

Forecasting of Contraceptive Demand and Supply in Thailand During 1982-1986 the Fifth Five-Year plan*

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Introduction

Since March 1980, when the Thai government announced its national population policy aimed at reducing the population growth rate through a voluntary family planning program, the country has witnessed a continuous decline in population growth rate from over 3 percent per annum in 1970 to about 2 percent per annum in 1981. Nonetheless, the present rate of population growth is still considered relatively high and a hindrance to national social and economic development. By the end of the Fifth Five Year Plan (1982-1986), the Thai government hopes to reduce the population growth rate to 1.5 percent per annum. Even though there are trends and studies indicating that the target is feasible¹, it is still uncertain whether the contraceptive demand and supply are adequate enough to realize the target. As the realization of the target is vital to the success of the country's national development in various fields, there is a need to study the country's demand and supply of contraceptives during the Fifth Plan.

An attempt was made by Mr. Anthony F. Boni in 1980 to assess Thailand's contraceptive requirements during the Fifth Five Year Plan, focusing on making projections of method-specific contraceptives exclusively supplied by the National Family Planning Program (NFPP)². Female sterilization and male vasectomy were, however, excluded from the study despite the fact that these permanent contraceptive methods have been increasingly attractive to married couples at 30 year and over age group.

*This is a revised version of the research project, Contraceptive Demand and Supply Survey-Thailand : 1982-1986 Commissioned by United Nations Fund for Population Activities in 1983.

Based on the findings of the 1978 Contraceptive Prevalence Survey (CPS) and continuation rate surveys for pills, IUDs, injectable contraceptives, and projected new acceptor figures for 1982 to 1986, Boni obtained the projected annual contraceptive demand to be serviced by the NFPP over the Plan period. According to the projections, the NFPP would have to provide an all-four-method coverage rate of 40 percent of all married women at reproductive age in 1986. When the figure was adjusted for other non-NFPP supply sources and also for sterilization and vasectomy, a contraceptive prevalence of 69 percent was projected for the year.

As observed by Boni, projections of contraceptive requirements are quite a complicated process that not only takes into account of all relevant information and limited data available but also involves a set of assumptions on future availability of fundings for contraceptive supplies. Since these elements are constantly changing, a revised and updated projection of contraceptive needs by making use of most-up-to-date information is deemed necessary for a more accurate assessment of the national contraceptive demand and supply during the Fifth Plan.

Objective of the Study

The present study attempts to make an in-depth analytical study of Thailand's contraceptive demand and supply, with the more recent demographic data, family planning service statistics and other relevant information that were neither accessible to Boni nor available at the time of his study. An attempt will also be made to compare the findings of the present study with Boni's.

Major Sources of Data

The major sources of data are :

- 1) The 1960, 1970 and 1980 Population and Housing Censuses
- 2) The 1979 and 1981 Contraceptive Prevalence Surveys (CPS)
- 3) National Family Planning Project (NFPP) Service Statistics, 1965-1981
- 4) Survey of Fertility in Thailand, 1975 (SOFT)
- 5) National Longitudinal Survey, 1969/1970 and 1972/1973
- 6) "Population Projections for Thailand : Whole Kingdom and Regions 1970-2000", by NESDB's Working Group on Population Projection
- 7) Other demographic surveys and studies
- 8) Survey of Production Facilities in the Private Sector.

Methodological Procedures : Demand Side

Future Contraceptive demand and supply can be estimated by several methods. To a considerable extent, the choice of method(s) is dependent on the availability of required data, a thorough knowledge and evaluation of the method(s).

The present study relies heavily on statistical analyses. Nonetheless, there are occasions in which the statistical analyses have to be supplemented by intuitive and subjective assessment of probable future situations.

The empirical or statistical procedures used in the study can be briefly outlined as follows :

- 1) Projection of currently married women at reproductive age
- 2) Projection of new acceptors by method
- 3) Projection of active users by method
- 4) Estimate of contraceptive requirements
- 5) Analysis of capacity of local contraceptive production

Projection of Currently Married Women at Reproductive Age

Based on the 1960 Population Censuses and the 1975 Survey of Fertility Survey, the percentage distributions of currently married women at reproductive age (15-49) are used to compute a 10-year average of percentage decline in currently married women at reproductive age group (Table 1).

The percentage distributions of currently married women in 1970 to 1986 are estimated, using the percentage distribution of women currently married in 1970 as a starting point and applying the derived percentage change to the 1970 percentage distribution (Table 2).

