

Analysis of Contraceptive Switching in Indonesia

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Abstract. *This paper is focused on contraceptive switching in Indonesia. Since a woman might use more than one method of contraception during her reproductive period, she can contribute more than one contraceptive use interval to the data. Some studies of contraceptive switching have used statistical techniques which assume independence between switching but this assumption can be violated because the likelihood of switching might be correlated. Hence contraceptive switching varies not only across groups of contraceptive users but also across contraceptive users with the same socioeconomic characteristics. Hence the consequences of this contraceptive users' effect for the relationship between socioeconomic, demographic and contraceptive-related characteristics of users and contraceptive switching in Indonesia is analysed through the use of random-effects logistic models. The data used for the analysis is from the 1991 Indonesia Demographic and Health Survey. The findings confirm the results of previous studies that a number of socioeconomic and demographic factors influence the likelihood of switching contraception. Among these factors, contraceptive-related factors such as the method being used before switching, the duration of use at switching and the reason for switching, affect contraceptive switching most. The results also indicate that there is correlation between intervals for the same woman. This implies that there are other factors which have not been observed and contribute to the differentials of switching contraception across women with the same socioeconomic characteristics.*

Keywords: Contraceptive methods; contraception continuation; statistical models; socio-economic factors; multivariate analysis; DHS 1991 data; Indonesia.

1. Introduction

In the past two decades there have been substantial changes in the contraceptive practices of Indonesian women. The report of the NFPCB (BKKBN 1992) stated that the IUD was the most used method in 1969-70 but

was replaced by the pill in 1977-78. Growing concerns about the side-effects of the pill and some religious objections to using the IUD led to the increase in the use of the injection which was promoted for the first time in the mid-1970s and which gained popularity in the 1990s. In mid-1980s, the NFPCB introduced sterilisation and Norplant into the programme. Use of these two methods has increased notably. The condom, which was used by 18 percent of contraceptors in the 1969-70, was only used by two percent of contraceptors in the early 1990s. Use of other modern methods of contraception or traditional methods is persistently low.

The NFPCB started the privatisation of the family planning programme in 1987, although it still provides free or cheap family planning services for those who cannot afford it. In order to reduce the economic and logistic burden, the programme has promoted the use of the three chosen long-term and effective methods of contraception: IUD, Norplant and sterilisation, especially in rural areas. This strategy has contributed to the changes in the composition of method use among Indonesian women.

The availability of various contraceptive methods has allowed contraceptors to switch from one method of contraception to another in order to achieve their fertility goals. It is important to find out the patterns of contraceptive switching because it has direct implications for a woman's ability to avoid an unplanned pregnancy, and ofcourse the prevalence of specific contraceptive methods in the population (Grady et al. 1989). In addition, it is important to examine whether women with the same background characteristics have a different risk of switching due to their individual differences such as satisfaction and physical adaptation in using a specific method of contraception. Some women might experience more problems in using a specific method of contraception due to biological reasons and these problems are likely to be repeated in the next spell of contraception. If there are differentials in switching contraception among women with the same background characteristics, the family planning programme should provide better contraceptive methods which can be suitable for high-risk switching women in order to maintain their use of contraception.

This paper is designed to examine patterns of contraceptive method switching among married women in Indonesia. It is hoped that the analysis will answer questions about (1) the effect of method type and other contraceptive-related, socioeconomic and demographic characteristics on the risk of switching contraception, (2) what is the main reason for discontinuation, (3) what are the methods that couples are most likely to switch from, and (4) do women with the

same characteristics have the same risk of switching contraception? The analysis will also identify those who switch least or most and why. The results will be important for Indonesian family planning programme policy makers in improving the service and quality of available contraceptive methods and meeting the users' demands for specific contraceptive methods.

2. Data, Methodology and Model Selection Procedure

2.1 Data

The analysis investigates the factors affecting contraceptive switching to ever-married women aged 15-49. The 1991 Indonesia DHS recorded a contraceptive use history for the period in which a woman was married, from January 1986 to the time of the survey (May to September 1991). Contraceptive use at the time of the survey is also included. During the observed period, a woman might use more than one contraceptive method and also switch more than once. Hence she is likely to contribute more than one contraceptive switch to the data set. Random effects logistic models, which allow for the possibility of correlations between the outcome of two successive contraceptive intervals for the same woman, will be used to determine the influence of various factors on contraceptive switching.

