of change. However, our findings suggest that the social context of contraceptive use in Yemen is similar to the preconditions attained in societies that have experienced improvements in contraceptive use during the stage of fertility decline. We have discussed in detail the policy implications of our findings.

Introduction

Contrary to widespread predictions that natural fertility regimes in the Middle Eastern countries will persist, almost all countries in the region, apart from Yemen, have experienced fertility declines in recent decades (Rashad 1999, 2000). Fertility rates in Yemen, closely followed by the Sultanate of Oman, are higher than those in the Middle Eastern and North African states (Demographic and Health Survey [DHS] 1997), with the exception of the Gaza strip (Khawaja 2000).

In Yemen, marriage is nearly universal, and the age at first birth is low, with a high tempo of fertility during the early years of marriage (Eltigani 2001a). The 1991/1992 and 1997 DHSs report total fertility rates (TFR) of 7.6 and 6.7, respectively. One component of this low fertility decline

in Yemen is a reduction in marital fertility (Eltigani 2001a). In particular, women over 35 years of age appear to have lower fertility levels. This provides some indication that the process of fertility decline in Yemen may follow the experiences of many Western nations, where the fertility transition was heralded by a decline in marital fertility (Knodel and van de Walle 1986) during the course of modernization. Use of modern contraception within marriage was found to be a major factor in this decline.

Research on fertility in Yemen has several limitations. First, available studies are primarily descriptive (Eltigani 2001a; 2001b). They provide little empirical explanation for the prevailing fertility levels in Yemen. Second, current explanations of fertility decline in the Middle East and North African (MENA) countries tend to focus on the role of period factors such as occurrence of war, the state's subsidizing the cost of children, women's low socio-economic status and economic recessions on fertility trends (Eltigani 2000; Rashad 1999, 2000). However, very few studies have examined the effect of modernization on Yemenis' fertility. Third, little is known about the effects of modernization variables on fertility changes in Yemen.

The purpose of this paper is to examine the role of modernization on current use of modern contraception. More specifically, we propose a model based on the modernization explanation to examine the current use of modern contraception in a sample of married 15- to 49-year-old Yemeni women in the 1990s.

Current Use of Modern Contraceptives in Yemen: Toward an Explanation

One of the explanations of fertility decline, the modernization hypothesis (Haghighat 2002), suggests that modernization brings about socio-economic development and improvements in human capital, as well as changes in people's physical environment. With socio-economic development, households perceive a number of opportunities for social mobility (Petras and Veltmeyer 2003). The perception and pursuit of some of these opportunities tend to encourage the use of modern contraception for either spacing or stopping fertility. The onset of fertility decline, then, is characterized by a number of well-known strategies of family limitation. First, fertility declines within the state of marital union. Second, a large proportion of married women in high parities tend to use birth control to avert further births. Finally, the decline in fertility is seldom accompanied by reversals (Kirk 1996; Szreter 1993). Bongaarts (2001) suggests that once the fertility transition starts, family size drops rapidly. However, once fertility drops below about four births per woman, additional reductions occur, on average, at a substantially slower pace.

Over a period, the intensity as well as the spread of modernization may considerably improve the use of modern contraceptive methods. Ryder (1965) proposes a useful theoretical model, the cohort-historical, for examining the components of change in fertility determinants and their effect on fertility over time. Social change is seen as stemming from the fresh contacts new cohort members make with the contemporary social heritage (Ryder 1965). Interaction between the new cohort members and the existing social system makes it possible for the social system to influence members' characteristics. Conversely, the cohort members may bring about new rules of behaviour or alter the environment to fulfill social and economic needs. Such normative and environmental changes can bring about inter-cohort differences.

The cohort-historical model provides two explanations for differences in fertility variables across cohorts. The first is called the compositional explanation, and the second, the processual explanation. The compositional explanation assumes that the independent effect of determinants on fertility-related variables remains stable across cohorts. Given this, the changes in fertility-related variables are due to changes in the mean or aggregate levels of the determinants across cohorts. The second, the processual explanation, suggests that even if the cohort composition with respect to the determinants remains stable across cohorts, changes in fertility would result from changes in the effects of the determinants. Therefore, changes in the proportion of the predictors as well as their effects may contribute to growth in current use of modern contraceptives. These growth components are called compositional and processual.

