CORRELATES OF IUD TERMINATION IN A MASS FAMILY PLANNING PROGRAM
The First Taiwan IUD Follow-up Survey

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In the mass family planning programs found in an increasing number of developing countries more and more attention is being given to the problems of maintaining high levels of continuing use of contraception, once it is adopted. Previously, interest was concentrated on influencing large numbers of couples to begin contraception. Many of these programs have relied on the new intrauterine contraceptive device (IUD) as the principal method offered. The assumption usually made initially was that continuation rates would not be a great problem since the new devices theoretically could remain in place for years and required no recurrent decision for use. Only discontinuation required a decision.

It soon became apparent in Taiwan and elsewhere that, despite its many advantages, the IUD was not a perfect contraceptive and that many couples were terminating use. Only a very small proportion of terminations were due to pregnancies; a larger share resulted from involuntary expulsions, and the greatest proportion everywhere was the result of voluntary removals. Although some women discontinued use of the IUD to have a child, most voluntary removals were made at the request of the patients who complained of minor side effects such as excess bleeding, headaches and back-

aches. In the large majority of cases, these side effects were diagnosed as not serious from a medical point of view, and an unknown but substantial proportion were believed to be psychological. Whatever the physical basis of the complaint, the symptoms were very real to the women involved.

As the reality of a significant number of terminations has become clear in one country after another, attention has turned to developing methods to study rates and correlates of use and then to evaluate what happens to those who terminate use.

This article is believed to be the first to present the correlates of various kinds of terminations for a probability sample of all the acceptors of the intrauterine contraceptive devices in a large-scale, mass family planning program for the entire population of a large political unit.[1] It is also the first systematic report on the methods used for family limitation after couples terminate use of the IUD. The regular reports by Tietze on the Cooperative Statistical Program for Evaluation of the Intra-Uterine Device are uniquely important for clinical studies in the United States.[2] Also, a previous report has been made on the field program in the city of Taichung,[3] but that study is limited to one city with only about ten per cent of the IUD acceptances in all of Taiwan in March, 1965. Moreover, the Taichung study, although encompassing an entire city, has a clinical aspect, since it is under rather careful supervision by a medical staff with this specific assignment.

Korea has the only other national program to report life-table termination rates based on a probability sample survey of the field program, but rates by the characteristics of the couples are not yet available. The studies for other places recently reviewed by Mauldin, Nortman and Stephan[4] generally either are for a limited clinic or area or have not yet related termination rates to the characteristics of the couples or have both limitations.

The important, potential value of a sample representing all the cases in a program is that it can represent what is happening under the actual field conditions rather than under the more favorable conditions of the clinic or the easily accessible (but often over-studied and, therefore, contaminated) experimental area. Knowl-

edge of the correlates under field conditions may have important implications for the administrator in various ways. Insofar as this is true, one of the most important conclusions to be drawn from the wide variation in termination rates by the characteristics of the couples is that a single sample from a local area or clinic is unlikely to serve as a guide for a national program whose population and program may have different characteristics than that of the clinic or the local area. It will be all the more true, of course, that the results of studies in one country cannot easily be transferred to another. At present no easy substitute may be found for recurring probability samples of the whole population of women having IUD insertions. This report illustrates the results of one such study.

The Taiwan IUD follow-up studies began in the city of Tai-chung where all cases (rather than a sample) were followed and where each continuing case receives individual medical examina-tions at recurrent intervals. As the program expanded to all of Taiwan, such complete and intensive follow-ups became impracti-cal. A small-scale experiment in October, 1964, on the use of a non-medical follow-up interview of a sample of IUD cases appeared to be successful. Therefore, late in 1965, the first, annual, island-wide IUD follow-up survey was undertaken. A second survey late in 1966 was completed and coded by April, 1967. Since the results of this second survey, covering a longer time period and with a larger sample, are not yet available, the present report is limited in scope. It stresses comparisons with the more intensive Taichung city pro-gram and some characteristics not reported in previous studies.

THE DATA

The sample for the 1965 follow-up study was 2,000 cases, which were drawn as a probability sample of all the 71,016 acceptors of the IUD in Taiwan during the period from January, 1964, to March, 1965.[5] The sample was drawn from a complete file of "coupons" filled out by the physician at the time of insertion and submitted each month as the basis for the payments made to him. This means that the date of first insertion—a crucial fact—will be

substantially correct in all cases and will not depend on recall by the respondent in the follow-up interview. However, the date of termination is dependent on the respondent's memory. The questions asked in the survey may be classified into eight categories: 1. the circumstances of the insertions, 2. complaints after insertion, 3. removal, 4. expulsion, 5. history after termination, 6. pregnancies after the initial insertion, 7. other related questions about the use of the IUD, 8. questions about the background of the cases covering both social characteristics and previous reproductive behavior.

The interviews were carried out by about 60 part-time interviewers trained by the Taiwan Population Studies Center. Considerable field supervision and internal consistency checks were used to maintain the high quality of the field work.[6] The field work (from October through December, 1965) was carried out simultaneously with a province-wide survey on knowledge, attitudes and practices (KAP survey) with respect to fertility and contraception for a cross-section of married women of childbearing ages in the same sample areas as the IUD survey. The 173 IUD users found in the KAP survey were asked all the IUD survey questions too, and they have been included in the present analysis since they are an additional probability sample of IUD cases in the sample areas.