By applying the derived percent of currently married women to the number of women at reproductive age estimated by the NESDB's Working Group on Population Projection (Table 3), we obtain the first set of estimated number of currently married women by age group from 1971 to 1986 (Table 4). Boni's estimate seems to have been underestimated. The difference increases from 3.8 percent in 1981 to 11.9 percent in 1986.

Table 1 Percent of Currently Married Women Aged 15-49, 1960-1980

Age	1960 ¹	%Δ	1973 ¹	%Δ	1975 ²	%Δ	1980 ³	Change 1970-80	Average Change
15-19	12.5	+ 5	17.5	- 3.1	14.4	+ 1.3	15.7	- 1.8	- 0.18
20-24	56.4	+ 1.5	57.9	- 3.0	54.9	- 0.4	54.5	- 3.4	- 0.34
25-29	79.6	- 0.4	79.2	- 2.5	76.7	- 1.1	75.6	- 3.6	- 0.36
30-34	86.1	- 0.6	85.5	- 1.5	84.0	- 1.4	82.6	- 2.9	- 0.29
35-39	86.4	+ 0.4	86.8	- 0.3	86.5	- 2.7	83.8	- 3.0	- 0.70
40-44	82.7	+ 1.9	84.6	- 0.6	85.2	- 0.9	84.3	- 0.3	- 0.03
45-49	77.3	+ 2.8	80.1	+ 3.9	84.0	- 4.3	79.7	- 0.4	- 0.04
15-49	56.5	.0	56.5	- .2	56.3	- 1.2	55.1	- 1.4	- 0.14

Source : 1 1960 and 1970 Population and Housing Censuses

2 SOFT

3 Preliminary Report of 1980 Population and Housing Census (1% Sample)

Table 2 Estimated Percent of Currently Married Women 15-49, 1970-1986

Year	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1970 ¹	17.5	57.9	79.2	35.5	86.3	84.6	80.1
1971	17.3	57.6	78.8	85.2	86.5	84.6	80.1
1972	17.1	57.2	78.5	84.9	86.2	84.6	80.0
1973	17.0	56.9	78.1	84.6	85.9	84.5	80.0
1974	16.8	56.5	77.8	84.3	85.6	84.5	80.0
1975	16.6	56.2	77.4	84.0	85.3	84.5	79.9
1976	16.4	55.8	77.0	83.8	85.0	84.4	79.9
1977	16.2	55.5	76.7	83.5	84.7	84.4	79.9
1978	16.1	55.2	76.3	83.2	84.4	84.4	79.8
1979	15.9	54.8	76.0	82.9	84.1	84.4	79.8
1980 ¹	15.7	54.5	75.6	82.6	83.8	84.3	79.7
1981	15.5	54.2	75.2	82.3	83.5	84.3	79.7
1982	15.3	53.8	74.9	82.0	83.2	84.2	79.6
1983	15.2	53.5	74.5	81.7	82.9	84.2	79.6
1984	15.0	53.1	74.2	81.4	82.6	84.2	79.5
1985	14.8	52.3	73.3	81.1	82.3	84.1	79.5
1986	14.6	52.5	73.4	80.9	82.0	84.1	79.5

Source : 1 Same as Table 1

Remark : The estimated proportions are based on the average proportion of currently married women during 1970-1980.

Table 3 Projected Number of Women at Reproductive Ages ('000)

Year	15-19	20-24	25-29	30-34	35-39	40-44	45-49	15-44	15-49
1971	1,981	1,687	1,325	1,044	934	825	694	7,796	8,490
1972	2,032	1,743	1,400	1,081	939	850	713	8,045	8,758
1973	2,088	1,799	1,472	1,123	951	873	733	8,806	9,039
1974	2,149	1,355	1,540	1,172	969	894	753	8,579	9,882
1975	2,216	1,911	1,606	1,226	992	912	773	8,863	9,636
1976	2,300	1,957	1,662	1,303	1,023	912	800	9,175	9,957
1977	2,352	2,009	1,718	1,377	1,060	917	825	9,433	10,258
1978	2,463	2,065	1,774	1,443	1,102	929	843	9,781	10,629
1979	2,544	2,126	1,830	1,516	1,150	947	868	10,113	10,981
1980	2,622	2,192	1,886	1,581	1,203	970	886	10,454	11,340
1981	2,729	2,276	1,932	1,637	1,279	1,001	886	10,854	11,740
1982	2,820	2,358	1,983	1,692	1,353	1,037	892	11,243	12,135
1983	2,896	2,439	2,039	1,748	1,423	1,079	904	11,624	12,528
1984	2,955	2,519	2,100	1,804	1,491	1,126	921	11,995	12,916
1985	2,998	2,598	2,166	1,860	1,555	1,179	945	12,356	13,301
1986	2,986	2,705	2,249	1,906	1,610	1,254	975	12,710	13,685

Source : Working Group on Population Projection "Population Projections for Thailand : Whole Kingdom and Regions 1970-2000", July 1981.

