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A METHOD FOR ESTIMATING FUTURE CASELOADS OF FAMILY PLANNING PROGRAMS

by

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S U M M A R Y

This paper presents a simplified method for estimating future caseloads. Procedures and examples are presented for the following:

1. Estimating the expected number of clients who will be active at the end of some future date;

2. Estimating enrollment requirements to meet future caseload targets;

3. Estimating the expected number of clients who will be served in some future time period;

4. Estimating the number of clinic sessions and staff required for some future time period.

The final section of the paper presents a procedure for calculating dropout rates and for making more precise caseload calculations.

1. ESTIMATING THE EXPECTED NUMBER OF ACTIVE CLIENTS

Family Planning Program effectiveness is sometimes measured by the number of visits made to the clinics, the number of women served (some women make more than one visit), or the number of active clients at the end of some time period (some women drop out of the program). Of the three measures, the last is the more precise measure of effectiveness. Thus, it is useful to estimate the numbers of active clients a program can expect to be serving five, ten or fifteen years from now. Such estimates can give an indication of expected effectiveness, can be compared with target figures to determine whether or not these targets are likely to be met, and can be used for program planning purposes in general.

Rough estimates can be made quickly using the tables presented in the appendix. All that needs to be known is the average number of acceptors per time period and the dropout rate over that time period. In many cases these figures will not be known precisely and estimates must be made. A discussion of dropout and acceptance rates, and calculation procedures for more precise forecasting is found in Part 5 of this paper.

To estimate the future number of active cases a target date is specified, (January 1971, 1984) and the average number of acceptors and dropout rate for a specific time period are estimated (acceptors and dropout rate per month, per year, etc.). A factor is selected from Table A by choosing a row corresponding to the target date (final time period) for which the estimate is to be made and by selecting the column corresponding to the expected dropout rate. This factor is then multiplied by the average number of acceptors per time period. The product is an estimate of how many of all clients who join the program will still be active as of the target date.

a. The following illustration is based on a one year time period, a dropout rate of 20% annually* and an average of 20,000 new acceptors per year. Of all of the women who will enroll in the program over the next few years, we wish to estimate how many will still be active at the end of each (target) year between 1972 and 1980.

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*- In this example a dropout rate refers to the total number of dropouts at the end of one year from a cohort of acceptors. We normally refer to clinic or program dropouts in these calculations rather than method or contraception dropouts, (see part 5c of this paper) although the latter estimates can also be made.

Year	T	Dropout Rate	No. Acceptors		Factor**		No. Active
1970	T_1	20%	20,000				
1971	T_2	20%	20,000				
1972	T_3	20%	20,000	X	1.95	=	39,000
1973	T_4	20%	20,000	X	2.36	=	47,200
1974	T_5	20%	20,000	X	2.69	=	53,800
1975	T_6	20%	20,000	X	2.95	=	59,000
1976	T_7	20%	20,000	X	3.16	=	63,200
1977	T_8	20%	20,000	X	3.33	=	66,600
1978	T_9	20%	20,000	X	3.46	=	69,200
1979	T_{10}	20%	20,000	X	3.57	=	71,400
1980	T_{11}	20%	20,000	X	3.66	=	73,200

Thus, we expect to enroll a total of 220,000 women over the eleven year period (1970-1980) and we estimate that over 73,000 will still be active at the end of that period. Some further illustrations are given below.

b. We wish to estimate the number of active clients in 1984 given an annual dropout rate of 35% and 8,000 new acceptors annually. Using 1970 as T_1 the year 1984 would be T_{15} and the factor for a 35% dropout rate is 1.86.

8,000 x 1.86 = 14,880 active clients at the end of 1984

c. We wish to estimate the number of active clients at the end of the year given a monthly dropout rate of 15% and 500 new acceptors per month. Using the month of January as T_1 the month of December would be T_{12} and the factor for a 15% monthly dropout rate is 4.86.

500 x 4.86 = 2,430 active clients at the end of 1970

d. To estimate the number of active clients by the year 2000, given a five year dropout rate of 50% and an acceptance rate of 200,000 annually, we use the period of 1970-1974 as T_1 and 1995-1999 as T_6, where the factor at 50% dropout rate is .98. Since there are 200,000 acceptors per year, there are 1,000,000 over a five-year period.

1,000,000 x .98 = 980,000 active clients by the year 2000

It should be noticed that the annual net increase in number of active clients tends to decline over time. Programs tend to reach a ceiling of active clients. This ceiling is reached more quickly the greater the dropout rate. For example, with a 50% dropout rate per year, the program's active caseload begins to level off in the

** - Factors from Table A.

fourth year and reaches a ceiling of exactly one-half of the annual enrollment by the eighth year of the program. At a dropout rate of 20% per time period, the ceiling is reached in the 16th time period; at 40% it is reached in the ninth time period. In our first illustration we can see that the program expects to add 8,200 active clients to its caseload between 1972-73 but by 1979-80 it will add only 1,800. This program would tend to level off in the ninth year and would reach a ceiling of just under 80,000 by the 25th year. It would take about nine years to add the last 8,000 active clients to the caseload, compared to one year in 1972 (see Figure 1).

