DETERMINANTS OF CONTRACEPTIVE DISCONTINUATION IN SIX DEVELOPING COUNTRIES

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Summary. This analysis investigates the determinants of contraceptive discontinuation in six developing countries, using data from Phase I surveys of the DHS programme. Cumulative probabilities of discontinuation at 24 months for reasons other than the desire for another child were examined. By this time, typically about 40% of couples have stopped use and most are subsequently at risk of an unwanted conception. Discontinuation of IUD use was found to be less common than for other methods, partly perhaps because cessation of use requires a deliberate decision to have the device removed.

The most important results are negative ones. Neither the schooling of couples nor their type of residence exerted appreciable influence on discontinuation. The policy and programme implications are discussed. Prior use of a method, fertility preferences and the related demographic factors of age and family size emerged as pervasive predictors of discontinuation.

Introduction

One of the considerable advances of the Demographic and Health Survey (DHS) programme over its predecessor, the World Fertility Survey, is its more comprehensive approach to the collection of information on past contraceptive use. In the latter programme, no attempt was made to obtain information on the length of past episodes of use, nor on detailed reasons for discontinuation. By contrast, in the Model A questionnaire of the first phase of the DHS, designed for higher contraceptive prevalence settings, provision was made to collect data on contraceptive use episodes that occurred in the 5-year period preceding the survey, though, as will be discussed later, not all episodes were covered. In the second phase of the DHS, the measurement of past contraceptive use was further strengthened with the introduction of a monthly calendar onto which use-episodes, together with other information, were mapped.

This new body of information is of considerable practical use in several ways. As contraceptive adoption increases, continuation of use becomes a more important determinant of the level of current use and thus of demographic impact (Jain, 1989). Insights into the determinants of continuation are valuable, therefore, from this

perspective. Perhaps more importantly, contraceptive continuation provides an indirect, but nevertheless powerful indicator of the adequacy of family planning provision and degree of satisfaction with methods and services. Of course, high continuation does not necessarily imply satisfaction, but low continuation usually denotes some problem with the chosen method, or with the counselling or related health services. Programme managers need to know how successfully and how persistently different types of client use specific methods, and to what extent defects in the quality of services can be held responsible for early discontinuation or method failure.

While DHS data cannot illuminate this last aspect, they permit analysis of other determinants of continuation in ways that can provide useful guidance for programme strategy. In this study multivariate statistical techniques are employed to estimate the effects on method-specific continuation of four types of determinant or predictive factors: socioeconomic characteristics; demographic and motivational attributes; use of preventive health services; and prior experience of contraception. The study builds upon an earlier, more descriptive study that used life-table analysis to compare method- and cause-specific continuation, drawing on data from six Phase I surveys conducted as part of the DHS programme (Ali & Cleland, 1995).

Data and methods

Study populations

The choice of surveys for this analysis was guided by the following considerations: availability of appropriate data; avoidance of countries where the majority of users are sterilized; preference for surveys where there is a sufficient number of episodes for separate analysis of at least three reversible methods (or groups of methods). These criteria were met by few surveys. Since female sterilization is the dominant contraceptive method in Latin America, most of the surveys in this region were not eligible for inclusion. After examining all surveys for which data files were readily available, six surveys were selected. Three were from the Arab World: Egypt (1988), Morocco (1987), and Tunisia (1988); two from Asia: Indonesia (1987) and Thailand (1987); and only Ecuador (1987) was selected from Latin America.

The countries chosen are in no way representative of all high-use developing countries; geographically, three of the six are in North Africa. However, they do span a range of conditions. The overall level of current use in 1987 or 1988, when fieldwork was conducted, varied from 36% to 66% and the method mix was equally diverse. Sterilization accounted for nearly half of all users in Thailand but was very rare in Indonesia, Morocco and Egypt. In Indonesia and Morocco the dominant method was the pill; in Tunisia, it was the IUD; and in the remaining three countries, the pill and IUD were equally popular. All other methods were used by fewer than 10% of married couples.

All six countries had well-developed family planning programmes at the time of the survey, although their rating on the 1989 Mauldin–Ross index of effort varied from very strong (Thailand and Indonesia) to moderate in all others (Mauldin & Ross, 1991). Adult female literacy, probably the single most important socioeconomic influence on reproductive behaviour, ranged from 40% in Morocco to 92% in Thailand.

