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CONTRACEPTIVE PREVALENCE SURVEYS

FURTHER ANALYSIS REPORT

FACTORS AFFECTING CONTRACEPTIVE USE AMONG HIGH-RISK WOMEN IN KOREA

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Chai Bin Park
East-West Population Institute
East-West Center
and
School of Public Health
University of Hawaii Honolulu, Hawaii, U.S.A.

Heesoon Hahm Lee
Survey Statistics Section
Korea Institute for Population and Health, Seoul, Korea

and

Nam-Hoon Cho
Family Planning Research Section
Korea Institute for Population and Health, Seoul, Korea

Westinghouse Health Systems
Post Office Box 866
Columbia, Maryland 21044
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ABSTRACT

This paper investigates the causal relationship between the current use of contraceptives and certain explanatory variables of Korean women who are highly exposed to the risk of unwanted pregnancy using the 1979 Korean Contraceptive Prevalence Survey (KCPS) data. The explanatory variables selected are age of woman, previous experience of abortion, number of living children, whether the last pregnancy was wanted, education of woman, and number of contraceptive sources known to woman. Residential areas (urban-rural) and types of contraceptive methods being used are treated as control variables. The causal structure is simpler in the rural areas than in the urban areas. Reversible methods take a simpler causal structure than permanent methods. Education is by far the most important factor across the methods and residential areas. In the urban areas the experience of abortion also stands out as a significant factor, while in the rural areas so does the number of living children.

In 1962 when the government of the Republic of Korea sanctioned the family planning program, it was estimated that less than 5 percent of eligible women were using contraceptives (Han, 1970). Since then, the contraceptive use has steadily risen. In 1971, 25 percent of the currently married women of 15-44 years of age used contraceptives; in 1976, 44 percent; and in 1979, over 54 percent (Koh et al., 1980). By 1982, the year of the most recent national survey, the contraceptive prevalence stood at more than 57 percent, with 47 percent practicing reliable methods and an additional 10 percent practicing less reliable methods (Cho and Chang, 1982).

There are, however, considerable differentials in contraceptive practice levels by socioeconomic and other characteristics of couples and by geographic regions in which they live. Program variables, including availability of family planning services, also may play a key role for acceptance of contraception, as asserted by Ravenholt and Chao (1974), for instance. Many of these supply and demand factors of contraception are, of course, correlated with each other and their joint effects on contraceptive use appear to be complicated.

The report of the Korean Contraceptive Prevalence Survey (KCPS) of 1979 indicates that the use of contraceptives is slightly greater in the urban areas than in the rural areas (55.1 percent versus 53.6 percent). This urban-rural differential is strikingly large, however, among women of young ages or among those with a small number of children; the difference sometimes is more than 10 points. When the educational attainment of women is controlled, not only does the urban superiority often disappear, but there are occasions when the rural prevalence exceeds the urban (Koh et al., 1980).

Multivariate analyses are increasingly being applied in the studies of factors influencing contraceptive use, especially since the World Fertility Survey began to supply a wealth of information regarding reproductive behavior (Immerwahr, 1981; Freedman et al., 1981; Naipeng and Abdurahman, 1981; Soeradji and Hatmadji, 1982; Tsui et al., 1981; Tsui, 1982; Pebley and Brackett, 1982). The recent series of contraceptive prevalence surveys also have begun to produce similar studies (Nair et al., 1982; Entwisle et al., 1982). Although some of these include contraceptive availability as one of the independent variables (Tsui et al., 1981; Tsui, 1982; Pebley and Brackett, 1982; Entwisle et al., 1982), it seems to have been a general procedure to treat only demographic and socioeconomic variables as factors.

Methodologically, many of the studies used the technique of multiple classification analysis (MCA), which was developed for interval measurement data as the dependent variable under the assumption of no interaction between the independent variables (Andrews et al., 1973). There are causal analysis (UN, 1979; Nair et al., 1982) applying path models that are also theoretically appropriate for continuous normal variables. As obvious, contraceptive use is a dichotomous data and many of the independent variables are associated with each other. Perhaps, because of this situation, more recent studies have applied the log-linear models (Tsui et al., 1981; Pebly and Brackett, 1982) and logit models (Entwisle et al., 1982) as the analytical techniques.

It seems that few studies in Korea have used multivariate analysis for factors of contraceptive use. H.J. Park and his associates (1974) examined several demographic and behavioral variables and emphasized the role of communication and attitude of spouse and relatives in the adoption process of family planning. Their sample is limited to the rural areas in which a demonstration health center is located.

This paper intends to evaluate the effects of various factors simultaneously, including availability of contraceptives, on the use of contraception by analyzing data of one of the most recent surveys in Korea. The survey was designed specially to measure contraceptive prevalence. The main analytical technique employed is the log-linear model, exploring the possible causal relationship between contraceptive use and the independent variables selected.

Material and Methods

The material for the present study was supplied by the 1979 KCPS. This survey was developed jointly by the Westinghouse Health Systems and the Korean Institute for Family Planning (KIFP). Although the questionnaire borrowed heavily from the model designed by the Westinghouse Health Systems to collect contraceptive prevalence and other information to family planning program management as part of a large international survey effort, it was modified to reflect the unique situation and specific data needs of Korea (Koh et al., 1980). The interview was carried out by trained interviewers to provincially representative samples of ever-married women 15-49 years of age. In addition, household interviews were conducted. This study was based on individual questionnaires that included about 14,000 women. The sample design, field operation, and data processing were primarily the responsibility of KIFP (for details of the survey, see Koh et al., 1980).

Since the initiation of the national family planning program in Korea, there have been frequent large-scale surveys on fertility and family planning. Between 1964 and 1979, the KIFP undertook 11 surveys with nationally representative samples, including one affiliated with the World Fertility Survey in 1974. (In the meantime, the KIFP has undergone several organizational changes to expand its activities. It first started as the Family Planning Evaluation Team of the Ministry of Health and Social Affairs, and recently was reorganized as the Korea Institute for Population and Health.) Thus, the KIFP has years of experience on fertility and family planning surveys, and the quality of survey data is generally reputed highly.