Table 4 Projected Number of Currently Married Women ('000)

Year	Age										Boni ¹	Ratio ²
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	15-44	15-49			
1972	347	997	1,099	918	809	719	571	4,889	5,460	-	-	
1973	355	1,024	1,150	950	817	738	586	5,034 (3.0)	5,620 (2.9)	-	-	
1974	361	1,048	1,198	988	829	755	602	5,179 (2.9)	5,781 (2.9)	-	-	
1975	368	1,074	1,243	1,030	846	771	618	5,332 (2.9)	5,950 (2.9)	-	-	
1976	377	1,092	1,230	1,092	870	769	639	5,480 (2.8)	6,119 (2.8)	-	-	
1977	386	1,115	1,318	1,150	898	774	659	5,641 (2.9)	6,300 (2.9)	-	-	
1978	396	1,140	1,354	1,205	980	784	677	5,809 (3.0)	6,436 (2.9)	-	-	
1979	404	1,165	1,391	1,257	967	756	693	5,940 (2.3)	6,633 (2.3)	-	-	
1980	412	1,195	1,426	1,306	1,008	773	706	6,114 (2.9)	6,820 (2.8)	-	-	
1981	423	1,234	1,453	1,347	1,068	844	706	6,369 (4.2)	7,075 (3.4)	6,138	1.038	
1982	431	1,269	1,435	1,387	1,126	873	710	6,571 (3.2)	7,281 (2.9)	6,224	1.056	
1983	440	1,305	1,519	1,428	1,180	903	720	6,780 (3.2)	7,500 (3.0)	6,331	1.071	
1984	443	1,333	1,558	1,468	1,232	943	732	6,984 (3.1)	7,719 (2.9)	6,434	1.086	
1985	444	1,372	1,599	1,508	1,280	991	751	7,194 (3.0)	7,945 (2.9)	6,535	1.101	
1986	436	1,420	1,651	1,542	1,320	1,055	775	7,424 (3.2)	8,199 (3.2)	6,632	1.119	

Source : Derived from applying the proportions in Table 2 to the projected women in Table 3

1. Boni's estimate of MWRA of 15-44 years
2. Ratio of MWRA of 15-44 years to Boni's estimate

Remarks : Figures in parentheses are annual percentage increases in the MWRA.

Projection of New Acceptors by Method

The projection of the number of new acceptors by method is based on analysis of trends of absolute numbers of contraceptive users by method.

Table 5 shows the distribution of new family planning acceptors by method. Data clearly show that pills, accounting for about 60 percent of the new family planning acceptors each year, are the most popular contraceptive method among the Thais. Second in popularity is sterilization, followed closely by DMPA. Declining in popularity is the IUD. Annual changes in new acceptors by method are more clearly shown by an index of new family planning acceptors with 1972 as the base year (Table 6).

The rates of new acceptors by method, as measured by percent of currently married women (aged 15-49) who practice a particular contraceptive method, are shown in Table 7. Figure 1 shows trends of contraceptive rates by method.

Given the set of data, we are now in a position to project new acceptors, by applying a regression method of time series analysis to the set of data for fitting the trend of contraceptive use by method. Table 8 shows the best fit equations (that have been identified as the best fitting ones) derived from the time series analysis to be used for projecting new acceptors.

Based on equations 1-5, the number of new acceptors by method are projected. The results are shown in Table 9.

Table 9 indicates that the pill will remain in most popular method during the Fifth Five Year Plan, followed to a much lesser degree by DMPA and sterilization.

Table 5 Number and Percentage Distribution of New Family Planning Acceptors by Method, 1969-1981