The present analysis is restricted mainly to only the first segment of IUD use, defined as running from the date of first insertion to the first termination event or to the date of the survey, if the device initially inserted was still in place. Although about 20 per cent of the women terminating use of the first device had at least one re-insertion, this later experience is not included in the present analysis.[7]

As is any other sample survey follow-up, this one may be somewhat in error because it depends on the users' reports of whether the IUD is still in place. These may be in error because unnoticed expulsions will not be reported and some women may not wish to report removals occurring outside of the program. However, this does not seem to be a serious problem in Taiwan. A subsample of the 1966 sample cases was examined by a doctor after the interview. The errors found in this comparison were too few to significantly affect total sample result. As far as possible, the results of the

Taiwan study will be compared with the Taichung results, in which the follow-up of IUD cases involved a clinical examination by an obstetrician.

The data are analyzed mainly by an adaptation of life-table methods familiar in mortality analysis. Here, however, instead of survival or mortality of persons, the survival (continued use) or mortality (termination of use) of the IUD is examined. The methodology is more exactly an adaptation of the multiple-decrement life-table, which takes various risks of mortality or termination into account. The multiple-decrement tables have been used to compute, for example, the probability that a newborn male will survive in the unmarried state to age 25. This depends on at least two sets of risks—the risk of dying before he reaches the age of 25, and the risk of being married if he survives to that age. Similarly, the method as applied here takes into account three different classes of events which may terminate the use of the IUD: pregnancy, expulsion and removal. These are competing risks in the sense that the occurrence of one event in any given time period precludes the occurrence of the other two for any specific woman.

Two types of rates will be used.[8] What Tietze has called "net rates" allow for the presence of competing risks. For example, a net cumulative rate of expulsion allows for, and is slightly reduced by, some women becoming pregnant or removing the device before they have had a chance to expel. Net cumulative rates are additive. The net rates of pregnancy, expulsion and removal add to the rate of termination for the three reasons combined. Because of this, net cumulative rates are most appropriate for studying the relative frequency of different types of termination in a single sample.

A problem arises, however, when one uses net cumulative rates for comparing the relative frequency of a particular type of termination, such as expulsion, in two different samples or subsamples. For example, suppose that in sample B the monthly rates of expulsion—that is, the probabilities of expelling during the first month, the second month and so on after insertion, among those retaining the device up to the beginning of that month—are lower in sample B than in A. Now, if the levels of competing risks are lower in B

than in A, then, fewer women in B are lost to pregnancy and removal and, therefore, they are exposed longer on the average to the risk of expulsion than in A. In this way sample B can show a higher net cumulative rate of expulsion despite its lower monthly rates of expulsion.

To handle this problem one may use what Tietze calls "gross rates." A gross cumulative rate is the idealized proportion of women that would have been observed to lose the device had it been possible to eliminate all competing risks to leave just one risk operative in the population, and if the monthly probabilities of this one risk were unaffected by the elimination of the competing risks. A gross cumulative rate is a pure function of the corresponding monthly rates and formally will be independent of the level of competing risks. Hence, in the example above, the gross cumulative rate of expulsion in sample B with its lower monthly rates of expulsion is necessarily also lower than in A. The resulting comparisons of A and B expulsion risks are consistent and more easily interpreted. Gross rates will be used in the sections dealing with differentials.

It is important to recognize that the cumulative life table termination rates, like those in a mortality life table, are synthetic constructions, based on merging the experience of different cohorts. The numbers of women shown in Tables 6 and 7, for example, are those contributing at least one month of experience. The number still wearing the device decreases with time after insertion. Thus, for some subgroups only a small number of women are left with the IUD in place at the end of 12 months. This, however, does not necessarily mean that such rates have a high sampling error, because they are built up from the individual monthly termination rates for months one through 12 based on the experience of larger numbers of women. The standard errors shown take into account the attrition in sample size over time.

The first three tables in the analysis dealing with the total sample present "net" termination rates for each cause, which allow for the presence of competing risks from each other cause. Most of the other tables showing the differentials by characteristics are

based on the "gross rates," which assume that the specific risk under review is the only risk of device loss. Table 5 shows the difference resulting from the use of net and gross rates.

SUBSTANTIVE RESULTS FOR THE TOTAL SAMPLES

The total termination rates were significantly higher in Taiwan as a whole than in Taichung, because pregnancy rates and removal rates were higher for Taiwan, although expulsion rates were lower. These results are shown in some detail in Tables 1–3. Table 2 shows the differences between the rates for the two studies and their standard errors at 12 months and 18 months. Table 3 shows the probabilities of termination from each cause during successive six-month intervals for those still in the first segment at the beginning of each six-month period. The excess of pregnancies in Taiwan as compared with Taichung is found only during the first six months. Two explanations seem plausible: 1. pregnancies at time of insertion might have been more difficult to detect under the field conditions of the general Taiwan program, less closely supervised than that of Taichung, and 2. more "accidental" pregnancies may be associated with an involuntary expulsion, because of the many fewer medical checks during the early months after insertion under the general Taiwan program than in the Taichung clinical program.