The modernization hypothesis suggests that in Yemen, as the proportion of population with access to modern physical infrastructure (Weinstein 1979) and investment in human capital increases over time, the proportion of those who currently use contraception is likely to increase. As educational levels increase, socio-economic mobility is likely to increase over time. Furthermore, the value of education in modernizing economies for acquiring desirable positions, goods and services is also improving over time (Sperandio 2000; Finkel 2002). Therefore, the impact of the modernization variables, education in particular, on current use of family planning may vary over time.

Modernization has been closely associated with availability of basic needs such as water and electricity. Modernization has ushered into developing countries flexible water delivery service systems, including the provision of piped water (Replogle 1999). With the availability of piped water, the risk of morbidity, especially from water-borne communicable diseases, decreases considerably. Time and energy saved by the availability of water near homes, especially for women, will be diverted to other tasks. In particular, mothers are more likely to focus on tasks that improve their own health as well as the health of their children (Halberstein and Davies 1979). A shift toward improving children's health and well-being is likely to reduce the demand for a large number of children (United Nations Population Fund 2002). Therefore, those with piped water are more likely to use modern contraception.

The returns of education are many. Education is positively associated with job status. More importantly, education provides key access to the world of information and knowledge necessary to improve personal well-being in an increasingly global economy. The quality and quantity of accessible information is rapidly increasing due to technological innovations. Even if educational levels do not change, the quantity and quality of information that can be obtained, processed and utilized has improved considerably over time. Therefore, the importance of education for personal well-being is rapidly increasing. Women's perception of opportunities for participation in extra-familial activities is likely to compete with fertility goals. As a result, over time, the effects of education on family size preferences and the odds of using contraception to avert births tend to become stronger. Therefore, we expect changes in the proportion of educated women as well as an increase in the effect of education over time on modern contraceptive use.

Finally, women's labour force participation is an important determinant of fertility. Women who hold jobs outside their homes are very likely to have smaller family size preferences and are also more likely to use modern contraception than those who are not working (Bogue 1990; Pritchett 1994; Al-Gallaf et al. 1995). In Yemen, there is small but steadily growing proportion of women who are engaged in work outside their homes. Vocational training programs have been set up in the main cities of Al-Hudaydah, Tai'z and Sana'a to train para medical health professionals such as birth attendants, nurse assistants and midwives. These women gain employment in the health sector soon after completion of the training program (Noman 1995).

Methods

Data

This study uses data from Demographic and Health Surveys conducted in Yemen. Two national surveys were conducted, one in 1991/1992 and one in 1997. The 1997 Yemen Demographic and Maternal and Child Health Survey (YDMCHS) is the second national survey since the unification of the country. The YDMCHS (1997) was designed to collect data on households and ever-married women of reproductive age (15–49). The survey interviewed 10,414 of the 11,158 eligible ever-married women in this age group (Central Statistical Organization [CSO, Yemen] and Macro International Inc. [MI] 1998). The first survey, conducted during 1991/1992, interviewed 5687 eligible women (CSO, Pan Arab Project for Child Development [Egypt] and MI 1994). Responses from the "Maternal and Child Health Questionnaire" module are used in the present study. Descriptions and coding of variables are given in Table 1.