Year	IUD	Pill	STR ^a	DMPA ^b	Condom	Total ^c
Number						
1965-1971 ¹	336,392	905,314	105,032	6,787	NA	953,525
1972	90,128	237,582	32,668	6,316	NA	456,694
1973	93,449	263,674	49,606	10,447	NA	422,176
1974	89,739	305,244	80,482	19,104	NA	494,479
1975	75,163	345,117	90,084	24,559	NA	535,023
1976	71,894	376,707	105,281	73,357	37,656	664,895
1977	74,794	488,765	125,939	68,714	69,393	827,605
1978	77,720	557,822	168,551	86,620	48,519	939,292
1979	78,082	614,525	174,032	117,951	54,286	1,038,876
1980	79,378	693,610	182,786	149,744	55,013	1,160,531
1981	80,134	634,902	177,404	170,491	61,645	1,124,576
Percent						
1965-1971 ¹	(35.1)	(53.2)	(11.0)	(0.7)	NA	100.0
1972	(19.7)	(71.7)	(7.2)	(1.4)	NA	100.0
1973	(22.1)	(63.6)	(11.8)	(2.5)	NA	100.0
1974	(18.2)	(61.6)	(16.3)	(3.9)	NA	100.0
1975	(14.0)	(64.5)	(16.9)	(4.6)	NA	100.0
1976	(10.8)	(56.7)	(15.8)	(11.0)	(5.7)	100.0
1977	(9.0)	(59.1)	(15.2)	(3.3)	(8.4)	100.0
1978	(8.3)	(59.4)	(17.9)	(9.2)	(5.2)	100.0
1979	(7.5)	(59.1)	(16.8)	(11.4)	(5.2)	100.0
1980	(6.8)	(59.8)	(15.8)	(12.9)	(4.7)	100.0
1981	(7.1)	(56.6)	(15.9)	(15.2)	(5.5)	100.0

Source : Research and Evaluation, National Family Planning Program, Data Sheet, 1982.

¹ The 1965-1971 period is the period before the inclusion of family planning program in the Five Year National Economic and Social Development Plan. ² Male vasectomy is also included. ³ DMPA service is available in 1970. ⁴ For 1965-1975, condoms are excluded.

Table 6 Index of New Family Planning Acceptors by Method, 1972-1981
(1972 = 100)

Year	IUD	Pill	STR	DMPA	Total
1972	100	100	100	100	100
1973	103.7	82.0	151.8	165.4	92.4
1974	99.6	93.2	246.4	302.5	108.3
1975	93.4	105.4	276.1	388.8	117.2
1976	79.8	115.0	322.3	1161.4	145.6
1977	83.0	249.2	385.5	1087.9	181.2
1978	86.2	170.3	516.0	1371.4	205.7
1979	86.6	187.6	532.7	1867.5	227.5
1980	88.1	199.5	559.5	2370.9	233.3
1981	88.9	192.3	543.1	2699.4	246.2

Table 7 New Acceptor Rates per 100 MWRA, 1972-1981

Year	Pill	IUD	DMPA	STR	Condom
1972	4.35	1.65	.12	.60	-
1973	4.78	1.66	.19	.38	-
1974	5.28	1.56	.33	1.39*	-
1975	5.80	1.26	.41	1.51	-
1976	6.16	1.17	1.20	1.72	.61
1977	7.76	1.19	1.09	2.00	1.10
1978	8.60	1.20	1.34	2.60	.75
1979	9.26	1.18	1.78	2.62	.82
1980	9.58	1.16	2.20	2.68	.81
1981	8.97	1.13	2.41	2.51	.87

*The figures from 1974 onwards included vasectomy.

Table 8 Regression Equations Used in Projecting New Acceptors by Method

Method	No.	Equation	R ²	Year
Number				
Pill	1	$\ln Y = 12.40393 + 0.10533t$	0.9008	1972 = 1
IUD	2	$\ln Y = 11.39014 - 0.01670t$	0.81969	1972 = 1
DMPA	3	$\ln Y = 10.8723 - 0.19607t$	0.9667	1976 = 1
STR	4	$Y = 20080.2 + 17929.655t$	0.99906	1976 = 1
Condom	5	$Y = 46161.467 + 2359.2t$	0.4054	1976 = 1

Table 9 Projected Number and Rate of New Acceptors by Method, 1982-1986

Year	Pill	IUD	STR	DMPA	Condom	Total
Number						
1982	776,440	73,665	217,306	207,892	62,675	1,337,973
1983	362,679	72,444	235,236	252,924	65,035	1,488,118
1984	958,496	71,244	254,165	307,710	67,394	1,658,990
1985	1,064,955	70,064	271,095	374,263	69,753	1,850,230
1986	1,183,239	68,904	289,025	455,453	72,112	2,063,733
Percent						
1982	58.0	5.5	16.2	15.6	4.7	100.0
1983	58.0	4.9	15.8	17.0	4.4	100.0
1984	57.8	4.3	15.3	18.6	4.1	100.0
1985	57.6	3.8	14.7	20.1	3.8	100.0
1986	57.2	3.8	14.0	22.0	3.5	100.0

When the projected number of new acceptors (Table 9) is divided by the projected number of MWRA (Table 4) a set of rates of new acceptors by method is derived (Table 10).