The major cause of the higher termination rate in the Taiwan sample clearly is the higher removal rate. At the end of 12 months removals accounted for 61 per cent of the Taiwan termination compared with 51 per cent of those in Taichung. That differential removal rates account almost entirely for the difference in total terminations is even clearer if the difference in the specific IUD devices used is considered. Almost all of the Taiwan sample cases involved Lippes loops No. 1 (25 mm.), while in the Taichung cases a considerable proportion of women used other devices. Table 4 compares the "gross" termination rates for the Taiwan sample with only those Taichung cases using Lippes Loop No. 1. With the method standardized in this way the difference in pregnancy rates

TABLE I. CUMULATIVE NET TERMINATION RATES PER IOO FIRST INSERTIONS BY TYPE OF TERMINATION*

Ordinal Month of Use	Pregnancy		Type of Termination Expulsion		Removal		Total Termination	
	FUI**	MS†	FUI	MS	FUI	MS	FUI	MS
1	.4	.2	1.7	2.5	5.4	3.5	7.6	6.2
3	1.4	1.0	4.8	5.7	10.4	6.8	16.6	13.4
6	3.2	2.3	6.7	8.6	15.4	10.9	25.3	21.8
12	5.0	4.5	9.7	12.2	23.2	17.7	37.9	34.4
18	6.4	6.5	11.3	13.9	30.3	23.2	47.9	43.6

* Sample size: FUI = 2,173; MS = 7,295
** Taiwan Island-Wide Follow-up Interview.
† Taichung Medical Study.

TABLE 2. CUMULATIVE NET TERMINATION RATER PER IOO FIRST INSERTIONS (AND THEIR STANDARD ERRORS), BY TYPE OF TERMINATION*

	Length of Time After First Insertion					
	12 Months				18 Months	
Type of Termination	FUI**	MS†	Diff.	FUI	MS	Diff.
Pregnancy	5.0(.5)	4.5(.3)	+0.5	6.4(.8)	6.5(.4)	− .1
Expulsion	9.7(.7)	12.2(.4)	−2.5	11.3(.9)	13.9(.5)	−2.6
Removal	23.2(1.0)	17.7(.5)	+5.5	30.3(1.6)	23.2(.6)	+7.1
Total termination	37.9(1.2)	34.4(.6)	+3.5	47.9(1.8)	43.6(.7)	+4.3

* The standard errors are in parentheses.
** Taiwan Island-Wide Follow-up Interview.
† Taichung Medical Study.

TABLE 3. NET PROBABILITIES OF TERMINATING WITHIN SIX MONTHS GIVEN FIRST-SEGMENT RETENTION,* BY TIME FROM INSERTION AND TYPE OF TERMINATION

Six-Month Interval from Insertion	Study	Type of Termination Pregnancy	Expulsion	Removal	Total
1–6	FUI**	.032	.067	.154	.253
	MS†	.023	.086	.109	.218
7–12	FUI	.024	.040	.105	.168
	MS	.028	.046	.088	.162
13–18	FUI	.022	.026	.114	.162
	MS	.031	.025	.084	.140

* See text.
** Taiwan Island-Wide Follow-up Interview.
† Taichung Medical Study.

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TABLE 4. CUMULATIVE GROSS RATES 12 MONTHS AFTER FIRST INSERTION, BY TYPE OF TERMINATION

Study*	Type of Termination			
	Pregnancy	Expulsion	Removal	Total
FUI†	6.2(.7)**	11.3(.8)	25.3(1.1)	37.9(1.2)
MS††	6.8(.5)	12.9(.6)	18.1(.7)	33.5(.8)

* Sample size: Nearly all of the 2,173 cases in the Taiwan study were users of the Lippes Loop No. 1. The Taichung data in this table are based on the 4,351 users of Lippes Loop No. 1.
** Standard errors shown in parentheses.
† Taiwan Island-Wide Follow-up Interview.
†† Taichung Medical Study.

TABLE 5. CUMULATIVE GROSS AND NET RATES PER 100 FIRST INSERTIONS 12 MONTHS AND 18 MONTHS AFTER INSERTION, AND THE DIFFERENCE BETWEEN NET AND GROSS RATES, BY AGE OF WIVES FOR TAIWAN SAMPLE

Age of Wives at First Insertion	Pregnancy			Expulsion			Removal			Total Terminations
	Gross	Net	Diff.	Gross	Net	Diff.	Gross	Net	Diff.	Gross and Net
					12 Months					
17–24	10.1	6.5	3.6	23.3	17.5	5.8	41.6	35.7	5.9	59.7
25–29	6.5	4.9	1.6	14.7	12.3	2.4	29.3	26.3	3.0	43.6
30–34	7.2	5.9	1.3	11.6	9.9	1.7	21.4	19.7	1.7	35.5
35+	3.9	3.3	0.6	3.9	3.6	0.3	21.0	20.1	0.9	27.0
					18 Months					
17–24	14.9	8.4	6.5	28.2	19.8	8.4	60.9	47.9	13.0	76.1
25–29	10.2	6.8	3.4	23.8	17.6	6.2	41.7	35.7	6.0	60.1
30–34	9.7	7.6	2.1	11.6	9.9	1.7	26.0	23.5	2.5	40.9
35+	4.1	3.5	0.6	3.9	3.6	0.3	27.8	26.4	1.4	33.5

virtually disappears; the difference in expulsion rates becomes very small,[9] but the difference in removal rates is almost undiminished.