Table 1. Background characteristics of population in Yemen

Variable	Variable Name and Value	Percentage (Survey)		Variable vs. Survey
		1997	1991	Chi-sq./df
Place of residence	PLACE			
Rural	0	71.7	74.5	15.3/1*
Urban	1	28.3	25.5	
Electricity	ELECT			
No	0	49.0	44.9	46.6/1*
Yes	1	51.0	55.1	
Source of drinking water	WATER			
Non-pipe	0	57.6	57.3	6.0/1*
Piped	1	42.4	42.7	
Occupation of woman	OCCUPW			
No work/regular work	0	73.4	86.9	531.9/1*
Agri. Self-employed/ Professional/Service	1	26.6	13.1	
Education of woman	EDUCN			
No education	0	78.9	85.3	102.4/1*
Some education	1	21.1	14.7	
Number of children ever born	CEB			
Less than 4 children	0	51.3	48.5	11.64/1*
More than 4 children	1	48.7	51.5	
Age groups – respondent				
15–19	AGE15			
20– 24	AGE20			
25–29	AGE25			
30–34	AGE30			
35–39	AGE35			
40–45	AGE40			
45–49	AGE45			
Current FP use	CURRFP			
No	0	89.9	92.9	42.3/1*
Yes	1	10.1	7.1	
Region	REGION			
North Yemen	0	80.8	79.0	8.29/1*
South Yemen	1	19.2	21.0	
Husband's occupation	HUSJOB			
Agri./Household/ Unskilled/No work	0	42.2	36.1	58.66/1*
All the rest	1	57.8	63.9	
Husband's education	HUSED			
No education	0	47.1	61.1	200/1*
All the rest	1	52.9	38.9	
Excess sons over daughters	MORESON	.109(Mean)	.103 (Mean)	

*$p < .05$.

Variables

Those who had ever used modern contraceptives such as the pill, Norplant, injections, condoms, sterilization and intra uterine devices were coded 1, and the rest were assigned to the reference group, coded 0. Water and electricity, among the six independent variables, indicate the quality

of modern basic physical infrastructure. Households with a piped water supply were coded 1 and the rest 0. Similarly, those with an electricity supply were coded 1, the rest 0. Place of residence is a dichotomous variable, with urban coded 1 and the rest 0. The remaining two variables, level of education and extent of female participation in the labour force, are demographic variables. Women with some education (they had attended school) were coded 1, the rest 0. Women who work outside their homes were coded 1, the rest 0. A variable SURVEY was created to distinguish the 1991 sample survey from the 1997 survey. Six control variables, children ever born, region, husband's educational level, husband's job status, age of the mother and the number of excess sons over daughters, have been included. The control variable, children ever born (CEB),was measured from responses to the question, "Total number of children you have had during your life." Those who had had more than four children were coded 1 and the rest 0. In many developing countries with high fertility, women in general consider families with fewer than 4 children as small (Sahleyesus 2005).

The second control variable, region (REGION), is binary, with those residing at the time of interview in South Yemen coded 1 and in North Yemen coded 0. There are 19 governorates and one municipality. The governorates are Abyan, Adan, Al-Bayda', Al-Dali', Al-Hudaydah, Al-Jawf, Al-Mahrah, Al-Mahwit, Amran, Dhamar, Hadramawt, Hajjah, Ibb, Lahij, Ma'rib, Sa`dah, San`a, San`a' (city, municipality), Shabwah and Ta`izz. Of these, Abyan, Adan, Hadramawt, Lahij, Al-Mahrah and Shabwah are in South Yemen. Prior to unification of South and North Yemen in 1990, the South was a communist state for nearly two decades and was far less developed than the North. This economic development differential may influence contraceptive use.

Husband's characteristics may also influence use of family planning methods (Pillai 1993). In particular, education and the husband's job status may influence family planning use. Husband's current job status (HUSJOB) is a dichotomous variable with categories such as agricultural employee, self-employed in agriculture, household and domestic sector employment, and working as an unskilled labourer coded 0 and the rest coded 1. If the husband had no education, he was assigned a code of 0; the rest were coded 1. To control for son preference in Arab societies such as Yemen, a new variable, MORESON, was created. It is measured as the difference between the number of sons and number of daughters. Respondent's age was grouped into seven 5-year intervals: 15–19, 20–24, 25–29, 30–34, 35–39, 40–45 and 45–50. The last age group, 45–50 years, was marked as the reference category.

Analysis and Results

The proposed model of contraceptive use is presented in Figure 1.