Several important assumptions are inherent in this calculation. See Part 5 and the appendix for a discussion of these and of procedures for more precise calculations of active caseload estimations.

In the following section we will illustrate how the above calculation procedure can be used to set targets.

2. ESTIMATING ENROLLMENT REQUIREMENTS

For a variety of reasons family planning programs often set five year targets. The overall target is usually broken into five annual subtargets. If a program wants to have an active caseload of 100,000 by the end of the five year plan, it is not enough to set the annual targets at one-fifth of the five-year target. This is because of the dropout problem.

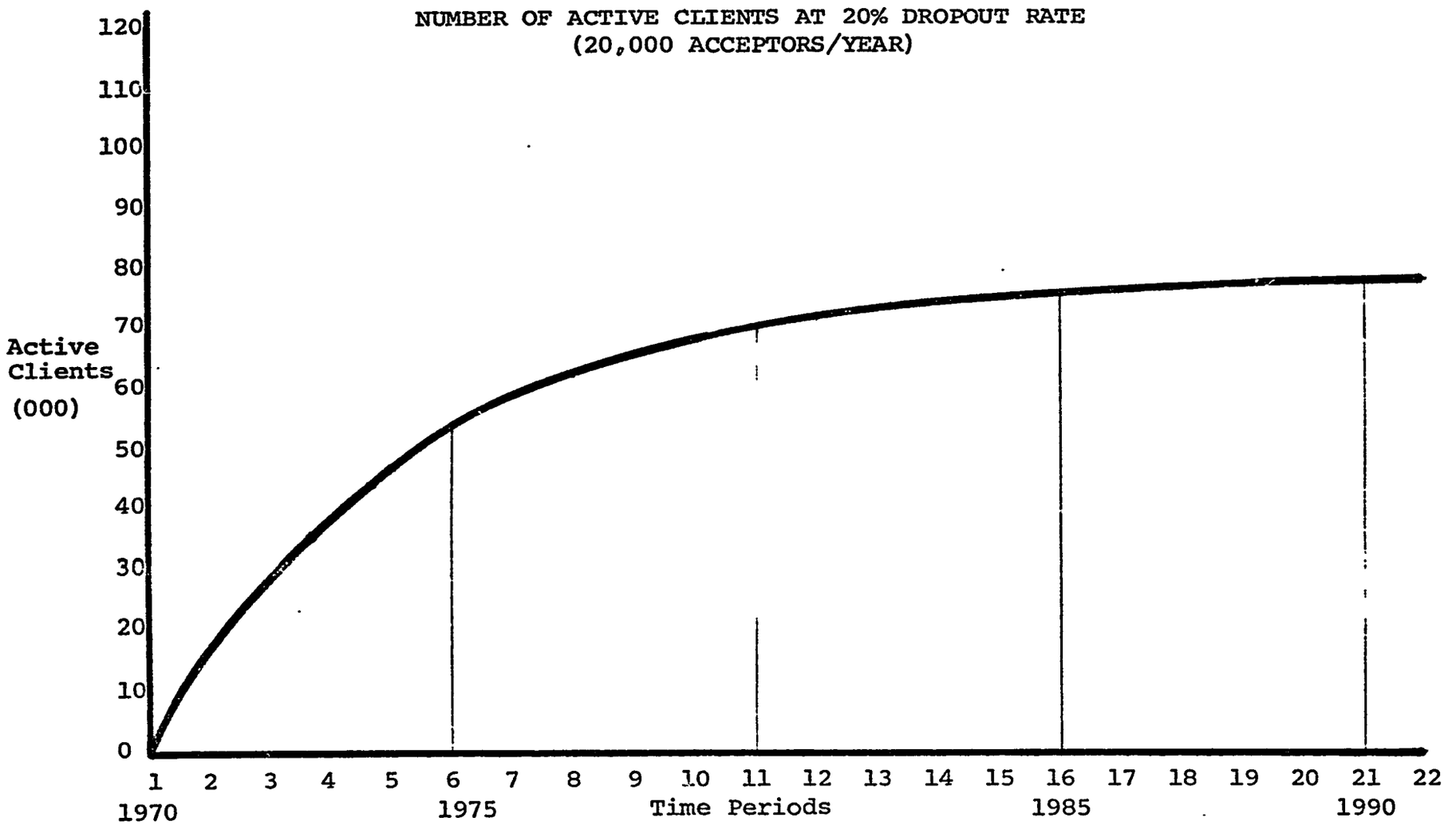
To calculate the number of clients who will have to be recruited every year in order to reach a prescribed target, we merely divide the target by the appropriate factor from Table A. This factor is selected in the same manner as described in Part 1. To repeat, a factor is selected from Table A by choosing the row corresponding to the final target date (final time period) and by selecting the column corresponding to the expected dropout rate.

a. In the following illustration we assume a five year goal of 100,000 active cases and an annual dropout rate of 25%. The appropriate factor from Table A at T_5, D_{25} = 2.29.

$$100{,}000 \div 2.29 = 43{,}668 \text{ new acceptors per year}$$

Thus, to obtain a goal of 100,000 active cases by the end of the fifth year there must be over 43,000 new acceptors per year.