Table 1. Contraceptive prevalence among currently married women, by method and other indicators, 1987–1988

Method and indicator	Ecuador	Egypt	Indonesia	Morocco	Thailand	Tunisia
Any method	44·3	37·8	47·7	35·8	65·5	49·8
Pill	8·5	15·3	16·1	22·9	18·6	8·8
IUD	9·8	15·8	13·2	2·9	6·9	17·0
Injectable	0·7	0·1	9·4	0·3	8·5	0·8
Vaginal	1·2	0·4	0·0	0·1	0·0	1·0
Condom	0·6	2·4	1·6	0·5	1·1	1·3
Sterilization	14·9	1·5	3·3	2·2	28·5	11·5
Periodic abstinence	6·1	0·6	1·2	2·3	0·9	6·3
Withdrawal	2·0	0·5	1·3	3·1	0·9	2·4
Other	0·4	1·3	1·8	1·5	0·1	0·7
Total fertility rate (1985–90)	4·1	4·5	3·5	4·8	2·6	3·9
Female adult literacy (%)	85	35	77	40	92	59
Programme effort score (1989)	58	66	80	57	80	69

Selection of episodes

The DHS Phase I questionnaire for high-prevalence countries gathered data on episodes of use occurring within birth intervals that ended in the 5 years preceding the survey date, as well as on contraceptive knowledge, ever-use, availability and acceptability. For the open interval (i.e. since last live birth), the questionnaire elicits information on the current episode and the previous one (if any) for current users. For women who are not currently using, information is obtained on the last episode of use (if any) in the open interval. For closed birth intervals, the questionnaire permits the identification of a maximum of two episodes, but collects details only for the last episode. These details include the method used, the duration of use and the main reason for stopping.

This study is restricted to episodes that definitely or probably started within the 5 years preceding the survey, because inclusion of episodes that started more than 5 years before the survey would have introduced a selection bias in favour of long episodes. The precise criteria for exclusion of episodes may be found in Ali & Cleland (1995).

Selection and definition of covariates

Selection of covariates was based on a number of considerations. In the absence of any comprehensive theory or framework that could be assessed with the DHS, the main consideration was the potential importance of results for programme guidance. Geographical characteristics are represented by one variable: urban–rural residence. This factor is considered to be a surrogate measure for accessibility and availability of family planning methods, and identification of urban–rural differences is also important for practical programme guidance. Socioeconomic factors are represented by the three variables: respondent's and husband's schooling, and husband's occupation.

Table 2. Percentage of episodes* of use with no information on preventive health care, by survey

Survey	*n*	Prenatal care	Assistance at delivery	Health card
Ecuador	1318	34·8	34·8	100·0
Egypt	4433	22·6	22·3	25·2
Indonesia	6308	100·0	27·9	100·0
Morocco	3018	27·8	27·9	30·6
Thailand	3617	42·2	42·2	43·2
Tunisia	2339	21·8	21·8	23·3

*Episodes that started within the last 5 years prior to the survey.

These factors have proved to be powerful determinants of current use, and they may be indirect measures of motivation to regulate fertility and familiarity with modern drugs. It is clearly of interest to ascertain whether they have an equally powerful effect on method-continuation. Moreover, programme managers need to know whether specific methods can be used more successfully by certain types of couple than by other types.

Demographic and direct motivational factors are grouped together because of the close relationship between a woman's age, number of living children at the start of the episode, and whether or not more children were desired at the start of the episode. The latter variable is derived from reported total desired family size and number of surviving children prior to the episode. From those two variables, a three-fold classification of women was made: desired number was greater than, equal to, or less than actual number. The first category represents women who were spacers for the episode of interest; the latter two categories define women who probably wanted no more children and therefore may be considered to be limiters.

The inclusion of health-related variables in the analysis stems from an interest in assessing whether or not access to, and utilization of, preventive maternal and child services is related to contraceptive behaviour. The expectation is positive. Health concerns and side-effects are a major reason for discontinuation of modern methods. Thus it may be anticipated that women who use modern health services might receive higher quality counselling and reassurance than other women, and therefore feel better able to persist with a method of contraception in the face of worries about side-effects and health concerns. Two main indicators are available in DHS enquiries: the nature of prenatal care (except Indonesia) and assistance with delivery of the child prior to the episode. In some surveys, possession of a child health card can be used as an additional indicator. This information was represented in the analysis by a series of dichotomous factors. One category comprises all cases in which care had been given by a doctor or trained paramedic. All other cases were grouped into the second category. Some episodes of contraceptive use started before the birth of the first child or started after the birth of a child born more than 5 years ago. For these episodes no information on preventive health care is available (Table 2) and they are omitted from the sub-analysis concerning health care.