Table 10 Projected Rates of New Acceptors per 100 MWAR by Method, 1982-1986

Year	Pill	IUD	STR	DMPA	Condom	Total
1982	9.1	0.9	2.6	2.4	0.7	15.8
1983	9.8	0.8	2.7	2.9	0.7	17.0
1984	10.6	0.8	2.8	3.4	0.7	18.3
1985	11.4	0.7	2.9	4.0	0.7	19.7
1986	12.2	0.7	3.0	4.7	0.7	21.3

Projection of Active Users by Method

To compute the number of active users for each method at the end of each year, we require information on continuation rates of a group of acceptors who still use the method (s) at a given point of time. Two sets of data on continuation rates are utilized; one is 6-month interval continuation rates and the other is monthly continuation rates. A general formula used in computing continuation rates is a well-know exponentially decayed function as suggested by Mauldin⁴ and Zatuchini⁵ and its modified version by Kelley⁶.

$$c = a e^{-rt}$$

c = continuation rate at time t

a = a constant indicating the percentage of initial acceptors who stay in the program beyond their first visit

e = the natural logarithm base with the value of 2.713

r = the continuation rate of decline in the continuation rate

t = time expressed in months since acceptance.

Transform the function into a natural loglinear form and apply the linear regression technique using the transformed function to the available data on continuation rates, Table 16 presents data on continuation rates the pill, IUD and DMPA. The continuation rates of the condom and sterilization (a permanent method) require a special assumption and treatment due to unavailability of data and information.

Table 11 Continuation Rate and Projecting Equation by Method

Method and Equation	Month							
	6	12	13	24	30	36	42	48
Continuous User								
Pill	76	64	56	49	44	33	33	27
IUD	82	75	68	65	59	54	48	48
DMPA	84	60	48	40	31	25	-	-
Equation								
IUD	$\ln C = 4.478 - 0.0134t; R^2 = .993$							
	$C = 88.1 e^{-0.0134t}$							
Pill	$\ln C = 4.461 - 0.0235t; R^2 = .998$							
	$C = 86.6 e^{-0.0235t}$							
DMPA	$\ln C = 4.612 - 0.0392t; R^2 = .996$							
	$C = 100.6 e^{-0.0392t}$							

Based on the equations(s) with the passage of time of 6-month intervals, we obtain estimated continuation rates of the three methods (Table 12). The estimated rates closely correspond with actual survey rates of each method, indicating the reliability of the estimating procedure.

Table 12 Estimated and Actual Continuation Rates by Method (Set II)

Months	Pill		IUD		DMPA	
	Estimated	1981 Survey Rate	Estimated	1977 Survey Rate	Estimated	1973 Survey Rate
0	86.6	-	88.1	-	100.7	-
6	75.2	76	81.3	82	79.6	84
12	63.3	64	75.0	75	62.9	60
18	56.8	56	69.1	68	49.8	48
24	49.3	49	63.3	65	39.3	40
30	42.8	44	58.9	59	31.1	31
36	37.3	38	54.3	54	24.6	25
42	32.3	33	50.1	48	19.4	-
48	28.1	27	46.2	48	15.4	-
60	21.2	-	39.4	-	9.6	-
72	16.0	-	33.5	-	6.0	-
96	9.1	-	24.0	-	2.3	-
108	6.9	-	20.7	-	1.5	-
120	5.2	-	17.6	-	0.9	-

Special treatment is needed to estimate rates of sterilization and condom acceptors. Sterilization is a permanent method. The loss of users, which is more or less a statistical equivalent of discontinuation of the method, is mainly due to death or passing the reproductive age boundary.

The life table technique can be used to adjust for the drop-out of STR acceptors. First of all, we need the number of new STR acceptors by age groups, 15-49. The percentage distribution of the new STR acceptors was available only from the Research and Evaluation Unit's Report on Characteristic Analysis of Acceptors for 1977. The other source of information was in the 1980 Census Preliminary Report. Thus, the age structure of new STR acceptors during 1965-1976 is arbitrarily assumed to be that of the 1977 new acceptors. The age pattern of new acceptors during 1978-1981 is assumed as that of the 1980 Census Report. The two sets of age structures of new STR acceptors are presented in Table 13.

Table 13 Age Structure of Female Sterilization (STR)

Age	Percent	
	1971 ¹	1980 ²
15-19	0.90	0.26
20-24	19.60	5.84
25-29	32.80	19.28
30-34	25.70	24.90
35-39	16.70	24.49
40-44	3.90	16.95
45-49	0.40	8.28
Total	100.0	100.0

Sources : 1 Research and Evaluation Unit, "Characteristics Analysis of Acceptors for 1977"
 2 Computed from Preliminary Report of 1980 Population and Housing Census.