This highlights the fact that in an IUD field program the major problem for retentions is to reduce the removal rate. Implicitly, therefore, more attention must be given to the quality of initial services and of supporting follow-up visits. Variations in removal rates presumably are related to the social characteristics of the acceptors and of the program. This again suggests the importance of observing the terminations in samples representing the actual field situation.

Before considering the data on differentials for which gross rates

are presented, it may be useful to consider Table 5, which compares gross and net rates for the Taiwan sample for each cause for various time periods. These data indicate that the differences between the two kinds of rates increase substantially as the total termination rate rises. It is important to remember that only the net rates are additive to the total termination rates. The gross rates, more commonly used, cannot be added to obtain a total termination rate since the result is to exaggerate the total termination rate. For example, for women under 25 years old, the correct total termination rate is 76.1 at 18 months, but adding the component gross rates would yield an incorrect total termination rate of 104.0. This biologically impossible result indicates rather clearly that adding gross rates leads to error.

DIFFERENTIAL CHARACTERISTICS
IN RELATION TO IUD TERMINATIONS

Tables 6 and 7 show termination rates in relation to ten characteristics of the women illustrating the differentials in the termination rates at 12 months. An unpublished table for 18 months shows very similar differential patterns.

Notice the two important characteristics not previously investigated by life-table methods: the type of doctor making the insertion (Variable 8, Table 6); and the time phase of the program (Variable 10, Table 6).

It frequently has been asserted in Taiwan, as well as elsewhere, that female patients prefer female physicians for various cultural and personal reasons. Both higher insertion and retention rates may therefore be expected for female practitioners. At least for Taiwan, this does not seem to be true for terminations. Considering only the private practitioners, the termination rates are not significantly different by the sex of the doctor, although the termination rates are slightly higher for the female doctors. The fact that the termination rates are somewhat lower for the health department doctors than for private practitioners probably reflects the fact that most of the insertions made by government doctors involved a few interested persons working in a more intensive clinical program.

TABLE 6. CUMULATIVE GROSS RATES PER 100 FIRST INSERTIONS AND STANDARD ERRORS 12 MONTHS AFTER FIRST INSERTION, TAIWAN

Characteristics at Time of First Insertion*	N	Type of Termination			Total Termination
		Pregnancy	Expulsion	Removal	
1. Age of wife					
17–24	194	10.1(3.2)**	23.3(3.8)	41.6(4.4)	59.7(3.9)
25–29	645	6.5(1.3)	14.7(1.8)	29.3(2.2)	43.6(2.3)
30–34	752	7.2(1.1)	11.6(1.5)	21.4(1.8)	35.5(2.0)
35+	584	3.9(0.9)	3.9(0.8)	21.0(2.0)	27.0(2.1)
2. No. of pregnancies					
2 and less	154	10.7(3.8)	19.3(3.6)	51.3(5.3)	65.0(4.4)
3	307	8.6(2.7)	19.4(2.7)	26.9(3.3)	46.2(3.4)
4	420	5.9(1.4)	12.0(2.0)	22.8(2.3)	36.1(2.6)
5 or more	1,295	5.6(0.8)	8.2(0.9)	22.8(1.4)	33.1(1.5)
3. No. of live births					
2 and less	199	7.7(2.9)	20.3(3.3)	45.0(4.6)	59.6(4.0)
3	429	8.5(1.9)	15.6(2.1)	29.6(2.8)	45.7(2.8)
4	481	4.5(1.1)	11.1(1.8)	22.7(2.2)	34.4(2.4)
5 or more	1,067	6.0(0.9)	8.1(1.0)	21.2(1.5)	32.0(1.6)
4. No. of induced abortions					
None	1,583	6.2(0.8)	12.8(1.0)	24.7(1.3)	38.4(1.4)
One	358	6.4(1.5)	8.0(1.6)	25.7(3.0)	36.0(3.0)
Two or more	235	5.7(2.0)	6.2(1.9)	28.9(3.4)	37.1(3.5)
5. No. of living children					
2 or less	228	6.5(2.5)	19.5(3.0)	41.8(4.2)	56.2(3.7)
3	484	7.4(1.6)	13.6(1.9)	27.5(2.5)	41.9(2.5)
4	556	6.2(1.2)	10.0(1.6)	22.6(2.0)	34.6(2.2)
5 or more	909	5.7(0.9)	8.9(1.2)	21.9(1.7)	32.9(1.8)
6. Use of contraception					
Used	561	6.6(1.3)	9.4(1.5)	24.3(2.1)	35.9(2.3)
Did not use	1,615	6.1(0.7)	12.0(1.0)	25.7(1.3)	38.6(1.4)
7. Wife·s education					
No formal or tutor	866	6.5(1.1)	11.9(1.4)	25.8(1.9)	38.9(2.0)
Primary grades	1,002	5.8(0.9)	10.7(1.2)	24.1(1.6)	36.1(1.7)
Jr. High+	308	6.8(1.8)	12.0(2.2)	28.1(2.9)	41.1(3.0)
8. Inserting agent					
Private obg, male	1,192	6.9(0.9)	10.4(1.1)	26.7(1.6)	38.8(1.6)
Private obg, female	212	7.2(2.2)	9.8(2.3)	25.8(3.4)	37.9(3.6)
Govt. Hospital staff	173	6.7(2.3)	19.0(3.4)	22.1(3.6)	41.1(3.9)
Health Dept. staff	235	2.3(1.1)	9.5(2.2)	24.0(3.3)	32.8(3.4)
Other	364	5.7(2.1)	12.6(2.6)	22.4(2.9)	36.0(3.4)
9. Interval from last birth to 1st insertion					
6 mo. or less	413	3.6(1.1)	10.7(1.9)	25.0(2.6)	35.4(2.7)
7–12 months	417	8.4(1.9)	14.5(2.2)	30.3(2.6)	45.5(2.7)
13 mo. or more	1,339	6.4(0.8)	10.6(1.0)	23.4(1.4)	35.8(1.5)
10. Period of 1st insertion, 1964					
Before July 1	302	4.0(1.2)	12.2(2.1)	24.8(2.6)	36.5(2.8)
July 1–Sept. 30	343	11.7(1.9)	12.0(1.9)	20.5(2.3)	38.2(2.6)
Oct. 1–Dec. 31	670	6.5(1.1)	11.8(1.5)	25.9(2.1)	38.9(2.1)
Total sample	2,176	6.2(0.7)	11.3(0.8)	25.3(1.1)	37.9(1.2)