The decision to change methods of contraception is assumed to be influenced by the socioeconomic, demographic and contraceptive-related backgrounds of the women. The variables considered are the impact of age at switching, age at the survey, number of living children at switching, region of residence, place of residence, childhood urban experience, religion, educational attainment, past and current work experience, regular contact with a source of information such as newspaper, radio and television, husband's educational attainment, husband's occupation, original method, reason for switching and duration of use of the original method.

It is assumed that young women are more likely to switch than their older counterparts since they might be still in the process of building up their family and also searching for the most suitable method of contraception. However, it would be expected that the much older women are more likely to switch to no method, because they might not be under pressure to use a contraceptive method due to perceived infecundity or lack of regular sex. They might also be more likely to switch to a more effective method to avoid the high costs associated with childbearing at an older age. Women with more children

would be expected to switch to a more-effective method in order to limit their births.

It is assumed that living in more developed areas such as in Java and Bali or in urban areas, being more adaptable to the cultural value of contraceptive practice, being better educated, being engaged in employment, being regularly in touch with the mass media, having a better-educated husband and having a husband who is a non-agricultural worker would increase the chances to switch a contraceptive method due to the availability of the desired contraceptive methods, competence to find a better method of contraception and ability to get a desired contraceptive method.

Those who use short-term methods would be expected to be more likely to switch than those who use long-term methods. Those who experienced health problems would be expected to be more likely to switch than those who wanted to get pregnant. In addition, a low chance of switching among those who have used a method of contraception for a long duration would be expected since they will become more familiar and experienced in using a specific method especially in coping with any health problems and side-effects. In contrast, a high chance of switching among short-period users would be expected since difficulties with contraceptive use tend to be encountered within the first few months of adopting a specific contraceptive method.

2.2 Methodology: Random-Effects Logistic Models for Binary Response Data

In the analysis of switching contraceptives the response variable is binary: switches or does not switch a contraceptive method. The ordinary fixed-effects binary logistic model is commonly used for this type of analysis. This model assumes that all of the variation in the individual probabilities of switching contraception can be explained by the covariates together with individual level residual error. Since the analyses of switching contraception in this chapter include women who contribute more than one spell of contraceptive use to the data set, the fixed-effects logistic model might not be appropriate because some of the assumptions on which it is based are violated, in particular that all the observations are independent. It is sensible to assume that risks of switching for contraceptive intervals within a woman are related rather than independent.

The random-effects logistic model, which is an extension of the ordinary fixed-effects logistic model, is more appropriate since it allows for unobserved heterogeneity between women. A comprehensive description of this model can be found in recent literature (e.g. Curtis et al. 1993, Madise 1993). Curtis et al. (1993) used random-effects logistic models to analyse the effects of the preceding birth interval on postneonatal mortality in Brazil, controlling for the correlation of survival outcomes between siblings. Madise (1993) also employed this model to study the importance of socioeconomic, familial and geographical factors in explaining the variations in mortality risks between Malawian children. The random-effects logistic model was first used in the study of contraceptive use dynamics by Steele (1993) and Steele et al. (1994) who studied the factors which influence the duration of a period of contraceptive use in China, controlling for the correlation of continuation outcomes between spells. In this section, this model is described briefly.

Notation

Let	Y_{ij}	be the response for the i^{th} spell of use of the j^{th} woman
	σ_{ij}	be the probability of switching a contraceptive method
	X_{ij}	be the vector of covariates for the i^{th} spell of the j^{th} woman
	β	be the vector of parameters associated with the X_{ij}

The random-effects logistic model assumes that when there is correlation in switching risks between successive contraceptive intervals the individual probability of switching a contraceptive interval equals those obtained from the ordinary fixed-effects logistic model plus a random perturbation on the logit scale due to the unobserved woman effect. The model can be written as

$$\text{logit} (\pi_{ij}) = X_{ij}' \beta + u_j$$

where u_j is the random component associated with the j^{th} woman.

The random component u_j is assumed to be normally distributed with variance to be estimated from the data. The model can then be rewritten as

$$\log (\pi_{ij}) = x_{ij} \beta + \pi v_j$$

where $\sigma \geq 0$ is scale parameter which measures the amount of extra variation due to the random effect and $v_j \sim N(0,1)$. If $\sigma = 0$ there is no extra variation arising from the woman effects and no correlation between contraceptive use

intervals for a particular woman and the model reduces to the ordinary fixed-effects logistic model.