In this study, the current use of contraception, rather than ever-use, was treated as the response variable. The KCPS listed nine individual methods of contraception. (In addition, abortion was mentioned in the survey but is not included as a method of contraception in this paper.) Depending on their nature, the methods of contraception were reclassified into several groups. The <u>government methods use</u> in this paper means the use of those offered by the government regardless of the source of procurement; that is, oral pills, condom, IUD, and female and male sterilizations. Of these, the use of pills, condom, and IUD was grouped together as the <u>reversible methods use</u>. Female and male sterilizations formed the <u>permanent</u>

methods use. Other methods—such as injectables, vaginal, and rhythm method—were included in all methods use.

Six variables were chosen as the explanatory variables for the use of contraceptives. They are: Age of woman--AGE--(A), previous experience of abortion—ABORT--(B), number of living children--CHILD--(C), whether the last pregnancy was wanted—DESIR--(D), educational level of woman--EDUC--(E), and number of contraceptive sources known to the client--AVAIL--(F), as a measurement of perceived availability of contraception. Although availability of contraceptives was often measured in terms of the number of contraceptive sources known to the respondent (Morris et al., 1981), for the contraceptive users the source of the particular method currently used was not counted. This operational arrangement was taken from the following argument: In a survey such as KCPS, it cannot be discerned whether a client has accepted a method because its source was made known to her or she has "discovered" the source because she was so well motivated that she actively sought it out. In the latter case, the source may be considered as a measurement of demand rather than that of availability. In addition, current residence of woman (urban or rural) was treated as a control variable. In this study, all of these variables were considered to be dichotomous. A summary of the variables and their categories are shown in Table 1.*

Although information on these variables was obtained for all ever-married women 15-49 years of life, certain restrictions were imposed to select the subjects in this study. To conform to the KCPS report (Koh et al., 1980) and other similar national reports in Korea,

*Tables are presented on pages 27 to 39.

we first limited the age group to 15-44 years only. All nulliparous women were also excluded, because one of the explanatory variables selected was the desirability of the last pregnancy. Further, because illegitimate births are rare in Korea, only currently married women were subjected to the analysis. Out of some 14,000 women interviewed, 11,230 women, or about 80 percent, met these conditions. The contraceptive use rate for this group was 58.5 percent for the urban areas and 55.7 percent for the rural areas as against 55.1 and 53.6 percent, respectively, for all women in this age category.

However, not all the currently married women are the objects of contraception. If contraception is used to prevent unwanted pregnancy, women who are not exposed to such risk may be excluded from a study of contraceptive determinants. We thus formed the following five groups of nonusers depending on their degree of risk:

Group	Description
1	All currently married women
2	Group 1 less currently pregnant women
3	Group 2 less those who want additional children as soon as possible
4	Group 2 less those who want to bear more children in the future
5	Group 3 less those who are not living with their husbands and those in post-partum and in a self-identified menopausal or sterile state

Among these only Group 5 (high-risk women) were subjected to detailed analysis together with the users. The seven-way classification of these high-risk women by residential areas is shown in the Appendix. As all the variables in our data are qualitative variables, each with dichotomous categories, the log-linear model was applied in establishing the possible relationships among them (Bishop et al., 1975; Haberman, 1978). The model assumes that the cell frequency of a cross-classified table is expressed in a multiplicative form of main effects and interactions. Then the logarithm of the expected cell frequency may be written as an additive function of parameters in manner similar to the usual analysis of variance model.

For instance, if n_{ijk} denotes the observed frequency in the (ijk)th cell of a three-way table pertaining to three categorical variables, A, B, and C, the log-linear model for the expected frequency of the corresponding cell m_{ijk} may be written as:

$$\log_e m_{ijk} = u + u_i^A + u_j^B + u_k^C + u_{ij}^{AB} + u_{ik}^{AC} + u_{jk}^{BC} + u_{ijk}^{ABC}$$

where u's are effects with superscripts indicating the variables to which the effects refer and subscripts showing the category of the variable to which they apply. Because these effects are measured as the deviation from the overall mean effect u, the following constraints, as in the analysis of variance, must be satisfied:

$$\Sigma_i u_i^A = \Sigma_j u_j^B = \Sigma_k u_k^C = 0$$

$$\Sigma_i u_{ij}^{AB} = \Sigma_j u_{ij}^{AB} = \Sigma_i u_{ik}^{AC} = \Sigma_k u_{ik}^{AC} = \Sigma_j u_{jk}^{BC} = \Sigma_k u_{jk}^{BC} = 0$$

$$\Sigma_i u_{ijk}^{ABC} = \Sigma_j u_{ijk}^{ABC} = \Sigma_k u_{ijk}^{ABC} = 0.$$

The log-linear model written above is the saturated model because it contains all possible effects, making the observed frequency equal to the expected frequency, $n = m$. By setting specified effects equal to zero, the log-linear analysis can select the most parsimonious model that fits the data. The goodness-of-fit is examined by the likelihood ratio chi-square statistic G^2, which takes the following form:

$$G^2 = 2\Sigma\,(n_i \log_e n_i/m_i).$$

When a particular model is chosen, the μ's present in the model will represent the magnitudes of corresponding main effects and interactions.

The log-linear analysis provides structural relationship among the variables in the cross-classification data. When a variable in the data is regarded as the response variable, the log-linear model is equivalent to the logistic model (Bishop, 1969). Operationally, a log-linear model, whose interactions involving the response variable conditioning on the explanatory variables (Cox, 1970; Fienberg, 1980), is the logistic model. The best-fit model was selected by the stepwise procedure as suggested by Goodman (1971), examining the difference in G^2 between two logistic models as the test of the effects not included in one of the two models.