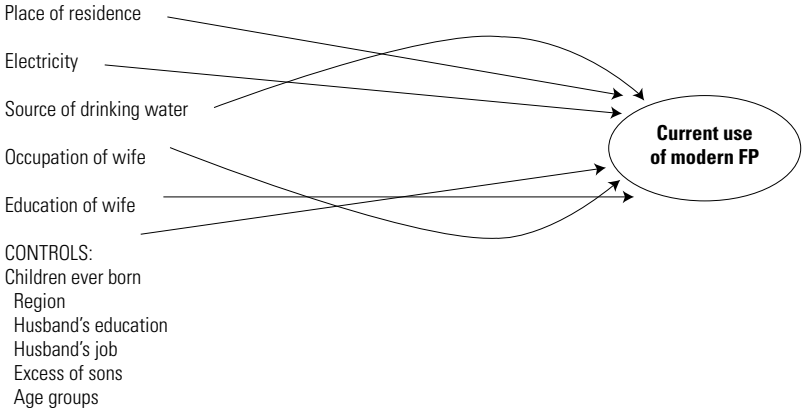
This model was tested separately for each of the two samples: 1991 and 1997 Yemen DHS. Table 1 presents descriptive characteristics of all the 1991 and 1997 survey variables used in this study.

Nearly 7% of respondents in 1991 reported current use of modern contraceptive methods. This percentage increased to about 10% in 1997. There was nearly a 3 percent increase in CURRFP during 1991–1997. The percentage of households with electricity and water declined slightly, whilie the percentage of urban households increased by about 3 points in the period between the two surveys. There was a small increase, nearly 6 points, in the percentage of women with some education. Only a small proportion of women worked outside their home. In 1991 about 13% of women had worked outside the home. This percentage more than doubled in 1997. The average number of children declined slightly during 1991–1997.

We used multivariate regression to analyze the data. The dependent variable, CURRFP, is nominal. It is therefore necessary to choose from a number of regression techniques, such as logistic and probit, specifically designed for categorical dependent variables. The probit regression method is used here. Probit regression was preferred over logistic as the former offers coefficients that are more directly interpretable than the logistic coefficients. For a binary dependent variable, the probit model is $\phi^{-1}(p) = \beta' X$ where ϕ^{-1} is the inverse of the cumulative standard normal distribution function, referred to as probit or normit. The regression coefficient β is described as the amount of Z score change in the dependent variable for unit of change in the independent variable. The predicted

probability can be obtained from a Z table. A goodness-of-fit measure is the pseudo R square that is calculated as the –2 * log likelihood (-2LL plus the sample size). As the fit of the proposed model to the data increases, the pseudo R square values also increase.

Figure 1. Model of modern contraceptive use in Yemen



Results from probit regressions of CURRFP on the modernization variables for 1991 and 1997 survey data are presented in Table 2.

The four columns in the table present the results from four probit regressions. The first two regressions are for the 1991 and 1997 samples separately, and the third is for the interaction effect of each of the variables with the variable SURVEY. The coefficient in each cell is the net effect. Across the two samples, those who have an urban place of residence are more likely to have currently used modern contraceptives. A rural–urban differential in contraceptive use is found in most Arab societies during the early phase of fertility transition (Fargues 1997). This pattern is also observed in Yemen.

Those who had an electricity connection were more likely to have currently used modern contraception than the rest. The magnitude of the 1997 coefficient is almost thrice the size of the 1991 coefficient. Those who had piped water were more likely to have ever used modern contraceptives. This holds for the 1991 and 1997 samples.

A second set of modernization variables, education and occupation, are associated with an individual's capacity to participate in modern social and economic organizations. The net effects of occupation on current use of modern contraception are not significant but are positive across the two samples. Having some education considerably improves the likelihood of current use of family planning when compared with those who have no education at all. All net effects are positive and significant. Surprisingly, there is a decline in the magnitude of the effect from 1991 to the 1997 sample. This decline occurred alongside an increase in the proportion of women with some education from 1991 to 1997 (see Table 1).