FIGURE 1


NUMBER OF ACTIVE CLIENTS AT 20% DROPOUT RATE
(20,000 ACCEPTORS/YEAR)
Active Clients (000)
120
110
100
90
80
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
1970
1975
Time Periods
1985
1990

b. We wish to know how many new acceptors we need each month to reach 7,000 active clients by the end of the year, given a monthly dropout rate of 10%. The factor from Table A at T_{12}, D_{10} is 6.46.

7,000 ÷ 6.46 = 1,085 new acceptors per month

3. ESTIMATING THE EXPECTED NUMBER OF CLIENTS SERVED

An estimate of the workload of a clinic or program can be useful for planning purposes. Not all women remain with the program long enough to be classified active at the end of a given time period. But these women will have received some service and it is useful to estimate how many there will be.

The number of clients served equals the number of active clients plus the dropouts in that time period. It can be calculated in the same way as the estimate for active clients. The only difference is that the factor is selected from Table B.

a. Let us assume that the annual dropout rate is 40% and that there are an average of 15,000 new acceptors per year. How many clients will be served <u>in</u> the tenth year of the program? The factor from Table B at T_{10}, D_{40} is 2.48.

15,000 x 2.48 = 37,200 clients will be served in 1979

This is not the total number of clients served over the ten year period, nor is it the number of active clients at the end of 1979. It is the total number of women (or clients) that will come to the clinic at least once during 1979.

For comparison sake, the following calculation shows the number of active clients at the end of 1979 given the above information. The factor (from Table A) at T_{10}, D_{40} is 1.49.

15,000 x 1.49 = 22,350 active clients by the end of 1979

b. Let us take the data from the first illustration in Part 1, and calculate the number of clients served between 1972 and 1980:

Year	T	D	Acceptors		Factor*		No. Served
1972	T_3	20%	20,000	X	2.44	=	48,800
1973	T_4	20%	20,000	X	2.95	=	59,000
1974	T_5	20%	20,000	X	3.36	=	67,200
1975	T_6	20%	20,000	X	3.69	=	73,800
1976	T_7	20%	20,000	X	3.95	=	79,000
1977	T_8	20%	20,000	X	4.16	=	83,200
1978	T_9	20%	20,000	X	4.33	=	86,600
1979	T_{10}	20%	20,000	X	4.46	=	89,200
1980	T_{11}	20%	20,000	X	4.57	=	91,400

It may be noted that the factor from Table B is one digit larger than the previous factor from Table A. This is a consistent relationship. Thus, $f_{B_T} = 1+f_{A_{T-1}}$, where f_{B_T} is the factor from Table B and $f_{A_{T-1}}$ is the T-1 factor from Table A.

A comparison of the two tables illustrates this point. The 1980 figure of number of clients served is 20,000 more than the 1979 figure of number of active clients. Although this shorthand calculation can be used, we have developed separate tables (A and B) for ease of calculation.

4. ESTIMATING EXPECTED NUMBER OF VISITS, CLINIC SESSIONS AND STAFF REQUIRED

How many visits will these women make in a future time period, say 1979? This information is especially valuable for program planning. It can be used to estimate the resources we will require to furnish services: how many centers, clinic sessions, nurses, paramedics, pills, etc., will we need in 1979?

The definition of "visit" should be clear. One useful distinction is between medical visits (visits involving a medical examination), non-medical visits (nurse consultations, for example) and supply calls. Sometimes it is useful to distinguish between new medical visits and checkup medical visits. A more detailed discussion of these distinctions and calculation variations appears in Part 5.

*Factors from Table B.

Only two items of information are required to make the basic estimates: the expected number of clients to be served in a future time period and the average number of visits made per client per time period.

a. To determine the number of visits that will be made by the 91,400 women who are expected to be served in 1980 (last illustration), we multiply this figure by the average number of visits expected per client in 1980:

91,400 x 3.4 = 310,760 client visits in 1980

b. If we wish to estimate the total number of visits that will be made in the nine-year period between 1972-80, we multiply the total of the "No. Served" column by the average number of visits expected per client each year:

678,200 x 3.4 = 2,3005,880 visits between 1972-80

The planning value of this estimate is demonstrated in the following illustration:

c. From a, above, we have estimated that there will be 310,760 client visits in 1980. How many clinic sessions will be required in 1980? Let us assume that the above figure represents clinic session visits. We must estimate the average number of clients who can be serviced during one session. Let us assume that 25 clients can be seen in one session. Then,

310,760 ÷ 25 = 12,430 clinic sessions required in 1980

Other useful estimates are possible. For example, how many family planning centers will be required or how many sessions will each existing center have to conduct in 1980? The former estimate would be called for if there was a maximum number of sessions that could be conducted at a center. Let us assume that the average number of sessions per center is not expected to exceed five per week:

$$\frac{\text{12,430 sessions required in 1980}}{\text{*50 weeks x 5 sessions per week}} = \text{49.7 family planning centers required by 1980}$$

*- Assumes center is closed two weeks per year (vacation, holidays, unexpected closing).