In this study, analysis was conducted for urban and rural areas separately. In each area the log-linear model was applied to the observed aggregates. Although it is realized that a weighting system was used to derive national estimates of users, technical restriction of log-linear model prescribed the use of aggregates. If there are drastic differences in the interprovince causal structure, our finding may be seriously limited, accordingly. The examination of the KCPS report (Koh et al., 1980) seems, however, to indicate such differences are not large.

Results

Table 2 presents the results of fitting log-linear models to k-factor marginals, for each group of risk-status woman, under the condition that all k+l and higher factors interactions are zero. These results provide a clue for selecting an appropriate model for the data. For instance, if the chi-square statistic for two-factor marginals is significant and that for three-factor is nonsignificant, a model appropriate for the data will include two-factor interactions but not all three-factor interactions.

An inspection of the results seems to indicate that the structural relationship among the seven variables is similar and complicated in the first four groups. Although it tends to become simpler as the risk status moves from 1 to 4, the degree of change in the structural relationship is only slight. For the urban data, models lower than four-factor marginals and for the rural those lower than three-factor marginals are all significant. Of course, a complicated variable relationship indicated by high-order interactions makes the interpretation of analysis results difficult.

The structure of the variables in high-risk women (Group 5) appears to be distinctly different from others. There is a sudden improvement in the structure between Group 4 and Group 5. Although a systematic simplification in the structural relationship is expected with the advancement of risk status because of the reduction in the diversity of the population, the sudden improvement is noteworthy. According to Table 2, the most parsimonious log-linear model that appropriately fits the urban data should contain a mix of two-factor and three-factor interactions, while that which fits the rural data should require only main effects and some two-factor interactions.

There were 1,028 nonusers in Group 5, representing a user rate over 85 percent. Table 3 presents the contraceptive user rates for high-risk women by category of the explanatory variables. In both residential areas, the differences between the high and low categories are not significant for two factors: AGE and AVAIL. However, a different pattern seems to exist between urban and rural areas. EDUC is the only common significant factor in both areas. Among the urban women, depending on desiredness of the last pregnancy and previous experience of abortion, the proportion of users is significantly different. On the other hand, among the rural women, instead of these variables, CHILD produces differentials. It should also be pointed out that because of the relatively large sample size, even a difference of less that 3 percent (84.5 versus 87.3 percent for the desiredness of the last pregnancy), in one case has shown a highly statistical significance.

The importance of factors in the log-linear model was tested by means of chi-square contributions of partial and marginal associations (Brown, 1976). The numerical values of such contributions for all two- and three-factor interactions involving the response variable (X) are shown in Table 4 by urban-rural areas and by contraceptive methods. For two-factor interactions only, the contributions of effects not involving the response variable are also given in the table to show the strength of associations between specified factors. As all the variables are dichotomous, the degree of freedom of each effect is one.

The factor EDUC presents very large chi-square contributions in both areas for the use of any specified type of methods (EX). In the urban areas, the factor ABORT also shows fairly large contributions except for the reversible methods use. Factor AGE is strong for permanent methods use. In the rural areas, CHILD appears to be a strong factor, while the role of ABORT appears nil. The performances of AGE and AVAIL are similar as in the urban areas, the former being a strong factor for permanent methods use and the latter for all methods use. Among the factors, extraordinarily strong associations are noted between B and D, A and C, and C and E. There are also fairly strong associations between A and B, A and D, and C and D. In addition, D and E, and E and F show strong associations in the urban areas, while B and F show strong associations in the rural areas.

It appears, in general, that contraceptive use is little affected by joint effects of two factors. In the urban areas, however, the combined effect of CHILD and DESIR (CDX) and that of CHILD and AVAIL (CFX) may be fairly strong. For the permanent methods use only, the joint influence of AGE (A) and CHILD (C) appears to be strong. There is some indication that this particular effect is operating similarly in the rural areas too.

Table 5 lists the log-linear models judged to fit appropriately for the use of each type of contraceptive methods. Following the usual notation, the letter in brackets represents the variable label that significantly affects the use of contraceptives. Thus, for instance, factors significantly affecting the use of all methods in the urban areas are ABORT (B), CHILD (C), EDUC (E), and AVAIL (F). In Table 5, notice that the interaction term among the factors [ABCDE] is omitted in the description of models that fit. This is done so, as this interaction term among all the explanatory variables is included as the conditioning for the log-linear models involving causal analysis.

As all the models shown in Table 5 agree with the data so well ($P \geq 0.40$ in the urban areas and $P \geq 0.65$ in the rural areas), it may be tempting to consider further deletion of effects. Although we did consider further parsimonious models than the ones shown in Table 5, the efforts were fruitless. The difference in G^2 value resulting from the elimination of any effect is generally highly significant and the models so obtained present sharp reductions in P value from those of the earlier ones. Nevertheless, we have listed multiple models for certain methods in case the significance in G^2 between two log-linear models is moderate and the overall P value is still large for the simpler model.

For instance, consider the permanent methods in the urban areas. The overall P value indicates that the fit of model [AX] [BX] [CX] [EX] is excellent. By deletion of the least significant effect [CX], however, G^2 increases by 4.26 which is significant for one degree of freedom only at 5 percent. Thus, the difference in G^2 is moderate, yet the fit of the new model [AX] [BX] [EX] is still very good ($P = 0.42$). Under the circumstances, we have decided to list both models.

Table 5 also suggests that the factors influencing the prevalence of contraceptive use operate independently; there are no interactions between explanatory variables. The models in the rural areas are so much simpler than those in the urban areas--less factors are involved and the fit is better. Far more factors are required in the use of permanent methods than reversible methods, indicating that more complicated decision-making process is required for the adoption of the former method. The use of government methods appears to involve relatively small factors.

