FOLLOW UP OF CONTRACEPTIVE PILLS USERS
A METHOD—«ON THE TECHNIQUES OF ANALYSIS»

by

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INTRODUCTION

After three years of experience in the national program for family planning in the U. A. R., as a statistician I came to the concolusion that it is uncommonly difficult to bring out an easy and proper method of calculating the average time of continuous regular use of contraceptive pills. This is due to many different reasons and problems which face the statistician when he seeks collecting accurate and reliable information. In the previous reports I endeavoured to discuss, analyse and find out a solution for those reasons and problems..

Here, in this survey, I hope to point out the method of the analysis of technique of follow up which may lead to calculate the average number of months in which the clients used contraceptive pills regularly as from the exact month of start onwards. The theory underlying the method used is familiar to people who work in statistics and insurance. It is based on the system of constructing life tables.

The application of the method is simple, if we assume that clients who fail to prove their continuity of regular use of pills as drop outs.

THE METHOD

Suppose that a program starts in months (1) with (y_{10}) clinets. that new clients are entering in the program every consecutive months for a total period of (n) months. with numbers $(y_{20}, y_{30}, \ldots, y_{no})$ and that clients are followed every month strating from the second.

Every one who strats using pills and fails to be followed up the next month is considered as being lost sight of and the case will be shut Of those who start. at any month we shall know how many discontinued after one, two, three ... etcs months.

After (n+1) months from the start or (n) months of follow up we can draw a table similar to that shown below :—

TABLE I

Follow up of clients in a period of n months

Months of start	No. of clients	Months of follow up-number of clients													
		1	2	3	..	..	..	..	r	..	..	..	n-1	n
1	y_{10}	y_{11}	y_{12}	y_{13}	..	..	..	..	y_{1r}	..	..	..	$y_{1,n-1}$	$y_{1,n}$
2	y_{20}		y_{21}	y_{22}	..	..	..	..	$y_{2,r-1}$	..	..	..	$y_{2,n-2}$	$y_{2,n-1}$
3	y_{30}			y_{31}	..	..	..	..	$y_{3\,r-2}$	..	..	..	$y_{3,n-3}$	$y_{3,n-2}$
..					..	..	..	..	..	..	..	..	..	..
..						..	..	..	..	..	..	..	..	..
..							..	..	..	..	..	..	..	..
r	y_{ro}								$y_{r,1}$				$y_{r,n-r}$	$y_{r,n-r+1}$
..										..	..	..	..	..
..											..	..	..	..
..												..	..	..
n—1	$y_{n-1,o}$												$y_{n-1,1}$	$y_{n-1,2}$
n	y_{no}													$y_{n,1}$

It is clear that clients starting during the first month will be followed up for n months, those strating during the second month will have n—1 follow up and those starting during the n th months will have one follow up. Also it is obvious that the number of strting clients in any months is equal or bigger than the number in next month (i. e.) $y_{10} \geqslant y_{11}$ and in general $y_{r,j} \geqslant y_{r,j+1}$

where r = month of start

and j = « « follow up

Now if the drop out rate is not changing by elapse of time, there is no reason why the information in the above table should not be amalgamated in a life table form.

The next step of procedure for construction of a life table is to rearrange the data in table—1—using the order of follow up instead of the month as shown in table II

TABLE II

Number of clients arranged according to order of follow up

Months of Start	No. of starting Clients	Order of follow up—No. of clients (none lost sight of)																	
		1	2	3	..	..	..	..	r	..	..	..	n—1	n
1	y_{10}	y_{11}	y_{12}	y_{13}	..	..	..	..	y_{1r}	..	..	..	$y_{1,n-1}$	$y_{1,n}$
2	y_{20}	y_{21}	y_{22}	y_{23}					y_{2r}				$y_{2,n-1}$	
3	y_{30}	y_{31}	y_{32}	y_{33}					y_{3r}		$y_{2,n-2}$			
..										..				
..										..				
..									..					
..								..						
r	y_{r0}	y_{r1}	..	..	..	..	$y_{r,n-1+1}$							
..					..									
...				...										
...				..										
n—1	$y_{n-1,0}$	$y_{n-1,1}$	$y_{n-1,2}$											
n	$y_{n,0}$	$y_{n,1}$												

From the data in the columns of the above table, we can calculate the probabilities of regular attendance (continuous use of pills) in each months. Calculations may be somewhat laborious if the the number of months of follow up is exentsive. The probabilities of drop out are the compliements of the probabilities of regular attendance. From now onwards we shall use :

P_x for the probability of regular attendance in months x

and q_x « « « « drop out « « x

These two probabilities resemble the probabilities of surviving and dying in ordinary life tables.