* All characteristics are at the time of first insertion or for the period preceding that event.
** Standard errors are shown in parentheses.

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TABLE 7. COMPARISON OF TAIWAN AND TAICHUNG CUMULATIVE GROSS RATES PER 100 FIRST INSERTIONS, 12 MONTHS AND 18 MONTHS AFTER INSERTION, BY AGE OF WIVES AND BY NUMBER OF PRIOR PREGNANCIES

| | | | 12 Months Type of Termination* | | | 18 Months Type of Termination* | | | |
Age Group	N	P	E	R	T	P	E	R	T
Taiwan									
Under 25	194	10.1	23.3	41.6	59.7	14.9	28.2	60.9	76.1
25–29	645	6.5	14.7	29.3	43.6	10.2	23.8	41.7	60.1
30–34	752	7.2	11.6	21.4	35.5	9.7	11.6	26.0	40.9
35+	584	3.9	3.9	21.0	27.0	4.1	3.9	27.8	33.5
Taichung									
Under 25	895	6.6	26.0	34.8	54.9	9.9	30.2	48.5	67.6
25–29	2,112	6.7	17.0	22.6	40.1	11.0	20.3	31.1	51.1
30–34	2,109	5.7	10.3	15.6	28.6	8.9	12.2	21.2	36.9
35+	1,521	3.7	7.3	14.1	23.3	5.7	8.4	18.4	29.6

| No. of Previous Pregnancies | N | P | 12 Months | | | | 18 Months | | |
			E	R	T	P	E	R	T
Taiwan									
Less than 3	154	10.7	19.3	51.3	65.0	19.9	24.2	70.3	82.0
3	307	8.6	19.4	26.9	46.2	10.9	28.0	37.5	59.9
4	420	5.9	12.0	22.8	36.1	10.3	17.7	34.3	51.5
5+	1,295	5.6	8.2	22.8	33.1	6.7	8.6	29.2	39.6
Taichung									
Less than 2	162	3.9	31.8	53.7	69.7	3.9	37.4	72.8	83.7
2	566	7.5	30.0	33.7	57.0	12.3	31.9	45.3	67.4
3	953	6.2	19.4	22.8	41.6	8.4	23.8	32.3	52.8
4	1,187	6.4	14.9	22.3	38.2	9.9	18.4	31.3	49.5
5+	3,774	5.1	9.0	15.3	26.8	8.2	10.5	20.3	34.5

* P = pregnancy; E = expulsion; R = removal; T = total.

As the program advanced in time and number of insertions, the termination rate was expected to fall because the procedure might become better known and the larger number of old cases might provide social support to the new cases. Quite the opposite hypothesis has also been suggested, namely, that as time goes on, the termination rate will rise because those who have had experiences with the IUD talk about them, generating disquieting rumors, while those who are satisfied remain silent. Neither of these ideas seems to be correct insofar as the evidence from the terminations is concerned. The removal rates do not differ significantly at 12 months for the three periods considered. Also, rates do not differ significantly for

a comparison at six months in which a later time period was added —the first quarter of 1965.

The other differentials shown in Tables 6 and 7, by and large, are very similar in their overall pattern to those discussed for the Taichung cases in an earlier publication.[10] Therefore, although the level of termination rates differs significantly, the broad patterns of important differentials are similar for the larger Taiwan field study and for the more intensive clinical Taichung program. Since the rather similar Taichung results have been discussed in some details in the previous publications only the highlights of the new data will be listed here:

1. In Taiwan, as in Taichung, the wife's age and her parity (or number of previous pregnancies) are powerfully related to each type of termination and, therefore, to total termination rates. For these two most important variables only, Table 7 shows the data for both Taiwan and Taichung for each type of termination, for both 12 and 18 months. Both samples show very large comparable variations by wife's age and number of pregnancies, although the Taiwan rates are always higher (except for expulsions). The individual effects of age and parity or number of pregnancies are not separate in this analysis. The size of this first Taiwan sample is relatively small and this multivariate analysis will be done shortly with the much larger sample in the second Taiwan survey.