Let us now examine each factor.

Education of Woman (E)—This factor appears to be by far the most important one in contraceptive use; it appears in the best fit model for every method in each area. In the use of reversible methods, it is the only significant determinant. As will be seen later, it also has the largest magnitude of effects among the factors involved.

Age of Woman (A)—In contrast to our expectation, this is not usually a significant determinant. Its effect appears in the model selected only in the use of permanent methods in the urban areas.

Experience of Abortion (B)—The influence of this factor demonstrates a different pattern depending on geographical area. In the urban areas it is a significant determinant in every method except for reversible methods, but in the rural areas its effect does not appear in the use of any group of methods. This finding may be in agreement with the reports that abortion is more widely practiced in the urban areas (e.g., Hong and Watson, 1976). It also appears that the experience of abortion makes women seek a more radical procedure of contraception.

Number of Living Children (C)—Contrary to ABORT, while this factor is an important determinant in the use of every type of methods in the rural areas (together with EDUC), it fails to be a significant factor in the urban areas.

Desiredness of the Last Pregnancy (D)--Table 5 suggests that this factor is one of the least important among the six explanatory variables. It appears only once in the model for the permanent methods use in the rural areas. This finding is rather surprising as it is against the usual expectation. Many Korean women may begin to use contraceptives before unwanted pregnancies take place. Also most unwanted pregnancies may be disposed by abortion. It should be stressed, however, that our data have in fact presented extremely strong associations between this factor and ABORT (B) regardless of geographical area and method, as shown in Table 4.

Availability of Contraceptives (F)--Although the number of contraceptive sources known to the client appears to matter in the use of all methods both in urban and rural areas, when a specific group of methods is given, the question of availability is no longer significant. This may be in part due to the fact that we have excluded the source of method currently being used. In a society where the overall user rate is fairly high and family planning is generally accepted as in Korea, the role of this variable may not be very important. As discussed later, the number of sources known may not really measure the perceived availability.

In Tables 6 to 9, the results of log-linear analysis for the use of contraceptives are shown giving the estimates of parameters involved. For cases where more than one model are shown in Table 5 for a particular group of methods, not all the models are provided with their parameter estimates. However, the general situation for the omitted ones may be easily inferred from other models in the table.

The log-linear parameters are notated by μ. The modifier of odds owing to the factor under consideration is obtained by the exponential of twice the log-linear effect, according to theory. An expected odds of contraceptive use may be computed by the use of these log-linear parameters or modifiers of odds, as shown below.

For instance, in the model of all methods in the urban areas, the estimate of the log-linear effect of ABORT (B) is 0.084. Then the odds of using contraceptives will be modified by a factor exp(2 x 0.084) = 1.184 by the previous experience of abortion. Similarly, the modifiers owing to CHILD (C), EDUC (E), and AVAIL (F) are 0.884, 0.717, and 0.817, respectively. Note that these are the values for the lower categories of the factors. As such, the modifier for the upper category is the reciprocal of the corresponding modifier for the lower class. Since the odds for the overall user are 4.575, the expected odds of contraceptive use, say, for an urban woman with no experience of abortion, large number of children, low education, and high availability are $(4.575)\ (1.184)^{-1}\ (0.884)^{-1}\ (0.717)\ (0.817)^{-1} = 3.84$, or $\exp(2\ (0.760 - 0.084 + 0.062 - 0.166 + 0.101)) = 3.84$ to one.

Let us now examine the models selected for specified methods of contraception.

All Methods Use--As Table 6 shows, for the prevalence of all methods use, relatively large numbers of factors are operating--four factors in the urban areas and three, or possibly two, in the rural areas. The causal structure appears to be similar in both areas. EDUC, CHILD, and AVAIL are the common factors. In the urban areas, however, ABORT is the additional and important determinant. In the rural areas not only does ABORT fail to enter into the model but the one without factor AVAIL still fits the data quite satisfactorily. EDUC is the most important factor in both areas, but the magnitude of its effect relative to others is far more important in the urban areas than in the rural areas. In the latter area, however, the effects of the other two factors are only slightly weaker than that of education. The direction of a specified effect is in line with expectation, abortion being positive and other factors being negative.

Government Methods Use--A relatively simple causal structure is observed in the use of official methods, only ABORT and EDUC appearing as significant factors in the urban areas and so do CHILD and EDUC in the rural areas (Table 7). Since ABORT and CHILD present a strong association, as shown in Table 4, the underlying structure of factors in the two areas may be regarded as similar. While the degree of the effect of EDUC is about the same in both areas, the effect of CHILD in the rural areas is very much stronger in comparison with that of ABORT in the urban areas.

Reversible Methods Use--For the use of reversible methods, a simple structure appears to be operating (Table 8). In the urban areas only EDUC matters. In the rural areas, although there may be several appropriate causal models, none of these is a complicated one. Both EDUC and CHILD may be considered to operate alone or jointly. The effects of these variables are not large. In fact, from the viewpoint of overall chi-square value alone, it may be even considered that none of the six explanatory variables are significant. If this last model is accepted, we encounter a difficult situation to interpret. As the use of reversible methods is independent of these factors, it must be considered as a random event in this system of six independent variables.

Permanent Methods Use--In contrast to reversible methods, a fairly large number of factors are involved in the use of permanent methods (Table 9), suggesting complicated decision-making processes for acceptance of sterilization. In the urban areas three or four factors--AGE, ABORT, EDUC, and probably CHILD--are playing key roles, while in the rural areas two or three factors--CHILD, EDUC, and probably DESIR--are significant. As in other methods, EDUC exerts the strongest influence. Consistent with the nature of sterilization, significant factors involved--AGE and ABOR in the urban areas and CHILD in the rural areas--are considered more related to termination of pregnancy than spacing.