From the opposite viewpoint, we may calculate the number of sessions required per center by 1980. Assume we expect to have 40 centers in operation in 1980:

$$\frac{\text{12,430 sessions required in 1980}}{\text{50 weeks x 40 centers}} = \text{6.2 sessions per center per week required in 1980}$$

This same approach can be used to make estimates of personnel and other resources that will be required. All that we need is an estimate of the ratio between clients (or visits) and the resource, as: one physician can see 12 clients per session, one client requires an average of 13 packets of pills per year, etc. For example:

$$\frac{\text{310,760 visits required in 1980}}{\text{50 weeks x 12 clients per physician per session}} = \text{517.9 physician sessions required per week by 1980}$$

This could be 518 individual physicians conducting one session each per week, 259 physicians conducting two sessions each per week, etc.

5. ASSUMPTIONS, DEFINITIONS, OTHER CALCULATION PROCEDURES

Most program administrators do not know what the dropout, acceptance and visit rates are but these can be estimated fairly accurately by collecting a few statistics over a period of a few months. The average number of visits made per client per time period can also be estimated by checking a sample of clinic case cards.

The definitions of "dropout", "acceptor", and "visit", are very important and should be made as explicit as possible by the program administrator so that the interpretation of the estimates will not be ambiguous. The calculations explained above do not require adherance to standard definitions of these terms but some examples will be presented.

a. The Dropout Rate: A Cohort Formula

A dropout rate can be expressed in terms of a ratio between acceptors during a specified time period (e.g., one month) and the total number of those acceptors who are inactive at the end of the time period. For example, if the time period is one month, we would count the number of new acceptors in a certain month (January 1-31). Six months later (taking the mid point of

the month, July 15) we might count the number of these acceptors who are inactive. This would tell us the percentage of our cohort that is inactive after six months. If we calculated the rate again three months later we would have a nine month drop-out rate. This rate would be expressed as follows:

$$D_i = \frac{d}{a} \times 100 \quad \text{where,}$$

D_i = the dropout rate for a specific length of time (e.g., 6 months),

a = the number of new acceptors during the initial time period (e.g., January)

d = the number of dropouts from (a) by the end of D_i (July 15), and,

100 = constant for conversion to per cent.

An as illustration, suppose that 40 women were enrolled in January. Let us assume that by July 15th we know that only 28 of these women are still active. (The midpoint of the target month is used as a more precise estimate than the first of the month). We can calculate, therefore, that six month after enrollment, 12 of the 40 acceptors were inactive, i. e., 30% had dropped out. This is a six-month dropout rate for a cohort of women enrolled in a one-month time interval. We can calculate the same rates for the February cohort and measure it in mid August; the March cohort can be measured in mid-September, etc.

The tables in this paper assume that these dropout rates are the same for each cohort. Thus, after six months we expect that 30% of each cohort of acceptors will have dropped out. This rate may be calculated on a monthly, annual, bi-annual basis, or at longer or shorter intervals.

As an example of a longer interval, suppose that 20,000 women enroll in 1967. By July, 1968, we will have an estimate of the annual dropout rate for the 1967 cohort. By July, 1972 we will have the five-year dropout rate. Let us assume that by July, 1970 we know only 10,000 of the cohort are still active. We now have a three-year dropout rate of 50% on a cohort of women enrolled in a one year time period. Tables A and B assume that there will be 20,000 new acceptors in 1968 and that 50% of them will have dropped out by mid 1972, and so forth.

In using these tables it is important to keep these assumptions in mind and to define the cohort in terms of an enrollment time period (one month, one year) and to define the dropout interval (35% dropped out after six months, after one year, after five years).

b. Transfers

Should transfers be included in dropout calculations? Usually there are very few transfers and their inclusion or exclusion will make very little difference. In some cases it may be useful to account for them, as when different clinics are being compared in terms of dropout rates.

As an illustration, assume that 550 women enrolled in January and that 6 of these later transferred to other clinics. We would subtract these from our calculations if we are interested in the numbers of women who drop out of our clinic because we no longer have control of them. They are no longer part of our caseload. Two women who initially enrolled in other clinics were transferred to our clinic in January. These women would be treated like new clients, for they are new to our clinic, and we are measuring clinic dropout rates. A check of the records shows that by mid July, 45 of these women were no longer active. The 6-month dropout rate would be:

$$D_6 = \frac{45}{(550-6+2)} \times 100 = 8.2\%$$

When computing dropout rates for an entire program it is not necessary to include transfers since transfers-in minus transfers-out must equal zero (they are all inter-program transfers). And as we mentioned above, there are usually very few transfers in a particular clinic, so it is not particularly distorting to neglect to include them in the calculation. For example, the above illustration would still yield a dropout rate of 8.2% if the transfers were not included.