2. The women with at least one induced abortion had significantly lower expulsion rates and, therefore, lower total termination rates than the women with no experience of induced abortions (Variable 4, Table 6). In the Taichung sample, similar differentials were diminished, but persisted, with age and parity controls, suggesting the possibility that repeated induced abortions might have some effect on the uterus to make it more tolerant to the IUD.

3. Women of higher education had only slightly higher removal and termination rates than did those of less education (Variable 7, Table 6). These differences were less striking in this sample than in Taichung for which was speculated that better educated women had higher removal rates because they had more alternatives for family limitations.

4. Those women whose last birth before insertion was very recent (less than six months) had a very low pregnancy termination rate (Variable 9, Table 6). This probably reflects the inclusion of post-partum amenorrhea. The removal and expulsion rates were substantially lower for the women with long intervals since last birth, presumably because these are older women of higher parity.

FAMILY LIMITATION IN TAIWAN AFTER IUD TERMINATION

Concern is increasing in mass family planning programs about what are feared to be "high" termination rates for the IUD. Whether these termination rates really are high is a matter of definition. For those who expect complete and continuous protection for couples once they have received service from a family planning program, the termination rates certainly are high. In comparison with the previous situation involving the use of more traditional contraceptives or none at all, protection is considerable. The contraceptive pill may well have a better record when it is tested in mass programs in developing countries, but the evidence is not yet in from relevant areas. The pill certainly will have a better record than the IUD in terms of pregnancy rates during use. It is not yet known whether the pill will be equally (or more) acceptable initially and whether it will have a high continuous use rate (and that, rather than the pregnancy rate, is the important determinant of termination rates).[11]

Whichever specific methods are considered, at least a significant minority of all couples will abandon them for various reasons. For population control and family planning programs the important question is the fertility control history of these couples after they give up a particular method. High first-segment termination rates are much less serious for population growth if further births are prevented by reinsertion of the IUD, adoption of other contraceptive methods, or use of abortion to end pregnancies that do occur.

A very large proportion of the Taiwan couples in the IUD program were still protected in one or more of these ways at the time of the interview. In terms of fertility control, this record appears to be much better than would be indicated by first-segment termina-

TABLE 8. CURRENT FAMILY LIMITATION STATUS OF WOMEN EVER HAVING AN IUD INSERTION, FOR ALL COUPLES AND FOR THOSE WITH IUD NOT IN SITU

Current Family Limitation Status	All Couples %	All Couples with IUD not In Situ %
IUD *in situ* at interview		
still have device first inserted	64	
have device inserted after one or more terminations	5	
IUD not *in situ* at interview		
currently using other contraception	9	28
wife or husband sterilized after termination	1	3
others who aborted all pregnancies after first insertion	2	9
not using contraception, but not pregnant since first insertion	13	41
unprotected: at least one pregnancy not aborted and not using contraception	6	19
Total:	100	100
Number of couples	2181	676
Per cent who are:		
currently protected by contraception or sterilization	79	31
currently protected or aborting all pregnancies	81	40
currently protected, aborting all pregnancies, or never pregnant	94	81
not protected in any of these ways	6	19

* Included IUD *in situ*, contraception currently used, or sterilization.

tion rates. These may be misleading if they are interpreted to mean that the couples necessarily return to their former situation of little protection and high fertility.

Table 8 presents a detailed breakdown of the family limitation status of all the couples at the time of the interview. Approximately two-thirds still had an IUD in place, including about five per cent of the initial sample who had a device reinserted after one or more terminations. Of those ever terminating, 14 per cent had been reinserted and still had the device in place.

About 10 per cent of all the couples had given up the IUD, but currently were practicing another method or had been sterilized. This is about 31 per cent of the terminated cases—higher than the percentage ever practicing contraception before the program. Altogether then, 79 per cent of all the couples currently were practicing contraception, either with the IUD or in other ways. Almost all (95 per cent) of those who had begun to use another method of contraception after terminating the IUD were still using something or had been sterilized by the time of the interview.

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The type of termination for the first segment is an important determinant of whether contraception is used afterward:

Type of termination for first segment	Per cent currently using contraception or sterilized by time of interview excluding women using reinserted device
expulsion	28
removal	32
pregnancy	36

It seems remarkable that, of those who failed to prevent pregnancy with the IUD, so high a proportion continued to try afterward by other methods. This may reflect the motivating force of the extreme demographic pressures on those who in such a short time were again faced with the problem they were trying to solve by accepting the IUD.

An additional group of about two per cent of the couples had given up the IUD and were not currently using contraception, but they had aborted all pregnancies occcurring after the first insertion. Although abortion may be undesirable from several points of view, it is objectively a method of birth control. Eighty-one per cent of the couples are either currently practicing contraception or have used abortion effectively to prevent further births. An additional group of terminating couples (13 per cent of the total sample) are not currently using contraception, but they have had no pregnancies since their first insertion. Given the availability of abortion in this population, these couples do not yet have a problem, and, if it arises, a substantial portion is likely to use abortion to avoid it. These couples plus those in the preceding group total 94 per cent of all couples who ever had an IUD inserted who were either currently using contraception and abortion to prevent further births or had been successful in avoiding additional births between the time of first insertion and the time of the interview. This leaves only about six per cent of the couples who are unprotected and have had a pregnancy that was not aborted. They constitute about one-fifth of the couples who gave up the IUD.