The package EGRET has been used to estimate the random-effects logistic models by using the binomial approximation to the normal distribution. It can be used to fit the logistic binomial model for distinguishable data, that is, covariates operating at an individual (contraceptive use) level. In the random-effects logistic binomial model v_j is assumed to have a symmetric binomial distribution

$$v_j = \frac{W_j - E(W_j)}{\sqrt{\text{Var}(W_j)}} = \frac{2W_j - K}{\sqrt{K}}$$

where W_j has a binomial distribution with parameters K and 0.5 .

The limiting distribution of v_j as K increases is a standard normal distribution so the logistic binomial will be equivalent asymptotically as K approaches infinity.

The likelihood function for the logistic binomial model for distinguishable data is

$$\prod_{j=1}^J \left(\frac{1}{2}\right)^K \sum_{k=0}^K \binom{K}{k} \prod_{i=1}^{n_j} \frac{\left(\exp\left(X'_{ij}\beta + U_j\sigma \frac{2k-K}{\sqrt{K}}\right)\right)^{y_{ij}}}{\left(1 + \exp\left(X'_{ij}\beta + U_j\sigma \frac{2k-K}{\sqrt{K}}\right)\right)}$$

EGRET uses the modified-Newton procedure to maximise the logarithm of the likelihood ratio statistics for obtaining maximum likelihood estimates of β' and σ .

Fitting the random-effects logistic model can be done by finding a parsimonious model with fixed covariates only and then adding the random parameter. The significance of woman effects is tested by testing the null hypothesis $\sigma = 0$ against the alternative hypothesis $\sigma > 0$ using a modified likelihood ratio test statistic based on the usual likelihood test statistic. In this case the test statistic is minus twice the difference between the log-likelihood of the logistic model and the log-likelihood of the corresponding logistic-normal model. The test must be modified to allow for the fact that it is testing on the boundary of the parameter space, so a one-tailed normal test is used rather than

the usual χ^2 test. The remaining parameters can be tested in exactly the same way as for logistic regression.

When correlation of switching risks between contraceptive intervals exists, there will be more women with fewer risks of switching and more women with higher risks of switching than there would have been if there had been no correlation between contraceptive intervals. This problem is commonly known as *overdispersion*. When there is overdispersion, use of the ordinary logistic regression model can result in significant estimates when in fact they are not. This is because with the logistic regression model, the standard errors, which are inversely related to the number of independent observations, are under-estimated as there are in fact fewer independent observations. Hence it is important to check whether the fixed-effects covariates are still significant after including the random parameter.

The exponentiated parameter estimates are interpreted as odds ratios in the ordinary fixed-effects logistic model. The random-effects logistic model no longer estimates an individual probability of switching for contraceptive intervals with a particular set of characteristics because the probability depends on both the observed covariates and the unobserved woman effects. Hence the odds ratios obtained from the random-effects logistic model represent the effect of a particular variable on the odds of switching within the particular woman. This implies that the predicted probability of switching for two contraceptive intervals for different women with the same characteristics will differ by a small amount due to the woman effect.

An approach to illustrate the implications of the variability across women is proposed by Curtis et al. (1993). It involves estimating the probabilities of switching a contraceptive interval for different values of ν_j , while varying the values of one of the covariates. The values of ν_j used are -2, -1, 0, +1 and +2 which correspond to the mean value of ν_j and to one and two standard deviations on either side of the mean. Hence the probability of switching for a contraceptive interval with a particular set of characteristics will lie between the probabilities corresponding to $\nu_j = -1$ and $\nu_j = +1$ for about 69 percent of women and between the probabilities corresponding to $\nu_j = -2$ and $\nu_j = +2$ for about 95 percent of women. Negative values of ν_j would correspond to women with below-average risks of switching while positive values of ν_j would correspond to women with above-average risks of switching.

Since the package EGRET can only handle up to 13,000 cases, the package ML3 is employed to analyse the larger data set. This packages applies

the Iterative Generalised Least Squares (IGLS) algorithm to obtain consistent estimators of the maximum likelihood estimates (Goldstein 1991).

2.3 Model Selection Procedures

A combination of forward and backward selection was used to obtain the parsimonious ordinary binary or multinomial logistic models. Starting with the null model, each of the explanatory variables was added to the current model and the resulting change in deviance was compared to a Chi-squared distribution with the appropriate degrees of freedom. Each term was tested at the five percent level of significance. After the addition of a new term to the model, t-tests were used to determine whether any variables could be removed or whether any levels of categorical variables could be combined. The selected models were then extended by fitting the scale parameter in the random part of the model.