The same calculation for February acceptors and dropouts as of August would yield another 6-month dropout rate. If the figures for this time period were 400 acceptors, 38 dropouts and no transfers, we can calculate a separate rate as above (9.5%) or an average rate by adding the two figures together:

$$D_6 = \frac{45 \times 38}{(550-6+2+400)} \times 100 = 8.7\%$$

c. Defining Dropouts

Care must be taken in defining a dropout. Some programs arbitrarily assume that any client who misses an appointment is a dropout while others give a grace period of one, three or more months. Clients who are expected to visit the clinic only once per year (e.g., IUD clients) may not be recognized as dropouts until they fail to keep their annual appointment. However, these considerations are important mainly for "use-effectiveness" studies and are not particularly significant for caseload estimation.

The following definitions may be helpful:

Dropout Clients: clients who have either notified the clinic staff of their intention to stop attending the clinic or who have not returned to the clinic for a period of____or more months from the date of their last scheduled appointment;

1. Clinic Dropout only: clients of the above description who are using the method prescribed at the clinic but who are obtaining it from a different source;

2. Method Dropout: clients of the above description who are using some contraceptives method other than the one prescribed at the clinic and who are obtaining it from a different source;

3. Contraception Dropout: clients of the above description who are no longer using a contraceptive method of any kind.

We are not concerned with method or contraception dropouts here but only with clinic dropouts. Our major concern in computing dropout rates is to determine the number of clients who will be coming to the clinic in any given time period and the number of women who can be considered active during the time period.

The dropout definition may be as simple or complex as the program administrator wants to make it, as long as he recognizes the assumptions inherent in that definition.

d. Variable Dropout Rates in Caseload Estimation

The calculations explained above assume constant dropout rates. If they are expected to change significantly over time, an adjustment in the calculations can be made as follows:

1) by averaging the expected dropout rates

Year	Acceptors	Dropout Rate	
1970	16,000	.20	
1971	16,000	.25	Mean dropout rate =.25
1972	16,000	.30	(.20+15+.30)

Number Active Clients by end of 1972 = 16,000 x 1.73* =27,680

2) by calculating individual estimates for each year and summing the total

Year	Dropout Rates	Acceptors	Factor**	
1970	20%	16,000	x (.80)(.80)(.80)	= 8,192
1971	25%	16,000	x (.75)(.75)	= 9,000
1972	30%	16,000	x (.70)	=11,200

Total Number Active Clients by end of 1972.... 28,392

It can be seen that these two approaches yield similar estimates. The simpler first method might be adequate for most purposes and, of course, it requires much less calculation.

e. Acceptors: Definitions

The definition of an acceptor is also clinic or program oriented. We are not concerned with the number of women who are accepting contraception for the first time, for example. We are concerned with determining the number of women who enroll in our clinic or program.

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*- Rate from Table A at T_3, 25% dropout rate.

**- Rates from T ble A at T_1.

Care must be taken to define an acceptor clearly so as to avoid double counting. For example, a transfer from one clinic to another may not be considered a new acceptor to the total program but she may be a new client to the specific clinic that she transfers to. A woman who enrolls, drops out and re-enrolls (away for the summer, pregnant) should also be considered carefully. She would not normally be considered a new acceptor twice within the same dropout time interval. For example, we would not count a woman who drops out, returns, drop out again, etc., a new dropout and new acceptor every time. We may arbitrarily count her only once per year, or once every two years, or she may be considered a new acceptor every time she makes her post-pregnancy or post partum clinic visit.

f. Acceptors: Calculation Variations

The acceptance rate can be expected to fluctuate over time. If the eligible population is very small we can expect that the annual number of acceptors will decline over time as the supply of unserved eligibles declines. In some areas it is more likely that the supply will increase over time as the presently young population matures and as demand for birth control services increases among previously unserved eligibles.

If the acceptance rates are expected to change significantly over time, an adjustment in the calculations can be made as follows:

1) by averaging the expected number of acceptors

Year	Acceptors	
1970	16,000	Mean = 17,000 per year
1971	17,000	
1972	18,000	

Number of Active Clients by end of 1972 = 17,000 x 1.95*= 33,150

2) by calculating individual estimates for each year and summing the total

Enrollment Year	Acceptors	T**	No. Active
1970	16,000	x (.80)(.80)(.80)	8,192
1971	17,000	x (.80)(.80)	10,880
1972	18,000	x (.80)	14,400
Total number active by end of 1972..			33,472

*- From Table A at 20% dropout.
**- Rate From Table A at 20% dropout rate.