The use of induced abortions to terminate pregnancies occurring

after first insertion was quite common, especially if the pregnancy occurred with the IUD *in situ*. In this sample, about 74 per cent of all pregnancies since first insertion were ended by induced abortion, about 90 per cent of those occurring with device *in situ* and about 60 per cent of the others.

The current family limitation status of the sample is likely to be correlated with age and parity since these two variables are strongly correlated with the IUD termination rate and the induced abortion rate. Tables 9 and 10 present the relationship between parity and wife's age with several classifications of current family limitation status, both for all couples and for those who had terminated the IUD.

For all couples, the percentage who were "protected" from additional pregnancies increases rather sharply with either age or parity. The proportion who have had at least one pregnancy, not aborted, and are not currently protected by contraception is considerably

TABLE 9. FAMILY LIMITATION STATUS OF WOMEN EVER HAVING AN IUD INSERTION, FOR ALL COUPLES, AND FOR THOSE WITH IUD NOT IN SITU, BY WIFE'S AGE

| | | | Wife's Age | | |
Family Limitation Status	Under 25 %	25–29 %	30–34 %	35 and Over %	Total %
All couples with					
IUD still in place	46	63	74	78	69
IUD or other contraception currently*	62	73	84	85	79
IUD or other contraception, or aborting all pregnancies	66	75	87	87	81
IUD or other contraception, aborting all pregnancies or having none	87	91	96	97	94
Unprotected: at least one pregnancy not aborted and not currently using contraception	13	9	4	3	6
Total number of couples	195	647	754	586	2182
Couples who have terminated IUD					
Now using other contraception	30	27	38	32	32
Using other contraception or aborting all pregnancies	38	32	49	44	40
Using other contraception, aborting all pregnancies or having none	76	77	86	86	81
Unprotected: at least one pregnancy not aborted and not using contraception	24	23	14	14	19
Total number of couples terminating IUD	105	241	199	131	676

* Includes sterilization throughout.

TABLE 10. FAMILY LIMITATION STATUS AS PERCENTAGE OF COUPLES EVER HAVING AN IUD AND AS PERCENTAGE OF COUPLES WHO HAVE TERMINATED THE IUD, BY WIFE'S PARITY

	Wife's Parity				
Current Family Limitation Status	1 or 2 %	3 %	4 %	5 or More %	Total %
All Couples with					
IUD still in place	47	63	69	76	69
IUD or other contraception currently*	61	76	79	83	79
IUD or other contraception, or aborting all pregnancies	62	80	80	86	81
IUD or other contraception, aborting all pregnancies, or having none	84	93	94	97	94
Unprotected: at least one pregnancy not aborted and not using contraception	16	7	6	3	6
Total number of couples	198	430	482	1071	2181
Couples who have terminated IUD					
Now using other contraception	25	37	31	31	32
Using other contraception or aborting all pregnancies	28	47	35	43	40
Using other contraception, aborting all pregnancies, or having none	68	83	79	87	81
Unprotected: at least one pregnancy not aborted and not using contraception	32	17	21	13	19
Total number of couples terminating IUD	104	161	149	261	675

* Includes sterilization throughout.

greater for the younger and the lower-parity women than for others. The major cause for this overall difference is the higher retention rate for the older and higher-parity women.

Even considering only those who terminated the IUD, a significant increase with parity or wife's age still is seen in the proportion "protected" in the sense previously defined. This relationship does not arise from differences in the use of other methods of contraception, which does not vary systematically by age or parity. For the terminated cases the older and higher-parity women were more often "protected" simply because they were less likely to get pregnant, and if they did become pregnant they were more likely to use abortion. The lower pregnancy rates for the older women presumably are simply a biological phenomenon, but the higher abortion rates must reflect the facts of greater demographic pressures, when larger proportions have all the children they want. In any case, the proportion "unprotected" among the terminated cases varies from about

30 per cent among the younger and low-parity women to about 15 per cent among the older and high-parity women.

A significant part of this difference may arise from the fact that younger women are more likely than others to use the IUD for spacing purposes. It may be incorrect to define these women as "unprotected" in terms of their own goals. About 15 per cent of the women taking an IUD said that they were doing so to space their children, and this number decreases rapidly with age and parity.[12]

From the point of view of population effects, the significant question is not what family limitation methods are used, but what happens to the number of births. The period of the Taiwan program covered in this first survey was too short to yield significant answers to this question. However, the relatively low percentage with an unaborted pregnancy at the time of the interview should mean lower fertility later.[13]

REFERENCES

[1] Such comprehensive follow-up data are not available for any other method or combination of methods so far as is known, although such data are urgently needed.

[2] Regular mimeographed reports are issued by the Population Council. For a recent summary *see* Tietze, Christopher, Intra-Uterine Contraception: Research Report, *Studies in Family Planning*, 18, 20–24, April, 1967.

[3] Potter, Robert G., Chow, Lien-Pin, Jain, Anrudh K. and Lee, C. H., Social and Demographic Correlates of IUCD Effectiveness: The Taichung IUCD Medical Follow-Up Study, *1966 Social Statistics Section, Proceedings of the American Statistical Association*, pp. 272–277. A more complete version of this study by the same authors is available in *Expanded Report on Social and Demographic Correlates of IUCD Effectiveness: The Taichung IUCD Medical Follow-Up Study*, February, 1967, University of Michigan Population Studies Center mimeographed.