CALCULATIONS

1. Calculation of P_x

(*a*) Number of clients starting using pills :

$$y_{10} + y_{20} + y_{30} + \cdots + y_{r0} + \cdots + y_{n0} = \sum_{1}^{n} y_{r0}$$

(*b*) Number of clients followsd up the next month ater starfting :

$$y_{11} + y_{21} + y_{31} + \cdots\cdots + y_{r1} + \cdots\cdots + y_{n1} = \sum_{1}^{n} y_{r1}$$

(*c*) ... Probability of using pills for the first months from starting :

$$P_1 = \sum_{1}^{n} y_{r1} \; / \; \sum_{1}^{n} y_{ro}$$

(*d*) Of the $\sum_{1}^{n} y_{r1}$ who use the pills, no further history is known of y_{n1}

Therefore we are left with $\sum_{1}^{n} y_{r1} - y_{n1} = \sum_{1}^{n-1} y_{r1}$

who are exposed to discontinuity of pill use during the second follow up.

(*e*) Of $\sum_{1}^{n-1} y_{r1}$, the number of regular users is equai to :

$$y_{12} + y_{22} + y_{32} + \ldots\ldots + y_{r2} + \ldots\ldots + y_{n-1,2} = \sum_{1}^{n-1} y_{r2}$$

(*f*) Probability of using pills for the first 2 months from starting :

$$P_2 = \sum_{1}^{n-1} y_{P2} \; / \; \sum_{1}^{n-1} y_{r1}$$

(*g*) Continuing in the same manner we can calculate all P 's.

2. $q_x = 1\text{-}P_x$ ($x = 1, 2, 3, \ldots$ n months)

3. To complete the other elements necessary for the construction of the life table, we calculate :

(*a*) R_x = number of regular users at exact month x

The number we use for the starting month is immaterial, and let it be 100,000.

$\therefore \; R_1 = 100.000$

To find R_2 we multiply R_1 by P_1 (i.e.)

$$R_2 = R_1 \times P_1$$

and in general $R_{x+1} = R_x \times P_x$

(*b*) d_x = the number of drop outs between month x and month x + 1

$d_1 = R_1 - R_2$ or $R_1 \times q_1$

and in general $d_x = R_x - R_{x+1}$ or $R_x \times q_x$

(*c*) M_x = total number of months of regular use between months $M_{1=1/2}$ $(R_1 + R_2)$ or $M_1 = R_1 - 1/2\ d_1$

and in general $M_x = 1/2\ (R_x + R_{x+1})$ or $M_x = R_x - 1/2\ d_x$

(*d*) T_x = total months of regular use after exact month x.

This is an intermediate step in calculating the average number of months of regular use from exact month. x

$$T_1 = M_1 + T_2 \text{ or } T_1 = \sum_{1}^{n} M_x$$

and in general $T_x = M_X + T_{x+1}$ or $T_x = \sum_{x}^{n} M_x$

(*e*) e_x = the mean expectation of regular use or the average number of months of regular use after reaching month x $e_x = T_x / R_x$

This is the expected future of regular use of pills.

The following table is the final form of the life table :

TABLE III

Follow up life table

Months	Prob. of drop out bet.x & x+1 q_x	Prob. of regular use bet.x & x+1 P_x	No. of drop out bet. x & x+1 d_x	No. fo regalar users at exact month x R_x	Total months of reg use bet x & x+1 M_x	Total months of reg. after month x T_x	Expect. of reg. use after month x e_x
1	q_1	P_1	d_1	R_1	M_1	T_1	e_1
2	q_2	P_2	d_2	R_2	M_2	T_2	e_2
3	q_3	P_3	d_3	R_3	M_3	T_3	e_3
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
n—1	q_{n-1}	P_{n-1}	d_{n-1}	R_{n-1}	M_{n-1}	T_{n-1}	e_{n-1}
n				R_n			

Although the information given in the above table will answer many questions of the problems we are facing in the U.A.R. pill program, yet it is needless to say that to have proper and releable data for table—1—required a good design and concansious personnel for collection of information. In a report about follow up of clients in the U.A.R. pill program, I tried to develop a method of follow up which can work under our circumstances and by our people. However, I believe, that it is much better to try this method first, in a research project which can be regulated and designed to give accurate information.

NUMERICAL EXAMPLE

In this example, all figures are hypothetical. Table one is for data of follow of a sample of clients during 12 months.