In some cases the rates may vary both in terms of numbers of acceptors and dropouts over time. A detailed calculation can be made by computing individual estimates for each year and summing the total as follows:

Enrollment Year	Annual Dropout Rates	Factors*	Acceptors
1970	20%, 15%, 25%	(.80)(.85)(.75) x 16,000	= 8,160
1971	25%, 30%	(.75)(.70) x 17,000	= 8,925
1972	30%	(.70) x 18,000	=14,400
	Total number active by end of 1972.....		31,485

g. Clinic Visits

There are three major types of family planning visits: initial (usually the longest visit, involving interviews, lectures and a medical examination), medical checkup (a revisit with a medical examination), and supply call (to pick-up pills, foam, condoms, etc.). In addition, there may be special types of visits, like consultations, X-ray or laboratory visits. The calculations of numbers of sessions required per year can be made for each type of visit, for medical visits only, or for all visits combined, depending on how much detail the program administrator desires. If the aim is to determine how many physicians sessions are required, then it is not necessary to calculate the number of supply calls expected in a given time period. However, if the aim is to determine how many supply sessions (or nurse hours) are required, then these estimates would be necessary. In programs where new, revisit, and supply calls are all handled at the same session, it is necessary to estimate the numbers of each type of visit that can be handled in a single session. Then, based on the numbers of each type visit expected it is possible to determine the total number of sessions that will be required at some future time period.

Estimates of number of visits made per client per time period can be made by taking a random sample from clinic records. For example, a sample of X case cards could be drawn from among those clients who enrolled one year ago. The total number of visits made over the preceeding twelve months by these clients would be recorded (by type visit, if desired). The total would then be

*- Factors from Table A at T_1, which = ($1-D_i$ = specific dropout rates.

divided by X, the number of clients in the sample, to yield an estimate of the mean number of visits made per year.

Estimates can be made for all clients and all visits or there can be individual estimates, e. g., average number of checkup medical visits per year by clients using pills.

The following are illustrations of more precise calculation procedures that take certain variations into account:

a. Variations due to distinctions between types of visits only require estimates of the average number of visits per time period by type visit. For example, the average client may make 2.5 medical visits and 3.5 supply calls per year. The calculation for 1975 based on a 20% dropout rate and 20,000 new acceptors per year would be:

Medical visits	20,000 x 3.69* x 2.5	= 194,500
Supply calls	20,000 x 3.69* x 3.5	= 258,300
	Total visits in 1975	452,800

b. Variations due to differences in contraceptive methods used. The above calculation assumes the average number of visits is the same for all clients, regardless of method. To be more precise, one may wish to separate visits by contraceptive used. IUD clients generally require fewer visits per year than pill clients. This calculation requires an estimate of the proportion of the caseload and the average visits by type contraceptive. Using the above example let us assume that the distribution is 80% oral, 15% IUD, and 5% others; that women on orals make 3.0 medical and 4.2 supply calls, IUD clients make 1.1 medical, and "other" clients make 1.8 medical and 3.1 supply calls per year.

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*- Factors from Table B at T_6, D_{20}.

Acceptors X f_B* X Average Visits per year = Total Visits in 1975

Oral (80% = 16,000 Acceptors per year)

Medical	16,000	x 3.69	x 3.0	= 177,000
Supply	16,000	x 3.69	x 4.2	= 248,000
			Sub-total	425,000

IUD (15% = 3,000 acceptors per year)

Medical	3,000	x 3.69	x 1.1	= 12,200

Other (5% = 1,000 Acceptors per year)

Medical	1,000	x 3.69	x 1.8	= 6,600
Supply	1,000	x 3.69	x 3.1	= 11,400
			Sub-total	18,000
	Grand Total Visits in 1975			455,200

h. Interpolation of Specific Factors for Dropout Rates Not Shown in Tables A and B

Tables A and B give dropout rates at 5% intervals. If a more precise rate is known or estimated, it is a simple matter to determine the factor through interpolation.

Suppose that the dropout rate is 27%. If we are using Table A, we know the factor is between the 25% and 30% columns. The factor can be calculated by adding 3/5 of the difference between the columns to the 30% factor or by subracting 2/5 of the difference from the 25% column. If the time period is T_5, the calculation is as follows:

		Factor From Table A
T_5, D_{25}	=	2.29
T_5, D_{30}	=	1.94
Difference	=	.35

Subtracting from the 25% factor:

D_{27} = (2.29) - (2/5 x .35) = 2.15

*- Factors from Table B at T_6, D_{20}.

Factor From Table A
(Cont.)

Adding to the 30% factor:

$D_{27} = (1.94) + (3/5 \times .35) = 2.15$

If there are 20,000 acceptors per year at a dropout rate of 27% annually, we can expect to have

20,000 x 2.15 = 43,000 active clients by the end of the fifth year of the program.