Conclusions and Discussion

This study has investigated the causal relationship between contraceptive use and six selected explanatory variables among the women highly exposed to unwanted pregnancies in Korea, using the 1979 Korean Contraceptive Prevalence Survey data. By applying log-linear models, we have attempted to identify the significant factors and to estimate the magnitude of the effect of each factor. Analysis was conducted for urban and rural areas separately and contraceptive methods were grouped into several categories.

The results seem to indicate that different factors are operating, depending on the methods of contraception. The causal structure is simple for reversible methods but it is rather complicated for permanent methods. Education of woman is by far the most important factor across the methods and residential areas. In addition to education, in the urban areas experience of abortion stands out as the determinant, while in the rural areas so does the number of living children. Each of these factors exerts the effect independently; there is no evidence of joint effects of the factors, at least when residential area is controlled.

There are two aspects to consider for the apparent differences in the urban-rural causal structures. First, the latter appears to be simpler than the former. This aspect may reflect the relative complexity of urban life and urban dwellers in comparison with the rural. Second, as pointed out, abortion is a leading determinant in the urban areas but so is the number of living children in the rural areas. However, if abortion is considered as a popular urban practice to deal with excessive births, the underlying causal structure may be regarded similar between urban and rural areas.

In any case the variables identified as the significant determinants--such as education, abortions, or number of children--and the degree of their effects do not greatly differ from what was anticipated. What is surprising may be, however, in the variables excluded from the model. We expected desiredness of the last pregnancy (D) would to be a strong factor but, in effect, it appeared only once in the use of permanent methods in the rural areas. However, further scrutiny of the data being used has revealed that certain explanatory variables present extremely strong associations. Above all the strongest two-factor interaction is observed between ABORT and DESIR (BD). The chi-square contributions of partial and marginal associations for this particular combination frequently exceed 1,000 (for one degree of freedom) in either urban or rural areas (Table 4). CHILD and DESIR (CD) also show a very close association. Further, a highly significant three-factor interaction is noted for CHILD, ABORT, and DESIR (BCD). Thus, even if DESIR is not one of the determinants of contraceptive use by our statistical analysis, it nonetheless is closely related with the established determinants.

It may be said that there are two objectives for the use of contraception in terms of childbearing: termination and spacing. The general opinion of informed people in the Korean program is that most users, if not all, are the terminators, regardless of contraceptive methods. In fact, the 1978 survey has revealed that 92 percent of the contrceptive users are for fertility termination and only 6 percent are for spacing (Byun and Koh, 1979). By the nature of sterilization the permanent method users are obviously terminators, but the reversible method users may or may not be terminators. It is likely that characteristics and determinants of users are different depending on terminator or spacer.

Although we did not examine these two groups specifically, our data indicate that the pattern of factors is entirely different between the permanent and reversible methods users. For the permanent methods, factors--such as AGE, CHILD, and DESIR--that are indicative of termination dominate, while EDUC appears to be the only determinant operating for the reversible methods. Under the circumstances, a substantial portion of reversible methods can be spacers. On the other hand, if reversible method users are also essentially terminators, they may be more intelligent than permanent method users.

One aspect of contraceptive availability is measured by number of sources known to woman (Morris et al., 1981). If so, at least in Korea, availability seems to be only a weak factor of contraceptive use, contradicting earlier studies of Tsui et al., 1981, and Tsui, 1982. Some speculations may be advanced to this situation. In a society such as Korea, which has a vigorous program for a relatively long period of time and a fairly high general acceptance of family planning, the role of availability may not be important anymore. Number of sources known may reflect, to a substantial degree, the general level of social development including education. Indeed our data show a strong association between education and the number of known sources (EF), especially in the urban areas. Then some other measurement of availability may present a different situation from ours. A recent study seems to indicate that accessibility (time-to-source) has a greater effect on the use of supply methods than source knowledge in the rural areas (Cornelius and Novak, 1983). The weak relationship may be also to some extent attributable to the operational definition of availability adopted here--number of sources known for methods <u>other</u> than that currently used.

Each factor may be operating independently on the use of contraceptives, but there appear to be complicated interrelationships among the factors. We have already pointed out some unusually strong associations between pairwise factors with respect to ABORT (B), CHILD (C), and DESIR (D). There are several other strong associations, such as between CHILD and EDUC (CE), CHILD and AGE (CA), or EDUC and DESIR (DE). Furthermore, significant partial and marginal associations are frequently encountered for the following three-factor interactions: BCD, AEF, BDF, ABF, and ACE, though data are not shown here. Some of these may represent causal relationships.

Admittedly, there would be many other factors that affect contraceptive use. The Korea Institute for Population and Health (1982) cites family size norm and son preference as the major concerns in reducing fertility among other factors. When these other variables are included in the analysis, the finding can be quite different from the current one. When the effect of an explanatory variable is not linear, a change in the cut-off point for dichotomous categorization can result in difference findings. Though the log-linear model is a very powerful tool in analyzing multidimensional categorical data, the result is valid only for the data as presented. The data from a complex survey can be presented in vastly different ways by choosing different sets of variables. Conceptual framework for the causal relationship and selection of appropriate variables are then important tasks preceding analytical work.