Table 3. Percentage distribution of completed episodes according to reasons for discontinuation, by survey

Reason	Ecuador	Egypt	Indonesia	Morocco	Thailand	Tunisia
Wants another child	18·7	21·8	33·1	28·4	34·0	30·4
Method failure	27·0	18·6	11·2	26·1	8·1	19·1
Side-effects and health concerns	28·9	37·1	24·9	27·6	25·8	31·5
Other reasons	25·4	22·5	30·8	18·0	32·1	19·0
Number of episodes	1254	4084	4859	2737	3939	1988

The final type of factor considered in this study is prior experience of contraception. The relationship between earlier experience of contraception and subsequent use-continuation has rarely been explored but is of interest. For instance, are women who have used oral contraception previously more likely to be successful users of this method on subsequent occasions? Answers to questions of this nature are of obvious interest to staff of family planning programmes who have the task of assisting women to choose methods and of anticipating the likelihood of satisfaction with the method. Because DHS enquiries do not collect a complete life-time history of contraceptive use, it is not always possible to ascertain with certainty whether or not specific methods have been used prior to the episode of interest. Nevertheless, the data on ever-use of specified methods, together with information on episodes in the preceding 5 years, can be used to reconstruct prior use in a crude but adequate manner for an exploratory analysis. Critical for this reconstruction is the availability of information on the name of the earlier method used in closed intervals containing more than one episode.

This study was particularly interested in ascertaining whether prior use of a specific method is a strong predictor of use-continuation in subsequent episodes of use of the same method. The definitional procedure in these cases is particularly simple. The 5-year contraceptive history was searched for evidence of use of that method prior to the episode of interest. If no such evidence was found, it was assumed that the episode of interest represented the first occasion on which the respondent had tried that particular method. This assumption will be incorrect in an unknown number of instances when earlier use of the method occurred more than 5 years prior to the survey. The effect of this mis-specification will be to dilute the strength of any association between prior use and discontinuation probabilities.

Reasons for discontinuation

To determine the reason for discontinuation, respondents were first asked whether they became pregnant while using the method. Positive answers were classified as instances of method failure. Respondents who answered negatively were asked a second, open-ended question: 'what was the main reason you stopped using (method)?' The DHS coding of these reasons is detailed and includes several items of direct practical relevance to programme managers. Table 3 shows the percentage distribution of completed episodes by the reported reason for discontinuation. Three reasons are

dominant: health concerns including side-effects; method failure; and desire for a child. Other reasons comprise a miscellaneous bunch that defy further disaggregation. In all six surveys, the largest category is unspecified. Problems of availability and access are rarely mentioned, which is perhaps surprising in view of anecdotal accounts of frequent stockouts in some countries. The proportions mentioning cost as a reason for stopping are even smaller. Similarly, husband's disapproval is mentioned by respondents in only 1·8 to 2·5% of episodes. Accordingly, all these reasons were grouped together with 'other unspecified' answers to form a fourth miscellaneous category. The reliability of stated reasons for discontinuation in these surveys is unknown, though a study in Morocco showed a moderate level of agreement in reported reasons when a sample of women was re-interviewed after an interval of 3 years (Strickler *et al.*, 1997).

Data quality

The main limitation of Phase I DHS enquiries for estimation of contraceptive discontinuation stems from the fact that detailed information was collected only for the last episode of use within each closed birth interval. This restriction inevitably leads to an under-representation of episodes that are ended because of the desire to switch to another method. The validity of the results presented in this paper depends critically on the severity of this selection bias. Fortunately, the design of the DHS Phase I questionnaire permits crude estimates of the proportions of contraceptive use episodes for which detailed data were not collected: the name of any prior method used in a closed birth interval was coded. Using this information, it can be estimated that the percentages of missing episodes range from 4% in Ecuador to 8% in Thailand. Thus the magnitude of the problem does not appear to be sufficiently large to cause serious concern.

Further information on the likely effects of the selection bias can be derived from experimental studies in Peru and the Dominican Republic (Goldman, Moreno & Westoff, 1989; Westoff, Goldman & Moreno, 1990). In both studies, a split-sample approach was used to compare results from a DHS Phase I style of questionnaire with those derived from a much more detailed monthly calendar on which all episodes of contraceptive use (within the previous 5 years) were recorded. In Peru, the two data collection methods yielded similar 12-month discontinuation probabilities for the pill and IUD. However, for traditional methods, the calendar approach gave significantly higher estimates of discontinuation. In the Dominican Republic, by contrast, the results for traditional methods were very similar but the calendar approach produced higher discontinuation probabilities for the pill and IUD.

Despite the puzzling discrepancy between these two experimental studies, it is reasonably clear that the DHS Phase I style of data collection results in estimates of discontinuation that may be downwardly biased for some, if not all, methods. For descriptive purposes, this is a serious limitation. However, for an analysis of determinants, the potential bias may not matter, provided that its direction and magnitude are similar for the categories of the independent or predictor variables. To assess this condition, the percentage of missed episodes for these categories was calculated.