3. Factors Influencing Contraceptive Switching Among Contraceptive Method Users

There are 14,180 contraceptive use pairs which have a method of contraception as the original method, contributed by 12,684 women. Table 1 shows that almost six percent of these women switched method to another method of contraception more than once. Hence the random-effects logistic model will be employed in the analysis of the factors which influence switching contraception among contraceptive method users.

Table 1
NUMBER OF CONTRACEPTIVE SWITCHING CONTRIBUTED TO
THE ANALYSIS SAMPLE BY EACH WOMAN EXCLUDING
NO METHOD SPELLS, INDONESIA DHS, 1991

Number of switching	Number of women	Percentage
0	9,351	73.7
1	2,500	19.7
2	667	5.3
3	122	1.0
4	31	0.2
5+	13	0.1
Total	12,684	100.0

3.1 Contraceptive Switching Differentials Among Contraceptive Method Users

Table 2 presents the percentage of women who switched a contraceptive method by the socioeconomic, demographic and contraceptive-related characteristics. In general, nearly one-third of contraceptive method intervals were switched to another method of contraception during the observed period. The percentage switching varies greatly between younger and older women. Younger cohorts of women are more likely to switch than their older counterparts. The percentage switching declines as the number of living children increases. In contrast, it followed an inverted-U shaped when no method intervals were included (not shown). This finding indicates that women who had less children might use a contraceptive method for spacing their births and hence they switch more while women who had more children might use a method of contraception for limiting births and use the method more committedly.

As far as socioeconomic background is concerned, being more educated, being better off, living in modern developed areas and being in touch with a source of information seems to increase the chances of switching. There is evidence that those who lived in Java and Bali, lived in urban areas, had lived in urban areas until aged 12, were Moslem, ever worked, were non-agriculture workers, read a newspaper, listened to the radio and watched the television regularly and whose husbands were non-agriculture workers are more likely to switch contraceptive method than other women. In addition, the percentage switching increases as their and their husband's educational attainment increases.

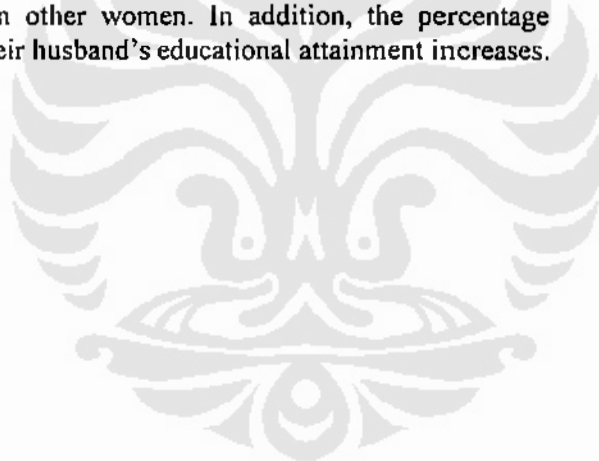


Table 2
PERCENTAGE OF CONTRACEPTIVE METHOD
SWITCHERS BY SOCIOECONOMIC, DEMOGRAPHIC AND
CONTRACEPTIVE-RELATED CHARACTERISTICS. INDONESIA DHS, 1991

Characteristics	Percentage of switcher	Number of pairs
Age at switching (years)		
<=24	42.4	4,598
25-34	33.7	6,405
35-39	22.9	1,639
40 +	9.6	1,639
Age at survey (years)		
15-24	34.6	3,062
25-34	36.3	7,113
35-39	30.7	2,453
40-49	16.3	2,025
Number of living children at switching		
None	39.1	800
One	36.2	4,401
Two	33.5	3,535
Three	31.8	2,538
Four or more	24.4	3,379
Region of residence at the survey		
Java and Bali	34.0	10,076
Outer Java and Bali I	26.0	3,118
Outer Java and Bali II	33.0	1,460
Place of residence at the survey		
Urban	38.8	4,773
Rural	29.1	9,880
Place of residence before aged 12		
Urban	38.6	3,350
Rural	30.3	11,303
Religion		
Islam	32.7	13,197
Other	28.1	1,457

(continued)

Table 2 (continuation)