An increase in the number of children ever born is associated with an increase in the likelihood of current use of modern contraception. The likelihood of contraceptive use is lower in South Yemen compared with the North. Of the remaining control variables, husband's education had no significant influence on current use of family planning. Husbands employed in a non-agricultural sector were more likely to use family planning in 1991. However, the effect is not significant in the 1997 sample. The effects of control variables, various 5-year age groups of the wife and the presence of excess sons on current family planning use were inconsistent across the two surveys.

Table 2. Probit regression of CURRFP on modernization variables, 1991 and 1997 Yemen DHS

Independent Variables	1991	1997	Interaction (Survey*Variable)
PLACE 0 = rural	0.401*	0.253*	-.148
ELECT 0 = no electricity	0.195*	0.520*	0.325*
WATER 0 = no piped water	0.370*	0.266*	-.104
OCCUPW 0 = no work	0.109	0.050	-.094
EDUCN 0 = no education	0.681*	0.484*	-.197*
CEB 0 = <4 children	0.486*	0.323*	-.162
REGION 0 = N. Yemen	-.148*	-.346*	-.202*
HUSED 0 = no education	.003	.012	.009
HUSJOB 0 = Agri., Household and Non-skilled	.241*	.056	-184*
MORESONS	.023	.037*	.014
AGE15[a] AGE20 AGE25 AGE30 AGE35 AGE40	-.229 .119 .448* .317* .440* .322*	-.569* -.192* .039 .093 .180* .120	-.340 -.311 -.409* -.223 -.260* -.201
LR Chi^2 (16) LR Chi^2 (33)	598.47*	1047.90*	 1688.21
Pseudo R^2	0.19	0.15	0.17

LR = likelihood ratio.
[a]The reference group is AGE45.
*p<0.05.

The probit regression results provide general support for the proposed modernization hypotheses in this study. The first set of modernization variables, PLACE, ELECT, WATER and EDUCN have significant positive influences on the likelihood of current use of modern contraception. The proportion of women with some education increased during 1991–1997 (see Table 1), while the education effect decreased during the same period.

We had proposed that there would likely be significant differences in the slopes of the education variable. These slopes are associated with the outcome variables such as CURRFP among sample respondents in the 1991 and 1997 surveys. To empirically test these propositions, a number of new interaction terms are obtained. Multiplying each of the seven independent variables with a dummy variable for survey membership generates these interactions. Respondents are coded 1 if they belong to the 1997 survey and 0 otherwise. The interaction effects are presented in the last column of Table

2. The interaction effects of electricity, wife's education, region, husband's job, age group 25–30 and age group 35–40 are significant.

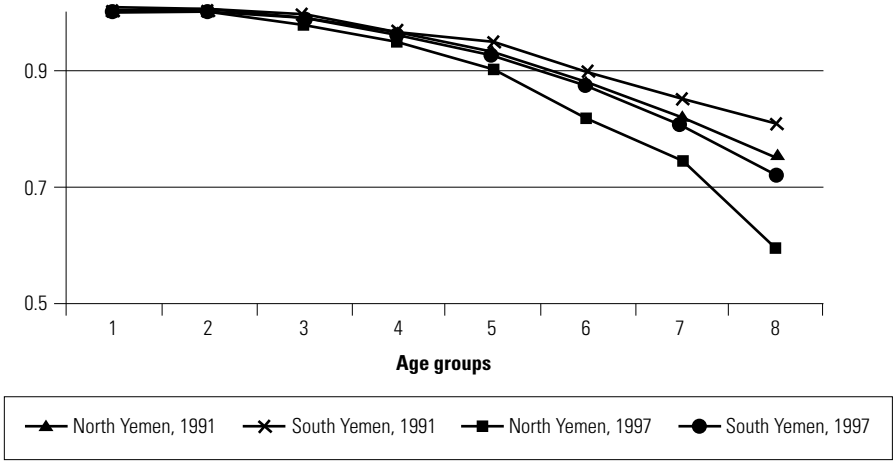
Table 3 presents the change in the proportion of modern contraceptive users between 1991 and 1997 across North and South Yemen. In 1991 the proportions using contraceptives in North and South Yemen were similar, with a small difference of 1.4 percentage points. This difference in contraceptive use increased to 3.5 percentage points in 1997. Contraceptive use was higher in the North in 1991 and 1997. The extent of current family planning use in South Yemen in 1997 is on par with the level of contraceptive use in North Yemen in 1991. Thus, regional differences in current use of family planning appear to have widened in favor of North Yemen. This regional difference is further highlighted by examining the proportion using birth control in 1991 and 1997 surveys for the two regions separately.