Illustrative results are shown for five of the six surveys combined (the Egypt survey did not collect information about prior episodes) in Table 4. It is apparent that the

Table 4. Percentage of contraceptive episodes for which detailed information was not collected (aggregated results for five surveys)

	Method			
	Pill	IUD	Periodic abstinence	Withdrawal
Place of residence				
Urban	5·7	6·0	6·8	11·7
Rural	3·9	3·9	7·8	7·7
Woman's education				
No education	3·5	3·8	6·4	8·1
Primary	4·6	5·1	5·6	9·9
Secondary +	7·2	5·7	8·2	11·2

percentages of all episodes that are missed tend to be higher for urban than rural respondents and for better educated than for less educated respondents. However, the differences are too small to represent a threat to the validity of results presented in this paper.

The pronounced heaping of episode durations in these six surveys also implies relatively poor precision, which is also expected given the long recall period. However, exploratory analysis of the data showed no obvious association between the method in use and the degree of heaping.

Statistical method

The duration of use can be modelled explicitly using either a discrete-time or continuous-time hazard model (Allison, 1982). In this study the discrete approach was used for a number of reasons. First, although the underlying process operates in continuous time, the duration of contraceptive use is recorded to the nearest whole month and so it is more natural to use a model that reflects the discrete-time measurement. Second, as durations are recorded in months, there are more likely to be a large number of ties in the data in which two or more women experience an event at the same time. In the case of the widely used Cox proportional hazard model (Cox, 1972), estimated via partial likelihood, the presence of ties can lead to serious biases (Sinha, Tanner & Hall, 1994).

The computational procedure amounts to this. For each data record, the duration of use was 'discretized' by splitting the time scale into units defined by the minimum interval allowable with the data (i.e. monthly intervals), and each discrete time unit was treated as a separate observation or a unit of analysis. For each of these new observations, the dependent variable was coded 1 if an event (contraceptive discontinuation) was reported by the woman in that time unit; otherwise it was zero. All the explanatory variables considered in this analysis had fixed values at the start of each episode and therefore there was no need to adjust their values at each unit of time.

Table 5. Cumulative probabilities of discontinuation at 24 months per 100 episodes of method-use by survey and method, for all causes except desire for pregnancy

Survey	All methods		Pill		IUD		Injectable		Condom		Traditional methods	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Ecuador	1318	40·5	498	47·2							322	41·7
Egypt	4433	36·1	2280	45·6	1427	15·9						
Indonesia	6308	28·3	2013	27·3	1517	15·7	1565	34·9	370	42·8	500	46·4
Morocco	3018	42·4	2129	42·3							485	44·3
Thailand	3617	35·2	1856	33·5	348	18·2	841	46·1	303	47·4		
Tunisia	2339	37·6	680	48·4	868	24·8					472	34·7

Indicator values were also included to estimate the baseline hazard at each unit of time, which was assumed constant. The hazard of discontinuation was assumed to be proportioal at each time unit, which is a less restrictive assumption than the usual proportional hazard model, which requires proportionality over the entire observation period. Finally, all these observations were pooled together and the maximum likelihood estimates of the complementary log–log model were computed using Stata (StataCorp, 1997).

Models were fitted for specific methods depending on the number of episodes of use in each of the six surveys. A total of 300 episodes was taken as a minimum for inclusion; the number of relevant episodes is shown in Table 5. Following this criterion, models for oral contraceptives could be fitted for all six countries, IUD models in four cases (Egypt, Indonesia, Thailand and Tunisia), and injectable and condom models for Indonesia and Thailand only. Periodic abstinence and withdrawal were pooled together to form a category termed 'traditional methods'. Models for traditional methods for all countries except Egypt and Thailand were fitted. The number of episodes of periodic abstinence and withdrawal in the four countries are 244 and 78 in Ecuador, 266 and 234 in Indonesia, 243 and 242 in Morocco, and 333 and 139 in Tunisia, respectively.

In exploratory work, models were estimated for all causes except desire for pregnancy, method failure, and health concerns, but results are presented here for the second outcome only at 24 months. This restriction is motivated partly by the desire to avoid an excessive proliferation of detailed data, but also by the desire to concentrate on results of practical importance. As mentioned earlier, discontinuation for a planned pregnancy represents no problem with the method or the service, whereas stopping for most other reasons does imply a problem or dissatisfaction. This contrast provides a clear justification for focusing attention on stopping for reasons other than desire to become pregnant. All results are shown in terms of the cumulative probability of discontinuation within 24 months of starting the method. The choice of 24 months was based on the fact that, by this time, substantial minorities of women have discontinued for reasons other than a planned pregnancy (Table 5). Furthermore, examination of model estimates for other durations showed similar patterns to that obtained for 24 months.

Results

To set in context the analysis of factors that influence discontinuation, Table 5 presents descriptive information on probabilities of discontinuation per 100 episodes by 24 months for all reasons except desire for pregnancy. For all methods combined, these probabilities are remarkably similar across the six surveys. With the exception of Indonesia, where contraceptive-use episodes are longer, the cumulative percentage of episodes that end within 24 months ranges only from 35 to 42%. Rapid discontinuation is thus equally common in settings where contraceptive prevalence and adult literacy is high (e.g. Thailand) as in settings where they are relatively low (e.g. Egypt). The results for specific methods are also unexpected. Highly effective hormonal methods are used for no longer on average than traditional methods. The reason is that high rates of method failure for the latter are offset by high rates of discontinuation of hormonal methods because of side-effects and health concerns. It may also be noted that in all four surveys with relevant data, IUD discontinuation is lower than for other methods.