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Table 1. Variables and their categories used in the present study

Label	Variable	Category
A	Age of woman (AGE)	A_1:15-29 yrs.; A_2:30-44 yrs.
B	Experience of abortion (ABORT)	B_1:yes; B_2:no
C	Number of living children (CHILD)	C_1:1-2; C_2:3+
D	Whether the last pregnancy was wanted (DESIR)	D_1:yes; D_2:no
E	Education of woman (EDUC)	E_1:primary school or less; E_2:middle school +
F	Number of contraceptive sources known (AVAIL)	F_1:0-2; F_2:3+
X	Current contraceptive use (response v.)	X_1:yes; X_2:no

Control variable: urban and rural

Table 2. Fit of log-linear models to k-factor marginals

k-factor	DF	Group 1		Group 2		Group 3		Group 4		Group 5	
		G^2	P	G^2	P	G^2	P	G^2	P	G^2	P
Urban											
1	120	7336.25	0.00	6427.54	0.00	5211.44	0.00	4133.88	0.00	3357.35	0.00
2	99	309.32	0.00	317.23	0.00	283.11	0.00	252.74	0.00	173.18	0.00
3	64	109.95	0.00	108.49	0.00	92.72	0.01	87.91	0.03	49.07	0.92
4	29	24.29	0.71	27.18	0.55	17.78	0.95	18.60	0.93	12.86	0.99
5	8	7.19	0.52	7.56	0.42	4.26	0.83	3.87	0.87	3.13	0.93
Rural											
1	120	5396.66	0.00	4749.93	0.00	3467.10	0.00	2629.22	0.00	2384.02	0.00
2	99	156.87	0.00	156.80	0.00	144.58	0.00	127.40	0.03	93.62	0.63
3	64	48.67	0.92	43.02	0.98	42.55	0.98	38.45	0.99	40.06	0.99
4	29	9.95	1.00	8.47	1.00	9.58	1.00	9.46	1.00	5.57	1.00
5	8	1.79	0.99	1.91	0.98	2.05	0.98	2.89	0.94	1.96	0.98

Table 3. Contraceptive user rate for high-risk women (Group 5) by explanatory variable

Variable	Category	Entire Country N	Entire Country Rate	Urban N	Urban Rate
Total		7279	85.9	4369	86.2
No. of living children	1-2	2204	84.8	1728	85.5
	3+	5075	86.4	2641	86.6
Education	≤Primary	4193	83.0***	1848	81.8***
	≥Secondary	3086	89.7	2521	89.4
Desiredness of last pregnancy	Wanted	2987	85.2	1737	84.5***
	Not wanted	4292	86.3	2632	87.3
Age	15-29	1330	83.8*	918	84.4
	30-44	5949	86.4	3451	86.6
Experience of abortion	Yes	4390	86.8***	2907	87.6***
	No	2889	84.4	1462	83.3
Availability	0-2	233	83.2	149	82.6
	3+	6018	86.0	4220	86.3

*p < = 0.05
**p < = 0.01
***p < = 0.001

Table 4. Chi-square contributions of two- and three-factor effects by contraceptive methods, KCPS

(1) Urban Area

Effect	All Methods		Gov. Methods		Reversible Methods		Permanent Methods	
	Partial	Marginal	Partial	Marginal	Partial	Marginal	Partial	Marginal
AX	2.08	5.40	1.55	3.47	3.15	4.13	14.91*	24.47*
BX	2.84	16.68*	4.56	10.19	0.55	2.46	7.18	13.05*
CX	3.04	1.57	2.19	0.55	0.25	2.88	4.61	7.52
DX	0182	7.34	0.05	3.21	2.23	2.07	0.57	2.46
EX	55.32*	50.20*	48.21*	44.99*	29.83*	32.80*	48.12*	42.22*
FX	4.86	10.51	1.28	4.57	0.25	1.72	0.12	2.07
AB	8.67*	100.59*	12.41*	96.79*	12.54*	62.70*	2.51	52.82*
AC	719.89*	856.71*	564.39*	674.81*	392.38*	481.95*	254.35*	317.93*
AD	30.31*	183.51*	31.47*	170.59*	13.41*	103.72*	25.96*	106.25*
AE	0.65	45.16*	0.57	36.91*	0.10	43.04*	0.24	8.06
AF	1.20	0.25	1.56	0.63	0.26	0.86	0.02	0.15
BC	0.90	52.30*	2.07	32.96*	3.10	19.13*	0.21	27.63*
BD	1477.87*	1604.46*	1138.05*	1242.96*	584.13*	645.05*	745.80*	810.56*
BE	5.40	2.52	4.94	0.67	2.85	0.49	5.74	0.15
BF	12.18*	38.66*	12.17*	34.58*	5.41	15.31*	14.07*	32.24*
CD	36.11*	165.70*	27.71*	125.87*	19.51*	81.40*	23.09*	91.96*
CE	207.23*	267.99*	178.23*	228.84*	122.36*	178.29*	67.68*	83.39*
CF	0.00	1.11	0.00	1.57	2.16	5.18	0.39	0.75
DE	28.00*	47.09*	21.66*	34.77*	8.97	19.68*	25.03*	28.89*
DF	7.68	26.67*	6.13	22.08*	4.07	10.26	2.53	15.45*
EF	41.51*	43.62*	36.77*	39.09*	15.82*	19.65*	26.74*	27.59*
ABX	1.39	2.77	0.67	1.93	0.05	1.68	2.19	3.16
ACX	1.17	1.72	2.27	3.03	0.07	0.46	7.88	10.31
ADX	0.01	3.91	0.14	2.88	0.00	3.22	0.82	2.19
AEX	0.04	0.00	0.05	0.00	0.00	0.68	0.04	0.95
AFX	0.82	0.52	1.06	0.35	0.36	0.28	0.03	1.92
BCX	0.01	2.84	0.00	4.53	0.12	4.96	0.02	3.67
BDX	0.07	0.10	0.83	0.13	2.97	0.97	0.10	0.00
BEX	3.23	0.01	3.06	0.00	3.31	0.00	2.51	0.02
BFX	0.01	0.00	0.03	0.00	0.08	0.30	0.05	0.16
CDX	3.21	11.26*	3.65	13.32*	4.55	11.84*	2.59	12.13*
CEX	1.81	0.72	2.02	0.86	7.22	5.64	0.02	0.36
CFX	9.70	7.17	10.12	6.77	6.59	3.83	9.52	8.18

Table 4. (continued)