Five sets of survival rates from the "West" Model Life Table are selected on the assumption of life expectancy at birth for females of about 61.57, 63.19, 64.76, 66.19, 67.60 years for the periods 1970-1975, 1975-1980, 1980-1985, 1985-1990 and 1990-1995 respectively (Table 14). A computer is used to compute the number of new STR acceptors surviving to next five-year period to 1995. Then, an interpolation technique is applied to get single-year survivors of STR acceptors during 1968-1986. The vertical summation of single-year survivors will provide the number of expected active users for STR for the end of each year during the period. The mid-year expected survivors of STR acceptors can be obtained by the same procedure discussed earlier.

Table 14 Survival Rates to be Applied to Sterilization Acceptors, 1970-1990

Age	Year				
	1970	1975	1980	1985	1990
Birth	.921392	.930116	.933261	.945667	.953443
0-4	.9762111	.9817021	.9830803	.9868670	.9895990
5-9	.9913984	.9930227	.9940813	.9949726	.9957539
10-14	.9911935	.9923431	.9934247	.9943323	.9951466
15-19	.9877238	.9392120	.9906127	.9917903	.9928676
20-24	.9843186	.9865301	.9382402	.9896393	.9909183
25-29	.9824082	.9843774	.9862362	.9878027	.9892368
30-34	.9794627	.9816146	.9336521	.9853861	.9869739
35-39	.9754618	.9777411	.9799076	.9817604	.9834542
40-44	.9693432	.9716920	.9739350	.9758639	.9776400
45-49	.9587581	.9614055	.9639429	.9661469	.9681703
50-54	.9422603	.9454619	.9435373	.9512274	.9537045

Applying the derived continuation rates of the pill, IUD, DMPA, condom, and survival rates to the projected annual cohorts of new acceptors and the registered annual cohorts of new acceptors before 1982, we obtain the remaining users at a specific point of time. The summation of all continuous users of a contraceptive method of different cohorts at a single point of time is the total number of active users at the point of time (Table 15).

Table 15 Mid-Year Projected Number of Active Users (1000 users)

	1981	1982	1982	Actual	1984	1985	1986
				1983			
IUD ¹	314.4	325.1	259.2	331.5	336.1	339.1	340.1
Pills ¹	1347.6	1477.5	1052.3	1050.1	1839.9	2049.3	2280.3
DMPA ¹	201.6	245.1	307.1	298.2	362.8	441.4	519.5
Sterilization ²	1044.8	1204.9	1263.3	1369.4	1508.2	1622.2	1714.9
Condoms ³	54.9	51.3	N.A.	43.7	42.5	43.6	45.1
Total NFPP users	2963.1	3303.9		3693.1	4089.5	4495.6	4900.4

- Notes : 1 Calculated, using estimated number of new acceptors and continuation rate.
 2 Calculated, using estimated number of new acceptors and survival rate for women at 30 years old.
 3 Calculated, using the estimated number of new acceptors and a continuation rate of 50 percent.

Table 16 shows the percentage of currently married women of reproductive age who are active users of contraceptives provided by the National Family Planning Program. The percentage (or the contraceptive prevalence rate) increases from 47.2 in 1981 to 67.7 in 1986.

Table 16 Projected Percent age of MWRA Provided Coverage by the NEPP

Method	1981	1982	1983	1984	1985	1986
IUDs	5.0	5.0	5.0	4.9	4.8	4.7
Pills	21.5	22.9	24.3	26.9	29.2	31.5
DMPA	3.2	3.8	4.5	5.3	6.3	7.2
Sterilization	16.6	18.7	20.6	22.1	23.1	23.7
Condoms	0.9	0.8	0.7	0.6	0.6	0.6
Total ¹ Coverage	47.2	51.1	55.6	59.9	64.0	67.7

1 The sum of all specific method coverage rate may not equal the total coverage due to rounding errors.

Due to the fact that not all contraceptive users are served by the National Family Planning Program assuming that the private sources account for 10 percent of contraceptive users for all methods in the first two years in the planning period, the private share is then postulated to increase gradually to 12 percent at the end of the planning period in 1986. When the private sources of contraceptive services are included, the adjusted contraceptive prevalence rates increase accordingly, from 57.2 percent in 1981 to 79.6 percent in 1986 (Table 17).