TABLE B

Factors for Computing Estimated Number of Clients SERVED During Any Given Time Period at Various Dropout Rates for that Time Period

Di	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Ri	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%	15%	10%	5%	0%
Time																					
T_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
T_2	2.00	1.95	1.90	1.85	1.80	1.75	1.70	1.65	1.60	1.55	1.50	1.45	1.40	1.35	1.30	1.25	1.20	1.15	1.10	1.05	1.00
T_3	3.00	2.85	2.71	2.57	2.44	2.31	2.19	2.07	1.96	1.85	1.75	1.65	1.56	1.47	1.39	1.31	1.24	1.17	1.11	1.05	1.00
T_4	4.00	3.71	3.44	3.19	2.95	2.73	2.53	2.35	2.18	2.02	1.88	1.74	1.62	1.52	1.42	1.33	1.25	1.18	1.11	1.05	1.00
T_5	5.00	4.52	4.10	3.71	3.36	3.05	2.77	2.53	2.31	2.11	1.94	1.78	1.65	1.53	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_6	6.00	5.30	4.69	4.15	3.69	3.29	2.94	2.64	2.38	2.16	1.97	1.80	1.66	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_7	7.00	6.03	5.22	4.53	3.95	3.47	3.06	2.72	2.43	2.19	1.98	1.81	1.66	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_8	8.00	6.73	5.70	4.85	4.16	3.60	3.14	2.77	2.46	2.20	1.99	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_9	9.00	7.40	6.13	5.12	4.33	3.70	3.20	2.80	2.47	2.21	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{10}	10.00	8.03	6.51	5.35	4.46	3.77	3.24	2.82	2.48	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{11}	11.00	8.62	6.86	5.55	4.57	3.83	3.27	2.83	2.49	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{12}	12.00	9.19	7.18	5.72	4.66	3.87	3.29	2.84	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{13}	13.00	9.73	7.46	5.86	4.73	3.90	3.30	2.85	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{14}	14.00	10.25	7.71	5.98	4.78	3.93	3.31	2.85	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{15}	15.00	10.73	7.94	6.08	4.82	3.95	3.32	2.85	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{16}	16.00	11.20	8.15	6.17	4.86	3.96	3.32	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{17}	17.00	10.64	8.33	6.25	4.89	3.97	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{18}	18.00	12.06	8.50	6.31	4.91	3.98	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{19}	19.00	12.45	8.65	6.36	4.93	3.98	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{20}	20.00	12.83	8.78	6.41	4.94	3.99	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{21}	21.00	13.19	8.91	6.45	4.95	3.99	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{22}	22.00	13.53	9.02	6.48	4.96	3.99	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{23}	23.00	13.85	9.11	6.51	4.97	3.99	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{24}	24.00	14.16	9.20	6.53	4.98	4.00	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00
T_{25}	25.00	14.45	9.28	6.55	4.98	4.00	3.33	2.86	2.50	2.22	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00

TABLE A

Factors for Computing Estimated Number of ACTIVE Clients at the End of Any Given Time Period at Various Dropout Rates for that Time Period

Di	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Ri	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%	15%	10%	5%	0%
Time																					
T_1	1.00	0.95	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05	0
T_2	2.00	1.85	1.71	1.57	1.44	1.31	1.19	1.07	0.96	0.85	0.75	0.65	0.56	0.47	0.39	0.31	0.24	0.17	0.11	0.05	0
T_3	3.00	2.71	2.44	2.19	1.95	1.73	1.53	1.35	1.18	1.02	0.88	0.74	0.62	0.52	0.42	0.33	0.25	0.18	0.11	0.05	0
T_4	4.00	3.52	3.10	2.71	2.36	2.05	1.77	1.53	1.31	1.11	0.94	0.78	0.65	0.53	0.43	0.33	0.25	0.18	0.11	0.05	0
T_5	5.00	4.30	3.69	3.15	2.69	2.29	1.94	1.64	1.38	1.16	0.97	0.80	0.66	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_6	6.00	5.03	4.22	3.53	2.95	2.47	2.06	1.72	1.43	1.19	0.98	0.81	0.66	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_7	7.00	5.73	4.70	3.85	3.16	2.60	2.14	1.77	1.46	1.20	0.99	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_8	8.00	6.40	5.13	4.12	3.33	2.70	2.20	1.80	1.47	1.21	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_9	9.00	7.03	5.51	4.35	3.46	2.77	2.24	1.82	1.48	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{10}	10.00	7.62	5.86	4.55	3.57	2.83	2.27	1.83	1.49	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{11}	11.00	8.19	6.18	4.72	3.66	2.87	2.29	1.84	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{12}	12.00	8.73	6.46	4.86	3.73	2.90	2.30	1.85	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{13}	13.00	9.25	6.71	4.98	3.78	2.93	2.31	1.85	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{14}	14.00	9.73	6.94	5.08	3.82	2.95	2.32	1.85	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{15}	15.00	10.20	7.15	5.17	3.86	2.96	2.32	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{16}	16.00	10.64	7.33	5.25	3.89	2.97	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{17}	17.00	11.06	7.50	5.31	3.91	2.98	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{18}	18.00	11.45	7.65	5.36	3.93	2.98	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{19}	19.00	11.83	7.78	5.41	3.94	2.99	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{20}	20.00	12.19	7.91	5.45	3.95	2.99	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{21}	21.00	12.53	8.02	5.48	3.96	2.99	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{22}	22.00	12.85	8.11	5.51	3.97	2.99	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{23}	23.00	13.16	8.20	5.53	3.98	3.00	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{24}	24.00	13.45	8.28	5.55	3.98	3.00	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0
T_{25}	25.00	13.73	8.35	5.57	3.98	3.00	2.33	1.86	1.50	1.22	1.00	0.82	0.67	0.54	0.43	0.33	0.25	0.18	0.11	0.05	0