Characteristics	Percentage of switcher	Number of pairs
Educational attainment		
None	19.1	1,911
Incomplete primary	29.7	4,959
Complete primary	34.2	4,682
Complete secondary or higher	41.4	3,102
Ever worked		
Yes	32.8	6,981
No	31.7	7,673
Occupation		
Non-Agriculture	39.1	3,826
Other	29.8	10,827
Read newspaper regularly		
Yes	39.8	4,863
No	28.5	9,790
Listen to the radio regularly		
Yes	33.3	9,963
No	30.0	4,691
Watch television regularly		
Yes	35.6	10,023
No	24.9	4,630

Table 2
(CONTINUED) PERCENTAGE OF SWITCHERS
(EXCLUDING NO METHOD SPELLS) BY SOCIOECONOMIC
DEMOGRAPHIC AND CONTRACEPTIVE-RELATED CHARACTERISTICS
INDONESIA DHS, 1991

Characteristics	Percentage of switcher	Number of pairs
Husband's educational attainment		
None	22.5	1,161
Incomplete primary	27.4	4,352
Complete primary	32.4	4,695
Complete secondary or higher	39.5	4,410
Husband's occupation		
Non-Agriculture	38.3	8,241
Other	24.4	6,413
Method used at switching		
Pill	31.3	5,007
IUD	20.3	3,508
Injection	40.1	4,453
Norplant	10.6	326
Other	45.6	1,360
Reason for switching		
Contraceptive failure	47.9	900
Wanted to have a baby	30.1	2,600
Health problems	76.8	2,375
Wanted better method	83.7	1,126
Husband's matters	28.2	312
Other	8.9	7,341
Duration of use at switching (months)		
1-12	51.2	4,235
13-24	36.4	2,391
25-36	31.3	1,970
37 +	17.6	6,057
Total	32.2	14,653

There are large variations in the percentage switching across contraceptive-related factors. Norplant users are the least likely to switch, followed by IUD, pill, injection and other contraceptive method users. Other contraceptive methods include condom, traditional and natural family planning methods. As one might

expect, those who wanted a better method and those who experienced health problems are the most likely to switch, followed by those who had experienced contraceptive failure, those who wanted to get pregnant and those who switched because of husband's views. The percentage of switching decreases as duration of use increases.

3.2 Multivariate Analysis of Contraceptive Switching Among Contraceptive Method Users

The results of the multivariate analysis on the probability of switching contraception among contraceptors show that of the characteristics given in Table 2, age at switching, age at the survey, number of living children at switching, region of residence, educational attainment, whether a woman reads a newspaper regularly, whether a woman watched television regularly, her husband's occupation, original method, reason for switching and duration of use of the original method are found to have a significant impact on switching. There is also strong evidence of an interaction between age at switching and method.

Table 3 displays parameter estimates and standard errors for the random-effects logistic model. The estimated random parameter σ in the random-effects logistic binomial is 0.78 with a standard error of 0.09. This value is very highly significant ($p < 0.001$), thus confirming the presence of significant individual woman variation in the risk of switching contraception.

The expectation that cohort would affect method switching is strongly supported. Those who were aged 15-24 and 25-34 at the survey are, respectively, 5.9 and 2.3 times less likely to switch than those who were aged 35-49. Negative health implications of the use of a contraceptive method for the older cohort of women might increase their likelihood of switching. They might also be more likely to switch to more effective methods in order to avoid the high costs associated with childbearing at an older age. The result shows (not displayed) an evidence of a high movement from short-term (pills, injections and other methods) to long-term methods of contraception (IUD, Norplant and sterilisation) as well as to other methods among older cohorts of women than among younger cohorts of women.

Contrary to expectation, women with no child and women with one child are found, respectively, to be 1.4 and 1.3 times less likely to switch than women with two or more children. Perhaps nulliparous women and women with one child continued to use temporary contraceptive methods in order to have children

while women with two children or more prefer to switch to a more-effective method in order to limit their births. This finding (not shown) confirms a higher continuation of the use of short-term methods of contraception among women with no or one child and a higher movement from short-term to long-term methods of contraception among women with two children or more.

The odds of switching are consistently higher for those living in Java and Bali and in Outer Java and Bali I. This finding reflects the pronounced regional differentials that are a major feature of Indonesian contraceptive use patterns.

The odds of switching contraceptive method for non-educated women are 0.7 times as great as for educated women. Reading a newspaper and watching television regularly significantly increase the risk of switching contraception by 27 and 38 percent respectively. This finding was expected because of the greater access to information about satisfactory alternatives to safe intercourse among educated women and among women who get knowledge through the mass media.