Effect	All Methods		Gov. Methods		Reversible Methods		Permanent Methods	
	Partial	Marginal	Partial	Marginal	Partial	Marginal	Partial	Marginal
DEX	4.75	3.14	5.50	4.07	6.68	4.53	3.79	2.87
DFS	0.13	0.69	0.25	0.43	0.03	0.14	0.82	0.47
EFX	0.81	0.53	0.56	0.44	1.02	0.20	0.57	0.50
(ii) Rural Area								
AX	3.76	8.39	1.35	4.12	0.20	1.55	4.07	7.01
BX	0.00	0.02	0.06	0.57	0.85	1.53	0.50	0.00
CX	7.74	9.21	8.10	7.53	5.05	4.35	10.36	9.08
DX	1.88	0.59	1.92	1.57	0.33	0.93	5.70	2.68
EX	19.76*	12.16*	15.90*	9.86	7.52	3.86	26.98*	18.65*
FX	6.45	6.48	3.38	3.04	1.18	0.91	0.99	1.32
AB	0.40	37.38*	0.55	27.86*	0.17	19.06*	1.14	23.13*
AC	470.14*	607.88*	405.44*	517.74*	339.38*	444.20*	133.37*	185.01*
AD	24.12	110.95*	14.42*	81.34*	9.24	62.00*	8.73*	43.89*
AE	5.54	75.49*	7.38	68.89*	8.61	72.11*	3.97	23.18*
AF	0.00	1.05	0.00	0.67	0.01	0.88	2.03	9.92
BC	0.08	11.76*	1.61	11.55*	2.11	13.43*	1.25	17.41*
BD	1195.35*	1240.19*	1028.93*	1063.23*	705.51*	726.03*	473.38*	504.76*
BE	5.93	0.47	5.43	0.18	12.22*	1.23	19.01*	3.27
BF	12.62*	32.67*	11.50*	27.25*	4.34	8.84	7.03	21.45*
CD	7.42	33.26*	14.53*	28.53*	18.10*	69.81*	17.21*	84.88*
CE	98.63*	169.54*	70.36*	132.65*	47.86*	111.62*	39.38*	55.93*
CF	0.03	0.75	0.02	0.62	0.10	1.08	1.35	8.18
DE	8.71	9.02	6.58	8.69	1.93	6.22	2.46	3.95
DF	5.01	21.60*	4.19	16.87*	0.84	5.16	1.57	16.74*
EF	0.35	0.57	0.01	0.04	0.93	1.15	0.10	0.66
ABX	0.15	1.38	0.06	2.07	0.03	2.53	0.03	0.52
ACX	0.02	0.17	0.00	0.38	0.89	0.23	3.65	8.49
ADX	0.00	1.00	0.08	2.26	0.18	2.21	0.21	1.91
AEX	2.50	5.79	0.85	0.67	1.70	2.76	1.95	2.90
AFX	1.48	4.88	1.70	5.26	1.68	4.98	0.00	0.08
BCX	0.00	2.95	0.09	3.36	0.14	2.97	0.05	2.07
BDX	0.26	0.00	0.51	0.07	0.73	0.21	0.00	0.07
BEX	3.93	3.65	3.09	3.02	3.07	2.58	2.88	3.31
BFX	0.29	0.57	0.27	0.34	0.04	0.22	1.10	1.77
CDX	0.53	2.76	0.30	3.09	0.25	2.23	1.04	4.44
CEX	0.04	0.66	0.15	1.00	0.03	0.17	0.29	1.85
CFX	0.92	4.94	0.86	5.07	0.62	4.36	0.01	0.21

Table 4. (continued)

Effect	All Methods		Gov. Methods		Reversible Methods		Permanent Methods	
	Partial	Marginal	Partial	Marginal	Partial	Marginal	Partial	Marginal
DEX	2.57	0.14	2.45	0.07	2.51	0.04	1.02	0.23
DFX	0.04	0.08	0.01	0.00	0.08	0.67	0.13	1.08
EFX	2.96	7.31	2.37	6.09	1.49	3.27	1.57	3.74

For variable label, see Table 1.

*p < 0.001

Table 5. Log-linear models selected for contraceptive use among high-risk women in Korea by method of contraception

Method	Model	DF	G^2	P
Urban				
All	[BX] [CX] [EX] [FX]	59	53.70	0.67
Government	[BX] [EX]	61	63.18	0.40
Reversible	[EX]	62	64.26	0.40
Permanent	[AX] [BX] [EX]	60	61.44	0.42
	[AX] [BX] [CX] [EX]	59	57.17	0.54
Rural				
All	[CX] [EX]	61	56.07	0.65
	[CX] [EX] [FX]	60	50.20	0.81
Government	[CX] [EX]	61	50.29	0.83
Reversible	[CX]	62	48.91	0.89
	[EX]	62	49.40	0.88
	[CX] [EX]	61	41.83	0.97
	[X]	63	53.27	0.80
Permanent	[CX] [EX]	61	48.37	0.88
	[CX] [EX] [DX]	60	43.81	0.94

Table 6. Estimates of the log-linear parameters of the models chosen for the use of all contraceptive methods among high-risk women in Korea.

Factor	$\underline{U}^a$	Odds modifier[b]
Urban		
Model:	[BX] [CX] [EX] [FX]	
Abortion (B)	0.084	1.184
No. of children (C)	-0.065	0.884
Education (E)	-0.166	0.717
Sources known (F)	-0.101	0.817
(Overall user)	0.760	4.575
Rural		
Model:	[CX] [EX] [FX]	
No. of children (C)	-0.135	0.764
Education (E)	-0.155	0.733
Sources known (F)	-0.123	0.781
(Overall user)	0.764	4.610
Model:	[CX] [EX]	
No. of children (C)	-0.137	0.760
Education (E)	-0.157	0.731
(Overall user)	0.871	5.712

[a] For the lower category. For the higher category, change the sign.

[b] For the lower category. For the higher category, multiply the reciprocal.