Di = Dropout Rate Ri = Retention Rate

APPENDIX

FORMULA DERIVATIONS FOR TABLES A AND B

Tables A and B are used for a cohort that is being replaced at a constant rate and for which the dropout rate is constant over time and cohorts. The second cohort is assumed to have the same dropout rates and the same number of acceptors as the first cohort. More precise calculations that do not make these assumptions can be made by estimating the size of each cohort and the dropout curves for each cohort (rates for each time period).

In Table A the dropout rate is represented by (X) where X is 20%, 35%, etc. The converse is the retention rate (1-X) and is the basic factor used in the calculations. If the dropout rate is 20%, the factor used in the first time period is (1-.20) = (.80), which simply means that 80% of the original cohort is still active. If the number of acceptors during the time period (one month, for example) is 2,000, we know that at the end of one month we have 2,000 X .8 = 1,600 active clients. During the second time period (second month) another 20% of this cohort will be lost, and from a new cohort of 2,000, 20% will drop out. Thus, (2,000)(.80)(.80) + (2,000)(.80) = 2,880 active clients. The general formula is:

$$(1-X) + (1-X)^2 + (1-X)^3 + \ldots + (1-X)^T$$

where X = the retention rate and T = the time period. This formula can be summarized as:

$$\sum_T (1-X)^T$$

Table B differs only in that dropouts are not counted in the first time period. That is, each acceptor is counted initially since we are interested in knowing the total number of women <u>served</u> during a time period, not just the number active at the end of that time period. The general formula is expressed as:

$$1 + (1-X) + (1-X)^2 + (1-X)^3 + \ldots + (1-X)^T$$

and can be summarized as:

$$\sum_T (1-X)^{T-1}$$

FORMULA DERIVATIONS BASED ON NON-CONSTANT DROPOUT AND ACCEPTANCES RATES

Calculations based on non-constant attrition requires the estimation of individual dropout rates for each time period and/or each cohort. Non-constant acceptance rates can be accounted for by estimating individual acceptance levels for each time period and/or cohort. These nine variations are diagrammed below:

	Dropouts	Acceptors	Both
Time Period	A	D	G
Cohort	B	E	H
Both	C	F	I

Estimates based on variable dropout rates over time could be expressed as follows: cumulative percent dropouts: at the end of one month = 20%, at the end of two months = 25%, (an additional 5%) at the end of three months = 28% (an additional 3%). In this case X is a specific dropout rate for an (i)th period of time, as

$$(1-X_1) + (1-X_1)(1-X_2) + (1-X_1)(1-X_2)(1-X_3)+\ldots+(1-X_1)(1-X_2)\ldots(1-X_i)$$

which can be represented by $\sum\prod_i(1-X_i)$

where X_i= the dropout rate for a specific period of time.

Using the above example we have:

$$(1-.25) + (1-.25)(1-.05) + (1-.25)(1-.05)(1-.03) = 2.15$$

If we have 200 acceptors monthly, we will expect to have 2.15 X 200 = 430 active clients at the end of the third month.

When acceptor rates are variable we merely use different factors from Tables A or B for each cohort. For example, a constant 20% dropout rate for three groups of acceptors would be calculated as follows:

First month	:	200 acceptors	x $(1-X)^3$
Second month	:	150 acceptors	x $(1-X)^2$
Third month	:	230 acceptors	X $(1-X)$

and the general formula would be:

$$\sum A_i \ (1-X)^T$$

where A_i = a specific cohort of acceptors, X = a constant dropout rate, and T = the time period.

In cases where both dropout and acceptor rates vary, the computations become only slightly more complex. The general principle is that individual rates are estimated for each cohort of acceptors over time. For example, over a three month period we may have 200, 150 and 230 acceptors. Dropout rates for each cohort may vary over time, as: cohort J has cumulative dropout rates of 20%, 25%, and 28%; cohort K has cumulative rates of 35% and 42%; and cohort L has an initial rate of 15%. The calculation of number of active clients at the end of the first three months would be as follows:

Cohort No.	Acceptors (A)	Dropout Rates (X)	No. Active $= A_i \prod_i (1-X_i)$
J	(200)	(.20) (.05) (.03)	(200) (.80) (.95) (.97) = 147
K	(150)	(.35) (.07)	(150) (.65) (.93) = 91
L	(230)	(.15)	(230) (.85) = 196
	Total Active at the end of the three months..		434

This general formula can be expressed as:

$$\sum A_i \prod_i (1-X_i)$$