Table 6 provides an initial overview of the multivariate results. It identifies significant net effects of predictors ($p < 0.05$) in final models at 24 months for all reasons except desire for pregnancy by method and country. Categories associated with a significantly higher risk of discontinuation relative to the reference strategy are labelled with a positive (+) symbol, while a negative label denotes significant effects in the opposite direction.

The demographic and motivational factors emerge as the most consistent set of predictors of continuation of contraceptive methods in the six surveys examined. Desire for another child, number of living children, as well as the respondent's age are pervasively significant predictors of discontinuation, though less so for the pill than for other methods.

By comparison, socioeconomic effects are generally absent. Urban–rural residence is a net predictor of discontinuation only in Egypt and Morocco for the pill and Indonesia for the condom. Women's education emerges as a significant predictor in only one instance, while husband's education has no significant net effect on discontinuation. Husband's occupation has significant net effects on continuation of hormonal methods in Thailand and Ecuador and on continuation of traditional methods in Morocco. The results also show that prior experience with a contraceptive method is associated with longer subsequent use. Two health-related factors – nature of care at delivery and possession of a health card – appear to be important for modern methods in some settings.

Effects of urban–rural residence

Of the four socioeconomic or geographical factors, urban–rural residence has been singled out for more detailed examination because of the potential policy relevance of findings. Unadjusted (i.e. bivariate) results were first compared with adjusted results. Five statistically significant unadjusted effects were observed compared with three significant adjusted effects but in all other regards the two sets of results were very similar. Attention is therefore restricted to the adjusted risks of discontinuation for rural relative to urban respondents. Table 7 shows a total of eighteen survey- and method-specific relative risks. In sixteen of them, rural respondents are more likely than

Table 6. Summary of net relative risk of discontinuation at 24 months of use, for all reasons except desire for pregnancy, by method and survey; significant predictors at 5% (+ = positive; − = negative)

	Pill						IUD				Injectable		Condom			Traditional		
	EC	EG	ID	MO	TH	TN	EG	ID	TH	TN	ID	TH	ID	TH	EC	ID	MO	TN
Socioeconomic																		
Residence																		
(Urban)*																		
Rural		+		+									+					
Women's education																		
(Secondary+)*																		
No education	+																	
Primary																		
Husband's education																		
(Secondary+)*																		
No education																		
Primary																		
Husband's occupation																		
(Professional)*																		
Agricultural employee	+				−							+						
Others												+					+	
Demographic and motivational																		
Age group																		
(35+)*																		
<25	+						+	+	+	+	−		+		+	+		
25–34							+											

	EC	EG	ID	MO	TH	TN
Number of living children						
(4+)*						
0–1	+			+		+
2–3	+			+		+
Desire for more children						
(Actual = desire)*						
Actual < desired	+	+		+		+
Actual > desire	+			+		
Non-numeric answer		+		+		+
Prior use of the method						
(Used before)*						
Did not use	+	+	+	+	+	+
Utilization of health facilities[a]						
Prenatal care						
(Trained personnel)*						
Untrained personnel	NA	NA	NA	NA	NA	NA
Assistance at delivery						
(Trained personnel)*						
Untrained personnel	+	+			+	
Has a health card						
(Has a card)*						
No card	NA	NA	NA	NA	NA	NA

[a]Model based on subset of valid cases. NA = not applicable. * = reference category.
EC, Ecuador; EG, Egypt; ID, Indonesia; MO, Morocco; TH, Thailand; TN, Tunisia.

Table 7. Net relative risk (RR) of discontinuation for rural compared with urban respondents at 24 months of use for all reasons except desire for pregnancy, by survey and method

	Residence	Pill		IUD		Injectable		Condom		Traditional	
		RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Ecuador	Rural	1·34	(0·94–1·92)							1·01	(0·59–1·72)
Egypt	Rural	**1·30**	**(1·11–1·54)**								
Indonesia	Rural	1·02	(0·81–1·28)	1·12	(0·74–1·68)	1·00	(0·79–1·26)	**1·76**	**(1·15–2·70)**	1·14	(0·75–1·71)
Morocco	Rural	**1·57**	**(1·30–1·90)**	1·28	(0·88–1·85)					1·14	(0·75–1·73)
Thailand	Rural	1·13	(0·89–1·43)	0·83	(0·39–1·78)	1·07	(0·77–1·49)	1·67	(0·96–2·89)		
Tunisia	Rural	1·28	(0·96–1·72)	1·43	(0·97–2·12)					1·42	(0·86–2·36)