Months of start	No. of clients starting	Months of follow up—number of clients										
		1	2	3	4	5	6	7	8	9	11	11
1	124	110	86	70	60	52	44	37	32	29	26	24
2	175		160	128	103	91	82	74	64	55	46	40
3	95			82	65	51	41	33	27	22	19	16
4	119				106	85	68	59	50	43	38	33
5	185					168	134	109	98	89	80	91
6	104						97	72	58	48	42	35
7	117							104	80	66	60	53
8	100								89	73	62	51
9	88									79	64	53
10	121										110	85
11	98											88

Table II — Rearrangment of figures according to order of follow up.

Months of strat	No. of clients start	Order of follow up—No. of clients (none lost sight of)										
		1	2	3	4	5	6	6	8	9	10	11
1	124	110	86	70	60	52	44	37	32	29	26	24
2	175	160	128	103	91	82	74	64	55	46	40	
3	95	82	65	51	41	33	27	22	19	16		
4	119	106	85	68	59	50	43	38	33			
5	185	168	134	109	98	89	80	71				
6	104	92	72	58	48	42	35					
7	117	104	80	66	60	53						
8	100	89	73	62	51							
9	88	79	64	53								
10	121	110	85									
11	98	88										

ANALYSIS AND RESULTS

1. $\sum_{1}^{11} y_{ro} = 124 + 175 + \ldots\ldots + 98 = 1326$

2. $\sum_{1}^{11} y_{r1} = 110 + 160 \qquad\qquad + 88 = 1188$

3. $\therefore P_1 = \sum_{1}^{11} y_{r1} \;/\; \sum_{1}^{11} y_{ro} = 1188 - 1326 = 0.89593$ & $q_1 = 1 - 0.89593 = 0.10407$

4. $\sum_{1}^{10} y_{r1} = \sum_{1}^{11} y_{r1} - y_{1,11} = 1188 - 88 = 1100$

5. $\sum_{1}^{10} y_{r2} = 86 + 128 + \ldots\ldots + 86 = 872$

6. $\therefore P_2 = \sum_{1}^{10} y_{r2} \;/\; \sum_{1}^{10} y_{r1} = 872 + 1100 = 0.79273$ and $q_2 = 1 - 0.79273 = 0.30727.$

7. Coninuing in the same manner we get P_3 . P_4 . ....., P_{11}

8. $R_1 = 100.000$

& $R_2 = R_1 \times P_1 = 100,000 \times 0.89593 = 89593$

$R_3 = R_2 \times P_2 = 89593 \times 0.79273 = 71023$

9. $d_1 = R_1 - R_2 = 100.000 - 89593 = 10407$

$d_2 = R_2 - R_3 = 89593 - 71023 = 18570$

10. $M_1 = 1/2 (R_1 - R_2) = 1/2 (100.00 + 89593) = 94797$

$M_2 = 1/2 (R_2 + R_3) = 1/2 (89593 + 71023) = 80308$

11. $T_1 = \sum_{1}^{11} M_x = 94797 + 80308 + \ldots + 20758 = 518060$

$$T_1 = \sum_{1}^{11} M_x = 80308 + \ldots\ldots\ldots\ldots\ldots + 20758$$

$$= 423263$$

12. $e_1 = T_1 / R_1 = 518060 \div 100{,}000 = 5.2$ months

$e_2 = T_2 / R_2 = 423263 \div 89593 = 4.7$ months

TABLE III

Follow up life table

Month	Prob. of drop out bet. x & x+1 q_x	Prob. of regular use bet. x & x+1 P_x	No. of drop out bet. x & x+1 d_x	No. of regular users at month x R_x	total months of reg x & x+1 M_x	total months of reg after month x T_x	Expect. of reg. use after month x e_x
1	0.10407	0.89593	10407	100 000	94797	518660	5.2
2	0.20727	0.79273	18590	89593	80308	423263	4.7
3	0.18679	0.81321	13266	71023	64390	342955	4.8
4	0.13458	0.86542	7773	57757	53871	278565	4.8
5	0.12254	0.87746	6125	49984	46922	224694	4.5
6	0.12931	0.87069	5671	43859	41024	177772	4.1
7	0.13433	0.86567	5130	38188	35623	136748	3.6
8	0.13665	0.86335	4517	33058	30800	101125	3.1
9	0.14151	0.85847	4039	28541	26522	70325	2.5
10	0.10811	0.89189	2914	24502	23045	43805	1.8
11	0.01692	0.92308	1661	21588	20758	20758	1.0

This table shows that the average number of future months of regular use for a new comer is 5.2 and for those who were regularly using the pills for four months is 4.5.

Also we can say that the percentage of regular users after 6 months from the start will be 43.859.

It is also clear that we can deduce other kinds of informtion from the above table.

CONCLUSION

This is an endeavour on the way of analysing follow up information.

I have chosen this side of the analysis on believing that it may help to answer the question of expectancy of regular use of pills.

REFERENCE

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