Husbands also play an important role in the decision to switch a contraceptive method. Those whose husbands were non-agriculture workers are 1.2 times more likely to switch than those whose husbands were agriculture workers or were unemployed. This result might be expected since these women might be better off and hence can afford to switch as much as they like until they find the most suitable method.

As expected, those who had used a contraceptive method for a year or less are 2.2 times more likely to switch than those who had used a contraceptive method for more than three years. This finding might be expected since short-term users might use a method for spacing births while long-term users might use the method for limiting births. The result shows (not given) that injections, condoms and traditional methods are the main methods used by those who had practised contraception for a year or less.

Table 3
PARAMETER ESTIMATES AND STANDARD ERRORS FOR THE
LOGISTIC BINOMIAL MODELS FOR CONTRACEPTIVE
METHOD SWITCHING, INDONESIA DHS, 1991

Parameter	Estimate	S.E.	N
Constant	2.62	0.47	14,180
Age at switching (in year)	-0.14	0.01	14,180
Age at the survey (in year)			
15-24	-1.78	0.16	2,493
25-34	-0.84	0.10	7,116
35+	0.00	-	4,571
Number of living children at switching			
None	-0.36	0.14	548
One	-0.24	0.07	3,875
Two or more	0.00	-	9,757
Region of residence			
Outer Java and Bali II	-0.36	0.06	5,491
Other	0.00	-	8,689
Educational attainment			
None	-0.31	0.09	1,838
Other	0.00	-	12,342
Read newspaper regularly			
Yes	0.24	0.06	5,093
No	0.00	-	9,087
Watched television regularly			
Yes	0.32	0.06	9,358
No	0.00	-	4,822
Husband's occupation			
Non-Agriculture	0.14	0.06	7,904
Other	0.00	-	6,276
Original method			
Pill	-0.88	0.37	4,810
IUD	-1.12	0.43	3,443
Injection	-1.76	0.39	3,959
Norplant	-3.98	1.31	320
Other	0.00	-	1,648

(continued)

Table 3 (continuation)

Parameter	Estimate	S.E.	N
Duration of use (in month)			
1-12	0.77	0.07	4,023
13-24	0.38	0.08	2,362
25-36	0.28	0.08	1,806
37+	0.00	-	5,989
Reason for switching			
Failure	1.61	0.09	895
Wanted to get pregnant	1.05	0.07	2,382
Health problems	3.24	0.07	2,164
Wanted better method	3.72	0.10	1,083
Husband's matters	1.03	0.16	290
Other	0.00	-	7,366
Interaction			
Age. Original method			
Age. Pill	0.02	0.01 *	-
Age. IUD	0.01	0.01 *	-
Age. Injection	0.05	0.01	-
Age. Norplant	0.08	0.04	-
Age. Other	0.00	-	-
Scale parameter σ	0.78	0.09	-

Note: - Groups with zero estimate are reference groups.

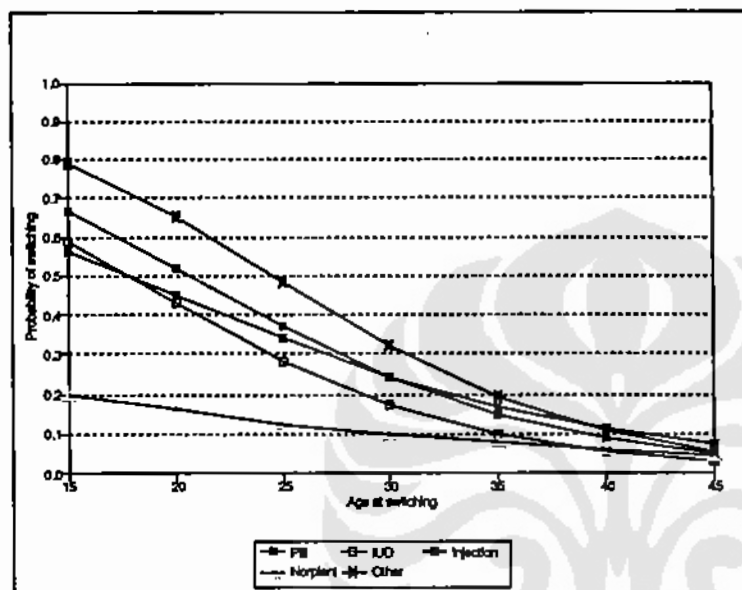
- * Not significant at $p = 5$ percent.