Table 17 Estimated Contraceptive Prevalence Rate of All Sources

Source	1981	1982	1983	1984	1985	1986
NFPP	47.2	51.1	55.6	59.9	64.0	67.7
Private	10.0	10.0	11.0	11.0	12.0	12.0
Total	57.2	61.1	66.6	70.9	76.0	79.6

Estimate of Contraceptive Requirements

To estimate contraceptive requirements ($TC_i(t)$), we simply multiply the total number of active users ($TB_i(t)$) at the mid-year with the average number of contraceptives (a_i) required to prevent conception. Then the equation used to estimate the contraceptive requirements for the i method at time t is

$$TC_i(t) = a_i TB_i(t) \quad (11)$$

Where a_i is defined as

$$a_i = q.Q + (1-q) Q/2 \quad (12)$$

q = retention (continuation) rate at one year

Q = number of contraceptives in cycles, doses or pieces that provide effective birth control prevention in one year.

The application of the formula (equations 11 and 12) requires assumptions about the average requirement of a particular method per new acceptor per year. The assumptions are : For the IUD, an average of 1.1 loops for new insertion and replacement must be provided to a new acceptor a year. For the pill, the annual supply requirements for each active user are 13 cycles per year. A new DMPA acceptor requires 4 doses of a three-month effective protection injection. The number of condoms required for each new acceptor is assumed to be 114 pieces per year, which also includes the number of condoms supplied to vasectomy clients for temporary post operation protection.

Based on the procedure described above, the annual stock requirements of contraceptives are calculated. The results presented in Table 18 are obtained from applying the procedure to the estimated number of active users (Table 15)

Table 18 Estimated Annual Stock Requirement of Contraceptives
(Unit in thousands)

Method	1981	1982	1983	1984	1985	1986
Pill (Cycles)	-	16,902.6	18,877.0	21,048.5	23,447.4	26,092.4
IUD (loops)	-	81.0	79.7	78.4	77.1	75.8
DMPA (Doses)	-	902.0	1,097.4	1,335.1	1,624.4	1,911.8
Condom (Pieces)	-	5,848.2	5,004.6	4,845.0	4,970.4	5,141.4
Ratios of the Current Estimate to Boni's Estimate ¹						
Pill	-	1.039	1.118	1.193	1.266	1.340
IUD	-	1.396	1.285	1.153	1.056	0.984
DMPA	-	0.693	0.706	0.764	0.837	0.893
Condom	-	0.813	0.667	0.619	0.611	0.608

Remarks : 1 Based on Boni's Medium Projection of Table 2 and Table 5, 8, 12.

General Discussion

If the estimates of annual stock requirements of contraceptives are compared with those of Boni, the current estimated IUD requirements of the two estimates are higher than the estimate made by Boni between 1982 and 1985 but lower than Boni's at the end of the Fifth Plan. Analysis of IUD trends presented earlier shows a decline in popularity. Thus it is expected that the lower estimates at the end of the Fifth Plan are more realistic. It should be noted that the difference between Boni's estimate and the current estimate is very small. Insofar as DMPA requirements are concerned, the present set of estimates is lower than Boni's. However, as the number of annual active DMPA users constitutes a very small proportion of the total annual active contraceptive users, the total annual active contraceptive users, the differences between Boni's estimate and the current of estimates have no practical significance. On the basis of the small differences between Boni's estimate and the set of estimates, it can be said that Boni's estimate is as acceptable as our set of estimates.

However, our set of estimates may prove to be better, depending on the Thai government's policy towards the use of DMPA. At present, the only official endorsement by the Thai government is the specification of DMPA as a method of contraception in the Fifth Five Year Plan. There are movements to caution the potential family planning acceptors against the use of DMPA as a method of birth control.

What is more significant is the difference in the estimates of the pill requirements since more than half of the new acceptors adopt the pill. The present estimates give higher results than Boni's. In terms of ratios, of the present estimate to Boni's is about 4 percent in 1982 and rapidly increases to 34 percent in 1986. Based on the differences between the two sets of estimates and Boni's, it seems that Boni's estimate is too low.

It is significant that all the estimated requirements of the pill, IUD, DMPA and condom will be seriously affected by a change in demand for sterilization. At present, there are active movements by private organizations towards sterilization. Furthermore, with government policy encouraging and increasing economic pressure limiting family-size to 2 or 3 children, the demand for sterilization, the only permanent method, has risen. According to small sample surveys in the Northeast, demand for sterilization is increasing, mostly by couples who have already had 2 or 3 children. Assuming that past trends continue, the NFPP sterilization rate will increase from 16.5 percent in 1981 to 22.5 percent in 1986, or from 1.169 million couples in 1981 to 1.79 million in 1986. If the private services are included, the number of sterilization acceptors will increase by no less than 12 percent. (It is beyond the scope of the study to estimate the medical

requirements needed for the new sterilization acceptors, depending on whether sterilization is performed on men or women and the method used.)