urban respondents to have discontinued the method within 24 months. The probability of obtaining such a pattern by chance is remote and hence it can be concluded that there is a pervasive tendency for rural couples to discontinue methods sooner than urban couples. However, many of these differences are small in magnitude and only three attain statistical significance, though there are two further cases of borderline significance (IUDs in Tunisia and condoms in Thailand). Any rural–urban disparity in use-continuation was expected to be most apparent for methods that require regular re-supply, such as oral contraceptives and condoms. Table 7 provides a hint that this expectation might hold for the condom, though any confident interpretation is precluded by the fact that relevant results are available only for Indonesia and Thailand. Comparison of results for the pill with those for the IUD (that requires infrequent checks) or for traditional methods, however, reveals no clear-cut rural–urban difference.

Effects of respondent's age

Of the three demographic and motivational factors, respondent's age at the start of the episode has been selected for more detailed scrutiny. As before, unadjusted results were examined but the direction and magnitude of differences were very similar. Hence attention is confined to the adjusted estimates. The prior expectation is that older respondents will be more persistent in method use, even after controls for fertility preferences. Because fecundability declines after the age of 35 years, older women will be less susceptible to method failure, one of the major causes of discontinuation. The general pattern of results in Table 8 is consistent with this expectation. With few exceptions, women aged less than 25 years and those aged 25 to 34 years are more likely than older women to stop using methods of contraception in 24 months for reasons unconnected to the desire to become pregnant.

The strength of the association between age and discontinuation, however, varies by method. For hormonal methods, relative risks are small and only two estimates out of sixteen are statistically significant. For the IUD, on the other hand, risks of discontinuation for younger relative to older women are much larger and five out of eight available estimates are statistically significant. These differences cannot be attributed plausibly to the higher fecundability of young women because this method has a low failure rate. Rather, the results suggest that older women are better able to tolerate the side-effects of IUDs. Table 8 also contains evidence that respondent's age is a determinant of length of use of traditional methods. Relevant data are available for four surveys and, with the exception of Morocco, risks of discontinuation in younger women are markedly higher than for older women, though not all attain statistical significance.

Effects of prior use of the method

There has been little empirical investigation of the common-sense expectation that couples who have prior experience of a particular method will be more persistent and successful users than those who are adopting a method for the first time. Table 9 presents the relevant results for the six surveys. Of the total of eighteen estimates, sixteen are in the expected direction (i.e. higher risks of discontinuation for couples

Table 8. Net relative risk (RR) of discontinuation for younger respondents compared with those aged 35+ at 24 months of use for all reasons except for pregnancy, by survey and method

	Age group	Pill		IUD		Injectable		Condom		Traditional	
		RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Ecuador	<25	**2·28**	**(1·11–4·69)**							**2·77**	**(1·08–7·11)**
	25–34	1·73	(0·87–3·45)							2·06	(0·87–4·89)
Egypt	<25	1·26	(0·96–1·65)	**2·87**	**(1·45–5·69)**						
	25–34	1·06	(0·85–1·32)	**3·21**	**(1·77–5·82)**						
Indonesia	<25	0·83	(0·58–1·17)	**2·49**	**(1·19–5·24)**	**0·58**	**(0·38–0·88)**	**2·47**	**(1·18–5·18)**	**2·72**	**(1·22–6·06)**
	25–34	0·81	(0·60–1·09)	1·98	(0·99–3·97)	0·80	(0·56–1·14)	1·55	(0·87–2·77)	1·61	(0·79–3·28)
Morocco	<25	1·02	(0·76–1·37)							1·03	(0·57–1·87)
	25–34	1·03	(0·83–1·29)							0·97	(0·60–1·57)
Thailand	<25	1·47	(0·92–2·33)	**10·08**	**(1·03–98·30)**	0·90	(0·51–1·60)	1·51	(0·56–4·05)		
	25–34	1·28	(0·83–2·00)	8·11	(0·88–74·51)	0·88	(0·52–1·51)	0·89	(0·33–2·36)		
Tunisia	<25	1·48	(0·88–2·44)	**2·34**	**(1·14–4·79)**					1·94	(0·82–4·59)
	25–34	1·14	(0·76–1·71)	1·71	(0·91–3·24)					2·13	(1·01–4·51)

Table 9. Net relative risk (RR) of discontinuation for respondents with no prior experience of the method compared with those with prior experience at 24 months of use for all reasons except desire for pregnancy by survey and method