Table 3. Percent using modern contraception by region (South and North Yemen) and by survey (1991 and 1997)

	Use Modern Contraceptives	
Region	1991	1997
North	7.4	10.8
South	6.0	7.3

Figure 2 presents the cumulative proportions not using birth control in the 1991 and 1997 Demographic and Health Surveys separately for North and South Yemen. The 1991 and 1997 survival curves for North Yemen are much farther apart compared with the 1991 and 1997 survival curves for South Yemen. The likelihood of birth control use in the North improved much faster than in the South in the period between the 1991 and 1997 surveys.

Figure 2. Cumulative proportion not using birth control by region, 1991 and 1997 DHSs



To determine the sources of change in the likelihood of current use of modern contraception it is essential to examine the compositional and processual changes over time. The regression standardiza-

tion procedure can be used to decompose the difference in the mean level of the dependent variable (Iams and Thornton 1975; Teachman 1986). The model proposes that the differences in the mean level of the 1991 and 1997 current use of modern contraception can be decomposed into four parts. First are the differences due to different intercepts. Second are those due to different means of the covariates. Third are differences due to different effects of the covariates and fourth are the interactions between differences in the means and differences in the effects of the covariates.

Regression standardization methods are useful in assessing the extent of change in the likelihood of modern contraceptive use during 1991 and 1997. At the empirical level, these methods attempt to attribute the amount of change in modern contraceptive use to changes in slopes as well as averages of determinants that influence modern contraceptive use. Standard regression decomposition procedures such as the Oaxaca and Blinder method (Blinder 1973; Oaxaca 1973) are applicable only when the regression method used is linear. Nielsen (1998a, 1998b) suggests a method appropriate for decomposing parameter estimates from non-linear regression models such as logit and probit. Nielsen (1998a) presents three essential components of the decomposition method:

1. $\mu_{91} = \sum_{i=1}^{n} F[X_{91i}B]/N_{91}$

2. $\mu_{97} = \sum_{i=1}^{n} F[X_{97i}(B + \delta]/N_{97}$

3. $\mu_{97}^{0} = \sum_{i=1}^{n} F[X_{97i}B]/N_{97}$

where μ_{97} and μ_{91} are the average probits of modern contraceptive use. N_{97}, N_{91} are the 1997 and 1991 sample sizes. B is a vector of estimated parameters for the 1991 sample of households and δ is the estimated change for the 1997 sample households compared to the parameters for 1991 households. μ_{97}^{0} is the predicted probability of modern contraceptive use among 1997 households if they have the same parameters as the 1991 sample households. The difference in the likelihood of modern contraceptive use between 1997 and 1991 households ($\mu_{91} - \mu_{97}$) is divided into three components. One, the processual, represents the amount of change due to change in slope between 1991 and 1997. The second, the compositional, represents the amount of change in the mean levels of variables between 1991 and 1997. The third is related to all the rest, including the changes in the population intercepts.