The reason for switching strongly influences the risk of switching. The odds of switching for a woman who wanted a better method are 41.3 times as great as they would have been if the woman switched for other reasons. If the woman switched because of health problems, failure, wishing to get pregnant and because of husband's views, the odds ratio is reduced to 25.5, 5.0, 2.9 and 2.8 respectively. This finding suggests that wanting a better method provides a powerful motivation to switch.

There is an interaction between age at switching and method switched on the risk of switching. For example, the effect of an increase of one year of age on the risk of switching is -0.14. Yet, if the method switched is the pill, the effect associated with an increase of one year of age is $(-0.14) + (-0.88) + 0.02 = -1.00$. Figure 1 presents the estimated probabilities of switching contraception for each method at selected ages at switching. The random effect has been set at zero, while other variables have been set at their baseline values.

The expected negative relationship between the risks of switching and age is observed for all methods of contraception. However, there is no significant difference in the pattern of switching between pill and IUD users and other method users. As one might expect, Norplant users are the least likely to switch, followed by IUD, injection, pill and other method users. This may be because most Norplant users had two or more children and so were using contraception to limit childbearing and also because Norplant tends to be difficult to remove.

Figure 1
ESTIMATED PROBABILITIES OF SWITCHING
BY AGE AND METHOD



The presence of a significant random woman effect means that the probability of switching contraception for women with the same characteristics varies and the random effect controls for variation due to unobserved factors. There may be behavioural factors which may play an important role in the risk of switching between individual women but perhaps these have not been observed or cannot be measured. The random effect could be considered as a measure of the degree of satisfaction and/or physical adjustment with which a woman uses contraception. Satisfied users would be less likely to switch a contraceptive method, while those who are less satisfied may experience difficulties with use and hence would be more likely to switch to another contraceptive method.

The approach proposed by Curtis et al. (1993) is used to examine the implications of this variability across women. Table 4 shows the probability of switching contraception by socioeconomic, demographic and contraceptive-related characteristics. Age at switching has been set at its mean, 30.2 years, and the remaining covariates have been set to their baseline values. A considerable amount of variation across women in the probability of switching a method of contraception with the same characteristics is observed. For example, the probability of switching for women with no child ranges from 0.04, if the random woman effect is two standard deviations below the mean, to 0.50 for a similar use for which the random woman effect is two standard deviations above the mean.

It can be seen that the ranges of the probability of switching between categories within a characteristic overlap. For example, it is possible that the probability of switching for a woman with no children, but with an above-average risk of switching, would be higher than for a woman with two children or more with a below-average risk. However, for a specific fixed value of ν_j , the probability of switching is as expected. For example, the probability of switching for women aged 35 or over is consistently higher than for women aged 15-24. It is also consistently high among women with two children or more, those living in Java and Bali and in Outer Java and Bali I, educated women, those who read a newspaper regularly, those who watched television regularly, those whose husbands were non-agriculture workers, those who had used a method for a year or less, those who used an "other" method (condom, natural and traditional methods) and among those who switched because they wanted a better method than among other women.

Table 4
ESTIMATED PROBABILITIES OF SWITCHING CONTRACEPTION
BY SOCIOECONOMIC, DEMOGRAPHIC AND CONTRACEPTIVE-RELATED
CHARACTERISTICS FOR DIFFERENT VALUES OF THE RANDOM WOMAN EFFECT
INDONESIA DHS, 1991

Characteristics	Woman Effect, v_j				
	-2	-1	0	+1	+2
Age at the survey (in year)					
15-24	0.02	0.04	0.09	0.18	0.32
25-34	0.05	0.10	0.20	0.36	0.55
35+	0.11	0.21	0.37	0.56	0.74
Number of living children at switching					
None	0.04	0.09	0.17	0.32	0.50
One	0.05	0.10	0.19	0.34	0.53
Two or more	0.06	0.12	0.23	0.40	0.59
Region of residence					
Outer Java and Bali II	0.05	0.09	0.18	0.33	0.52
Other	0.06	0.13	0.24	0.41	0.61
Educational attainment					
None	0.04	0.09	0.18	0.32	0.51
Other	0.06	0.12	0.23	0.39	0.58
Read newspaper regularly					
Yes	0.06	0.13	0.25	0.42	0.61
No	0.05	0.11	0.21	0.36	0.55
Watched television regularly					
Yes	0.06	0.13	0.24	0.41	0.60
No	0.05	0.09	0.19	0.33	0.52
Husband's occupation					
Non-Agriculture	0.06	0.12	0.23	0.40	0.59
Other	0.05	0.11	0.21	0.36	0.55
Original method					
Pill	0.06	0.12	0.24	0.41	0.60
IUD	0.04	0.08	0.17	0.31	0.49
Injection	0.06	0.13	0.24	0.41	0.60
Norplant	0.02	0.05	0.10	0.19	0.34
Other	0.09	0.17	0.32	0.50	0.69