	Prior use	Pill RR	Pill 95% CI	IUD RR	IUD 95% CI	Injectable RR	Injectable 95% CI	Condom RR	Condom 95% CI	Traditional RR	Traditional 95% CI
Ecuador	No	1·02	(0·70–1·48)	1·00	(0·62–1·61)					1·22	(0·80–1·85)
Egypt	No	1·62	(1·37–1·91)								
Indonesia	No	1·95	(1·42–2·67)	1·77	(1·06–2·95)	1·26	(0·83–1·92)	2·16	(1·13–4·10)	1·38	(0·93–2·06)
Morocco	No	1·34	(1·23–1·59)							0·98	(0·70–1·35)
Thailand	No	1·64	(1·32–2·04)	6·12	(0·83–45·21)	1·37	(0·92–2·05)	2·21	(1·08–4·49)		
Tunisia	No	1·38	(1·02–1·89)	1·30	(0·83–2·04)					1·18	(0·80–1·74)

Table 10. Net relative risk (RR) of discontinuation for respondents whose delivery was not supervised compared with those whose delivery was supervised at 24 months of use for all reasons except desire for pregnancy, by survey and method

	Supervision of delivery	Pill RR	Pill 95% CI	IUD RR	IUD 95% CI	Injectable RR	Injectable 95% CI	Condom RR	Condom 95% CI	Traditional RR	Traditional 95% CI
Ecuador	Untrained	1·94	(1·12–3·34)							1·11	(0·49–2·50)
Egypt	Untrained	1·19	(0·99–1·43)	1·10	(0·72–1·67)						
Indonesia	Untrained	0·98	(0·72–1·32)	1·31	(0·83–2·07)	1·27	(0·95–1·69)	1·55	(0·78–3·05)	1·60	(0·92–2·78)
Morocco	Untrained	1·33	(1·03–1·71)							0·81	(0·51–1·29)
Thailand	Untrained	1·24	(0·86–1·77)	1·37	(0·61–3·07)	1·02	(0·68–1·52)	3·37	(1·05–10·77)		
Tunisia	Untrained	0·79	(0·53–1·19)	1·14	(0·64–2·03)					1·13	(0·51–2·52)

Note: estimates are based on subset of valid cases.

with no prior experience) and half of these are statistically significant. The hypothesis that prior experience may be a particularly powerful predictor of prolonged subsequent use for methods that demand a degree of skill from users receives mixed support. Prior use is a consistent predictor of discontinuation for the condom and oral contraceptives but less so (as expected) for injectables. However, use of traditional methods (that typically require a considerable contribution from users) appears to be unrelated to use-continuation.

Effects of assistance at delivery

The debate concerning the merits and demerits of integrated versus vertical family planning services has a long pedigree. An important strand in the argument for integration is the possible synergistic effect of integrated services. Women who use maternal and child health services that also offer family planning may be more likely than other women to adopt contraception, partly because each visit for health purposes affords potential opportunity for information and advice about family planning. By the same token, women who receive family planning and health services from the same source may be more persistent users of contraception because they have ready access to advice about side-effects and health concerns. A direct test of this link is not possible with DHS data, not least because source of supply is unavailable for most episodes. Instead the analysis sought to establish whether or not women who used modern maternal or child health services immediately prior to an episode of contraceptive use were more likely to be persistent users of the chosen method. Three crude indicators of use of modern services were available (though not for all surveys): receipt of antenatal care; assistance at delivery; and possession of a health card. The preliminary screening of results (Table 6) shows no significant relationship between receipt of antenatal care from a trained person and use-continuation. Assistance at delivery and possession of a health card both showed some significant effects in the expected direction and the former factor was selected for more detailed assessment because this datum was available for more surveys than the health care variable.

Table 10 shows the adjusted risks of discontinuation for women who did not have the benefit of a trained person at the delivery prior to the use-episode of interest compared with women whose prior delivery was medically supervised. Little effect of contact with health services can be expected on length of use of the condom or traditional methods because advice or counselling about such methods is rarely obtained from health providers. Therefore attention is confined to results for oral contraceptives, injectables and IUDs. Twelve estimates are available and ten of these show a difference in the expected direction. However, only two are statistically significant (for pill users in Ecuador and Morocco) and many of the relative risks are very small. Thus this analysis offers only mild support for the hypothesis that women who use modern health services are more persistent users of contraception than other women.

Discussion

The most important finding of the study is a negative one. Neither education of the wife nor that of her husband proved to exert significant influence on the length of use of methods. Out of a total of eighteen method- and survey-specific results, the

education of the wife exerted a significant effect on continuation in only one instance, while the effects of husband's education were not statistically significant at all. In view of the variety of settings in which these surveys were conducted, ranging from highly literate countries with strong family planning programmes (e.g. Thailand) to less well endowed countries (e.g. Morocco), this is a remarkable finding. Also remarkable is the fact that virtually no educational effects were found for methods that require skill or memory from users for successful use (e.g. oral contraceptives and condoms), as well as those requiring less of a contribution from users (e.g. IUDs and injectables).