The probit regressions of CURRFP presented in Table 2 provides crucial information with regard to the processual changes during the 1991 and 1997 surveys. The results of the decomposition are presented in Table 4. The total percentage difference between 1991 and 1997 current users of modern contraceptives is about 3%. (See Table 1). Approximately 18 percent of this difference is due to changes in composition of the sample, primarily due to changes in the composition of the modernization variables. Thus the increases in such characteristics as the proportion of respondents who had electricity at home, had piped water, lived in urban areas, resided in North Yemen at the time of the interview and had some education contributed to an improvement of the proportion currently using modern methods of family planning. A slightly smaller amount, about 17%t, is accounted for by processual changes. Consider the probit regression coefficients presented in Table 2. The 1991 and 1997 coefficients of occupation of woman are not significant at the .05 level. The rest of the coefficients, except for the coefficient for ELEC among the independent variables have declined in magnitude from their 1991 level. The ELEC coefficient increased almost threefold. The coefficients of the interaction of EDUCN and ELEC (among the variables that are not considered controls in this study) with SURVEY are significant . The 17% contribution by processual changes to the increase in proportion of current users of modern contraception is composed of significant changes in the coefficients of ELEC, EDUCN, REGION, HUSJOB and age group AGE25 and non-significant changes in the coefficients of the rest of the variables. The coefficient

of ELEC increased from 0.195 to 0.520, while the EDUCN slope decreased from 0.681 to 0.484. An increase in current use of modern contraception brought about by a strong magnitude change in the coefficient of ELEC and REGION was eroded by a decline in the magnitude of the coefficients of EDUCN and HUSJOB. The likelihood of contraceptive use in South Yemen compared with the North registered a significant decline, from -.148 to -.346.

Table 4. Decomposition of the 1991/1997 DHS survey respondents in the probability of current use of modern contraceptives in the Republic of Yemen[a]

	Contribution (Percentage Point)
Compositional (M)	18.71
Processual (S)	17.67
M + S	36.38
Intercept + Residual	63.62
Total	100

[a]Using Nielsen (1998) method.

In general, the compositional changes in the variables appear to be far more important than processual in improving the level of current use of modern contraception in Yemen. The interaction effects, except those of ELEC, EDUCN, REGION, HUSJOB, age 25–30 and age 35–40 are not significant (see Table 2). The slope changes in the two variables ELEC and EDUCN are in opposite directions, contributing very little to the improvement in current use of modern family planning. The only other significant source of contraceptive use decline is attributable to the southern regional context in Yemen. The residual, including the contribution of intercepts changes, accounts for about 64% of the changes in the level of current use of family planning. The shift in levels of current use of family planning may stem from several sources not accounted for in the proposed model of current use in this study.

Discussion and Conclusion

In this section we attempt to place the findings of our study in the broader social and economic context of modernization and development in Yemen. Prior studies on contraceptive use in the Middle East region observe that the levels of modern contraceptive use are considerably higher than they were a couple of decades ago (Allman and Hill 1978; Goldberg et al. 1983). Saxena and Jurdi (2002) claim that nearly 10.5% of the decline in fertility during the nineties is due to an increase in contraceptive utilization. They discount the role of other factors .

In the rural society of Yemen, the selected independent variables associated with current contraceptive use are wife's education, urban place of residence, region and availability of basic amenities such as electricity and piped water. Consumption of basic amenities is often a function of modern attitudes and socio-economic class membership. The above set of variables associated with current contraceptive use in Yemen are well known and often associated with the preconditions necessary for demographic transition. Therefore, the claim that in Islamic societies fertility regimes are immune from the process of modernization is not substantiated (Joseph 2004).

Several attributes of contraceptive use among Yemeni women are noticeable. First, the percentage of women currently using modern contraceptives in the 1997 sample is larger than the 1991 percentage. In addition, the likelihood of contraceptive use in North Yemen is significantly higher than in the South. This difference may be attributed to the past dissimilarities in socio-economic

and political conditions. The two decades prior to the unification of North and South Yemen in 1990 were a period of prosperity, particularly in North Yemen. Since unification there has been a decline in basic infrastructure due to deteriorating economic conditions..One component of the strength of basic infrastructure is the extent to which households have electricity supplies. The percentage of households in the 1991 and 1997 samples with piped water remained the same, while the percentage of households with electricity declined. This lack of improvement in basic infrastructure may be attributed to the economic decline that Yemen has experienced in recent years. Availability of electricity is strongly associated with contraceptive use. During 1990–1997, the strength of this net relationship increased.