[4] Mauldin, W. Parker, Nortman, Dorothy and Stephan, Frederick F., Retention of IUDs: An International Comparison, *Studies in Family Planning*, 18, 1–12, April, 1967.

[5] The sampling was done by a stratified three-stage sampling method. Excluding 30 aboriginal townships where no program has been implemented, a total of 331 townships in Taiwan was stratified into 27 strata by "degree of urbanization," "level of education of women" and "total fertility rate." From these strata a total of 56 sample townships was first drawn systematically with probability proportion to number of married women between the ages 20–44 at the end of year 1964.

During the second stage sampling, one-ninth of the administrative units in each of the sample townships were chosen systematically and during the third stage, IUD acceptors from these selected administrative units were chosen. The total sample size of 2,000 was allocated to each of the sample townships in proportion to the number of its IUD acceptors, and again proportionate to the number of acceptors in each of the sample administrative units within the sample township.

If the total acceptors in a sample administrative unit exceed the desired number, the sample cases were selected systematically from among them. On the other hand, if the total acceptors fall short of the sample size in the administrative unit, additional IUD cases in the adjacent villages were chosen in a predetermined fashion.

Since some women could not be located because of obscure or false addresses given on the coupons, panels of additional sample cases were drawn in the way mentioned above as supplements if needed. In case a replacement was necessary, it was done in a predetermined systematic order from the supplement sample list.

Twenty-six per cent of all the interviews were taken with women drawn from supplementary lists in this way. Those interviewed from the supplementary sample do not differ significantly from those interviewed from the original list wth respect to age, parity or education. This only helps to confirm the fact that both the original and supplementary panels were probability samples from the same universe. A check is now being made on the demographic characteristics at the time of insertion of the cases for which substitutions had to be made. They apparently do not differ enough to affect the overall results, but a systematic analysis will check that.

Since the larger townships had higher probability of being included in the sample than the smaller townships, and since more IUD acceptors were then selected from these selected larger townships, the sample of IUD acceptors was not selfweighting. The IUD acceptors from larger townships had higher probability of being included in the sample than those from smaller townships. Thus, in the total sample the urban areas were underrepresented. To compensate for this bias, weights were applied to all selected acceptors at the township level. These weights were obtained by taking the reciprocal of the probability of selecting an IUD acceptor from a township and then adjusting them so that the weighted sample size roughly equals the unweighted sample size. Properly weighted results are presented in this report.

⁶ The data were coded, punched and verified at the Taiwan Population Studies Center, which also did preliminary analyses by hand calculations to meet the most immediate needs of the action program. A duplicated set of cards was then sent to the University of Michigan Population Studies Center for computation of life table rates and other analyses.

⁷ Taking reinsertions into account increases total retention rates somewhat, but does not substantially affect any of the relationships examined here. Once experience beyond the first insertion is taken into account it becomes desirable also to consider alternate contraceptive and birth control methods.

⁸ The most complete explanation of the differences between these rates and of their sampling errors will be found in Potter, Chow, Jain and Lee, *op. cit. See also* Tietze, Christopher, Intrauterine Contraception: Recommended Procedures for Data Analysis, *Studies in Family Planning,* 18 (supplement), 1–6, April, 1967.

⁹ The remaining small difference in the expulsion rates is significant. However, it may be a result of the fact that without a regular medical check-up pro-

gram the Taiwan sample expulsions are more likely to go unnoticed until a pregnancy occurs.

[10] Potter, Chow, Jain and Lee, *op. cit.*

[11] The contraceptive pill has a much better record than the IUD for pregnancy rates during periods of continuous use. However, for either method, the important problem is continuation of use on a mass basis in the field. So far no documented test of the pill is available on such a mass basis in a developing country. Such evidence may be available soon from Singapore and Malaysia, where government programs are making the pill the primary method offered. In Korea and Taiwan, where the pill has been used mainly for women giving up the IUD, the pill termination rate is even higher than that for the IUD, but this is not an adequate comparative test.

[12] Among women interviewed at time of insertion of IUD in Taiwan, the proportion saying that they were taking the IUD for spacing rather than stopping their births varies as follows, with age and parity. (These data are derived from tabulations of the coupons filled out when a woman has an IUD inserted, and are for approximately 68,000 coupons for the period March–December, 1966).

No. of living children	IUD used for spacing	Age of wife	IUD used for spacing
0–1	85%	under 25	57%
2	56	25–29	27
3	16	30–34	7
4	5	35–39	2
5	3	40 or older	1
6	2		
7 plus	1		

[13] In the Second Taiwan Island-Wide IUD Survey, completed in February, 1967, a longer time period is covered with a larger sample. Preliminary calculations from these data lead to an estimate that for the 208,000 women having an IUD inserted up to June, 1966, birth rates from time of insertion to the end of 1966 were 56 to 86 per cent lower than they would have been without the IUD program. See Freedman, Ronald, Births Averted by the IUD Program, *Studies in Family Planning,* 20, 7–8, June, 1967.

ACKNOWLEDGMENTS