Several possible explanations should be considered. First it is plausible that educated couples, having broader knowledge of contraceptive methods and possible supply sources, may be more likely than less educated couples to switch methods in the search for a contraceptive regime that best meets their needs. However, this possible explanation is unconvincing because of the nature of episodes that have been analysed. It will be recalled that DHS Phase I collected detailed information on closed birth intervals only for the last episode in each interval, hence precluding the possibility that couples may have stopped using one method to switch to another. For the open interval, detailed information was elicited for the current episode and for any preceding episode. The latter type of episode may have been stopped for switching purposes. However, such episodes account for a small proportion (8%) of all episodes analysed here. It may be concluded that method switching cannot account for the unexpected lack of association between length of contraceptive use and the educational background of couples.

A second possible explanation is that better educated couples are more likely than other couples to use contraception for relatively short periods in order to space births. Again, this line of reasoning is largely irrelevant because the analysis contained controls for fertility preferences and the related factors of age and family size. Furthermore, episodes that were stopped in order to plan a pregnancy were censored and did not contribute to the overall discontinuation probability.

Another possible explanation is that better schooling, together with all its attendant advantages, implies less willingness to accept the discomforts and side-effects associated with use of modern reversible contraceptives. However, analysis of cause-specific discontinuation probabilities (not shown) lends little support to this view. The general impression is that cause-specific probabilities of discontinuation are unrelated to education. Moreno (1993) also found that educational differences in failure rates were small.

Over the last 30 years, population scientists have become conditioned to finding strong effects of schooling on nearly all types of demographic outcome and on the proximate determinants of these outcomes. For whatever reason, length of contraceptive-use episodes appears to be a genuine exception. The unexpected nature of this conclusion should not be allowed to overshadow its important policy message. Managers and service providers should not discriminate in terms of method promotion between well educated and less well educated couples.

The urban–rural results have an identical policy and programme implication. The generally small geographic differences in discontinuation probabilities observed in this study provide no justification for programme managers to rely more heavily on the promotion of permanent or long-acting methods (e.g. Norplant or IUD) in rural than

in urban areas. Prior use of a method emerged as a predictor of length of subsequent use of the same method. This is not surprising. Nevertheless the result provides useful guidance for service providers. Women who wish to re-adopt a method that they have already tried should be encouraged to do so. The absence of a marked link between uptake of modern preventive health services and use-continuation has less practical relevance. The results are far from definitive because of the absence of detailed information on supply sources.

Motivational factors and closely related demographic factors of age and family size emerge as the most pervasive set of influences on the willingness or ability of couples to persist with use of reversible methods. Couples who want no more children are more successful contraceptive users than couples who are interested primarily in spacing. Motivation, it appears, can triumph over inefficient use of methods (leading to method failure) and over the inclination to cease use because of side-effects or health concerns.

Acknowledgments

References

ALI, M. & CLELAND, J. (1995) Contraceptive discontinuation in six developing countries: a cause-specific analysis. *Int. Fam. Plann. Perspect.* **21**, 92–97.

ALLISON, P. (1982) Discrete-time methods for the analysis of event histories. In: *Sociological Methodology.* Edited by S. Leinhardt. Jossey-Bass.

COX, D. R. (1972) Regression models and life-tables (with discussion). *Jl R. statist. Soc. B.* **74**, 187–202.

GOLDMAN, N., MORENO, L. & WESTOFF, C. F. (1989) Collection of survey data on contraception: an evaluation of an experiment in Peru. *Stud. Fam. Plann.* **20**, 147–157.

JAIN, A. (1989) Fertility reduction and the quality of family planning services. *Stud. Fam. Plann.* **20**, 1–16.

MAULDIN, W. P. & ROSS, J. A. (1991) Family planning programmes: efforts and results, 1982–89. *Stud. Fam. Plann.* **22**, 350–367.

MORENO, L. (1993) Differences by residence and education in contraceptive failure rates in developing countries. *Int. Fam. Plann. Perspect.* **19**, 54–60.

SINHA, D., TANNER, M. A. & HALL, W. J. (1994) Maximisation of the marginal likelihood of grouped survival data. *Biometrika* **81**, 53–60.

STATACORP (1997) *Stata Statistical Software: Release 5.0.* Stata Corporation, College Station, TX.

STRICKLER, J. A., MAGNANI, R. J., MCCANN, H. G., BROWN, L. F. & RICE, J. C. (1997) The reliability of reporting of contraceptive behaviour in DHS calendar data: evidence from Morocco. *Stud. Fam. Plann.* **28**, 44–53.

WESTOFF, C. F., GOLDMAN, N. & MORENO, L. (1990) *Dominican Republic Experimental Study: An Evaluation of Fertility and Child Health Information.* Office of Population Research, Princeton University and Institute for Development/Macro Systems Inc., Princeton, NJ and Columbia, MD.