Women's occupation had no effect on the likelihood of ever using contraception. However, the proportion of women who work is considerably greater among the women in the 1997 sample than in 1991 across all age groups. We can only speculate on the reasons for this. It may be a demographic response to the growing unemployment among men. Women may be involved in raising resources for household sustenance. Davis (1963) suggests that several demographic behaviours are merely responses to population pressure resulting from an improvement in life expectancy and a significant decline in infant mortality rates. Especially in agricultural societies, an increase in the number of dependent inhabitants per unit of land results in agricultural intensification, necessitating an increase in agricultural inputs such as labour (Boserup 1965). When new labour-saving agricultural technologies are not rapidly introduced, as in the case of Yemen, agriculture may become labour intensive. However, in Yemen between 1991 ad 1997 the percentage of agricultural labour in the total labour force decreased from 61% to 50%. It is likely that men who are not now able to find jobs in oil-producing countries such as Saudi Arabia will find low wage-earning (cash) jobs in non-agricultural sectors. As a large proportion of men shift from agriculture to other sectors, the agricultural sector may increasingly rely on women's labour. Women may participate more in the agricultural sector in exchange for returns in cash or kind, contributing to an improvement in the welfare of the family.

Yemeni women with some education are more likely to currently use modern contraceptive methods than women with no education. Although there has been an increase in female education, there is room for considerable improvement. Only 58% of 6- to 15-year-old children in Yemen were attending school in 1997. About 40% of those were girls. Children from middle- and upper-income families are almost twice as likely to attend school as children from poor households (El-Kogali and El-Daw 2001). The effect of education on modern contraceptive use was significantly lower in 1997 than in 1991. This decline may indicate some loss of ability among women with some education to make decisions about contraception. Traditional attitudes toward women's roles remain very strong (Bruck 1997). When economic conditions deteriorate, women's labour is likely to be more intensively used within the domestic sphere of production controlled by kin and extended family members. Under these conditions, women's education is devalued.

The results of this study suggest that modernization processes, which bring about economic development, are now inevitable for promoting modern contraceptive use in Yemen. The objectives of the national population strategy adopted in October 1991 (Bahobeshi and Zohry 1995), but revised in 1995, were to reduce the total fertility rate to 6 births per woman by the year 2000, to increase the current use of contraception by 22% among women of reproductive age and to make family planning a free choice for couples and a basic human right. These goals have not been achieved. Furthermore, the rate of contraceptive use in the southern region of Yemen is significantly lower than the rate in the North. Disparities in development between the North and South have to be addressed as a component of the overall national strategy to improve modern contraceptive use.

To achieve the national goals with respect to family planning, the government identified two strategies: to increase women's education and increase availability of contraceptives (CSO and MI 1998). The need to focus on girls' education is urgent. Currently, public expenditure on elementary level school education is low. Compared with other Arab countries such as Lebanon, the poorest quintile's share of public spending on basic education in Yemen is very low. Among the

poor in Yemen, females do not receive even half the benefits received by males from public spending on basic education (Yuki 2003). This study found that the effect of education on contraceptive use is declining. Therefore, it is necessary not only to improve educational facilities for girls and women, but also to improve their perception of opportunities for participating in the economy. In Bangladesh, such an approach focused on poverty alleviation targeting resources and services (rural credit services) to the poor and to women (Sajeda and Lloyd 1998). The current economic crisis facing the nation is of concern.

Future studies are needed to understand the social and economic constraints on modern contraceptive use among women. In this study, we have not considered the social context of marital union. Factors such as consanguineous marriage (Saxena and Jurdi 2003), ethnicity (Khattab 2002; Al-Gallaf et al. 1995) and risk of divorce may influence the likelihood of contraceptive use. Also, the costs and benefits of Yemeni women's participation in work outside the household have not been adequately examined. Very little is known about the role of education on women's status and power within the household in the predominantly rural Yemeni society. The opportunity cost and benefits that accrue to women upon improving educational levels should be further investigated.

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