(continued)

Table 4 (continuation)

Characteristics	Woman Effect, v_j				
	-2	-1	0	+1	+2
Duration of use (in months)					
1-12	0.08	0.17	0.31	0.49	0.68
13-24	0.06	0.12	0.23	0.40	0.59
25-36	0.05	0.11	0.21	0.37	0.56
37+	0.04	0.09	0.17	0.31	0.49
Reason for switching					
Failure	0.09	0.18	0.32	0.51	0.70
Wanted to get pregnant	0.05	0.11	0.22	0.38	0.57
Health problems	0.34	0.53	0.71	0.84	0.92
Wanted better method	0.45	0.64	0.80	0.90	0.95
Husband's matters	0.05	0.11	0.21	0.37	0.56
Other	0.02	0.04	0.09	0.17	0.31

4. Summary

The analysis in the previous sections have shown that socioeconomic, demographic and contraceptive-related characteristics all contribute to the differentials in switching among Indonesian women. In addition, these factors vary by the type of contraceptive method switched as well as the reason for switching. Furthermore, for certain contraceptive methods, the unobserved individual women effect is present.

The findings show that the probability of switching contraception is lowest among older women, implying the stability in using contraception. It is higher among women who had more children. Hence, those who have more children should be encouraged continuously to adopt the most effective methods in order to reduce the possibility of unintended pregnancies during switching.

The probability of switching contraception is lower among those who had no education, did not have regular access to the mass media, lived in Outer Java and Bali and were married to agricultural workers. This does not mean that these women were happy with the method they were using but perhaps they did not have access to alternative methods which were suitable for them. This is confirmed by the findings (not shown) that these woman are also more likely to switch to no method after having health problems. Hence, these findings recommend the NFPCB to continue providing alternative methods for these

women to enable them to move around methods of contraception until they find the most suitable method for them.

Wanting a better method (easy to get, more effective, convenient and reasonable price) and having health problems are two main reasons which motivate users to switch a method. Hence, the NFPCB should continue to improve the methods of contraception which are effective, suitable both in term of health and cultural values, and affordable.

References

- Badan Koordinasi Keluarga Berencana Nasional (National Family Planning Coordinating Board). 1992. *Informasi Dasar Gerakan KB Nasional* (Basic Information of the National Family Planning Movement). Jakarta.
- Curtis, S.L., Diamond, I. & McDonald, J.W. 1993. "Birth Interval and Family Effects on Postneonatal Mortality in Brazil". *Demography*, Vol. 30 1: 33-43.
- Grady, W.R. Hayward, M.D., Billy, J.O.G. & Florey, F.A. 1989. "Contraceptive Switching Among Currently Married Women in the United States". In: *Dynamics of Contraceptive Use*. Edited by A.O. Tsui and M.A. Herbertson. Parkes Foundation, Cambridge.
- Madise, N.J. 1993. "Birth Spacing in Malaŵi and Its Impact on Under Five Mortality". Unpublished PhD. Thesis. Department of Social Statistics, University of Southampton, United Kingdom.
- Steele, F.A. 1993. "The Determinants of Sterilisation and the Duration of Contraceptive Use in China". Unpublished MSc Thesis. Department of Social Statistics, University of Southampton, United Kingdom.
- Steele, F.A. Wang, D. & Diamond I. 1994. "The Determinants of the Duration of Contraceptive Use in China: An Illustrative Analysis of Multinomial Multilevel Discrete Hazards Modelling: A Post-Modernist Perspective". Working Paper. Department of Social Statistics, University of Southampton, United Kingdom.
- Goldstein, H. 1991. "Nonlinear Multilevel Models, with an Application to Discrete Response Data". *Biometrika*, Vol.78 1:45-51.

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