Table 7. Estimates of the log-linear parameters for the models chosen for the use of Government methods among high-risk women in Korea

Factor	U[a]	Odds modifier[b]
Urban		
	Model: [BX] [EX]	
Abortion (B)	0.075	1.162
Education (E)	-0.149	0.743
(Overall user)	0.750	4.482
Rural		
	Model: [CX] [EX]	
No. of children (C)	-0.124	0.780
Education (E)	-0.143	0.752
(Overall user)	0.761	4.584

[a]For the lower category. For the higher category, change the sign.

[b]For the lower category. For the higher category, multiply the reciprocal.

Table 8. Estimates of the log-linear parameters of the models chosen for the use of reversible methods among high-risk women in Korea.

Factor	U[a]	Odds modifier[b]
Urban		
	Model: [EX]	
Education (E)	-0.139	0.757
(Overall user)	0.349	2.008
Rural		
	Model: [CX]	
No. of children (C)	-0.071	0.867
(Overall user)	0.454	2.477
	Model: [EX]	
Education (E)	-0.074	0.863
(Overall user)	0.547	2.986
	Model: [X]	
(Overall user)	0.497	2.703

[a]For the lower category. For the higher category, change the sign.

[b]For the lower category. For the higher category, multiply the reciprocal.

Table 9. Estimates of the log-linear parameter of the models chosen for the use of permanent methods among high-risk women in Korea

Factor	U[a]	Odds Modifier[b]
Urban		
	Model: [AX] [BX] [CX] [EX]	
Age (A)	-0.121	0.785
Abortion (B)	0.069	1.149
No. of children (C)	-0.056	0.895
Education (E)	-0.172	0.709
(Overall user)	0.376	2.123
	Model: [AX] [BX] [EX]	
Age (A)	-0.145	0.748
Abortion (B)	0.073	1.156
Education (E)	-0.163	0.722
(Overall user)	0.374	2.111
Rural		
	Model: [CX] [EX]	
No. of children (C)	-0.165	0.719
Education (E)	-0.205	0.663
(Overall user)	0.295	1.806

[a] For the lower category. For the higher category, change the sign

[b] For the lower category. For the higher category, multiply the reciprocal.

Appendix: Number of women by contraceptive use (X), and by age (A), experience of abortion (B), number of children (C), whether the last pregnancy was wanted, (D), education (E), and contraceptive availability (F), KCPS

						X			
						Urban		Rural	
A	B	C	D	E	F	Yes	No	Yes	No
1	1	1	1	1	1	0	0	1	0
1	1	1	1	1	2	23	5	8	3
1	1	1	1	2	1	5	0	0	0
1	1	1	1	2	2	72	11	12	1
1	1	1	2	1	1	0	0	0	0
1	1	1	2	1	2	71	13	33	4
1	1	1	2	2	1	5	0	0	0
1	1	1	2	2	2	155	18	30	6
1	1	2	1	1	1	0	0	0	0
1	1	2	1	1	2	12	1	5	0
1	1	2	1	2	1	1	0	0	0
1	1	2	1	2	2	12	1	2	0
1	1	2	2	1	1	2	0	0	0
1	1	2	2	1	2	38	6	26	5
1	1	2	2	2	1	0	0	0	0
1	1	2	2	2	2	30	1	12	3
1	2	1	1	1	1	0	0	1	3
1	2	1	1	1	2	55	33	73	26
1	2	1	1	2	1	7	0	2	0
1	2	1	1	2	2	214	43	49	9
1	2	1	2	1	1	0	0	0	1
1	2	1	2	1	2	1	1	2	0
1	2	1	2	2	1	0	0	0	0
1	2	1	2	2	2	16	2	0	1
1	2	2	1	1	1	0	0	4	1
1	2	2	1	1	2	23	5	53	8
1	2	2	1	2	1	0	0	0	0
1	2	2	1	2	2	20	3	15	1

Appendix (continued)

						X			
						Urban		Rural	
A	B	C	D	E	F	Yes	No	Yes	No
1	2	2	2	1	1	0	0	0	0
1	2	2	2	1	2	8	0	9	1
1	2	2	2	2	1	0	0	0	0
1	2	2	2	2	2	5	0	2	0
2	1	1	1	1	1	5	0	0	0
2	1	1	1	1	2	25	5	4	1
2	1	1	1	2	1	2	0	0	0
2	1	1	1	2	2	88	15	9	1
2	1	1	2	1	1	3	0	0	0
2	1	1	2	1	2	108	28	36	10
2	1	1	2	2	1	2	0	0	0
2	1	1	2	2	2	352	28	38	3
2	1	2	1	1	1	7	2	2	0
2	1	2	1	1	2	95	11	89	13
2	1	2	1	2	1	0	0	0	0
2	1	2	1	2	2	136	17	28	1
2	1	2	2	1	1	23	6	21	5
2	1	2	2	1	2	639	127	753	156
2	1	2	2	2	1	1	0	3	0
2	1	2	2	2	2	635	65	153	6
2	2	1	1	1	1	13	1	5	1
2	2	1	1	1	2	57	18	44	9
2	2	1	1	2	1	6	0	1	1
2	2	1	1	2	2	159	30	30	3
2	2	1	2	1	1	0	0	0	0
2	2	1	2	1	2	5	0	9	1
2	2	1	2	2	1	0	0	0	0
2	2	1	2	2	2	28	0	4	1
2	2	2	1	1	1	17	9	50	6
2	2	2	1	1	2	170	32	488	78
2	2	2	1	2	1	11	4	4	1
2	2	2	1	2	2	233	23	98	6
2	2	2	2	1	1	12	4	15	2
2	2	2	2	1	2	100	29	239	41
2	2	2	2	2	1	1	0	1	0
2	2	2	2	2	2	57	7	23	5

For categories of variables A-F, see Table 1.