In relation to the targets of the Fifth Five Year Plan, the present estimates of new acceptors and Boni's indicate much higher figures of new acceptors than the target set for the Fifth Five Year Plan (Table 19). These differences arise because the targets set for the Fifth Five Year Plan are much lower than the past records of annual new acceptors (Table 5). Let us hope that all existing health units, both private and public, will spontaneously serve the public as they come, if they are not short of contraceptive supplies.

Table 19 Estimated Number of New Acceptors Compared With the Fifth Plan Target

Source	Pill	IUD	DMPA	STR	Condom	Total
The Estimated Number*						
1982	776,440	73,665	217,306	207,892	62,675	1,337,978
1983	762,679	72,444	235,236	252,924	65,035	1,488,118
1984	958,496	71,244	254,165	307,710	67,394	1,658,009
1985	1,064,955	70,064	271,095	374,263	69,753	1,850,230
1986	1,183,239	68,904	289,025	455,453	72,112	2,068,733
The Fifth Plan Target						
1982	472,600	52,800	93,300	176,800	-	795,500
1983	504,900	56,400	89,100	187,700	-	847,100
1984	553,400	61,900	106,200	204,600	-	926,100
1985	587,500	65,700	112,200	216,600	-	982,000
1986	624,600	69,800	118,500	229,600	-	1,042,500

*National Economic and Social Development Board, *National Economic and Social Development Plan : Fifth Plan, 1982-1986* Bangkok : NESDB, 1982, Table 2.4

In any case, the targets set in the Fifth Plan are too low to be realistic. If the targets are strictly followed, it is doubtful whether the 1.5 percent population growth rate will be achieved by the end of the Fifth Plan. There is a need for research on the contraceptive requirements to achieve a 1.5 percent growth rate at the end of the Fifth Plan.

Methodological Procedures : Supply Side

A Survey of local production facilities of contraceptives in Thailand was conducted. Notes on the interview survey and company names of local producers are given in Appendices B. 1 and B. 2.

Inventory of Contraceptive Production Facilities

There are about 185 registered production facilities of medicine in the private sector of Thailand. In the public sector, there are two, the Government Pharmaceutical Organization (GPO) and the Armed Forces Pharmaceutical Factory (AFPF). Most facilities produce more than one single form of medicine (Table 20). The various forms are liquid, tablet, capsule, powder, ointment or cream, injectable and others.

Table 20 Number of Production Facilities by Number of Forms of Medicine Produced

No. of Forms of Medicine	6	5	4	3	2	1	Total
No. of Facilities	20	40	41	30	14	28	173

Source : 1980 Survey by the Statistical Section of the Office of Food and Drug Board, the Ministry of Public Health

The production figures of medicine in 1979 by the private sector are shown in Table 21.

Table 21 Quantities and Values of Medicine Produced in the Private Sector in 1979

No	Form of Medicine	Quantity	Value (Baht)
1.	Liquid	9,404,254 liters/year	347,373,938
2.	Tablet	4,460.3 million tablets/year	846,287,152
3.	Capsule	779.3 million capsules/year	822,087,258
4.	Powder	10,163 tons/year	256,088,929
5.	Ointment/Cream	331.6 tons/year	111,176,781
6.	Injectable		
	- Powder	144,178 kg./year	
	- Liquid	7,877,645 liters/year	
7.	Others		60,555,946
	Total		2,901,304,363

Source : Same as Table 20

Contraceptive Supply in the Public Sector

Insofar as contraceptive supply in the public sector is concerned, the GPO neither produces nor has any plan to produce contraceptive products in the near future. The present policy is to have the required contraceptive products for the NFPP procured by the purchasing department of GPO through a bidding process which can be entered by both local and overseas suppliers.

Contraceptive Production Facilities in the Private Sector

An interview survey of local private contraceptive manufacturers and/or distributors has produced results which are shown in Tables 22, 23, and 24. Three types of contraceptives are produced locally, oral contraceptives, injectable contraceptives, and condoms.

Oral Contraceptive Production (Table 22)

There are two major local manufacturers of oral contraceptives with a total annual production capacity of 3.3 million cycles. The 1981 production figure of 2.4 million cycles is about 73% of the total capacity. The first manufacturer reports a minimum stock policy of 3 months of sales while the second manufacturer keeps a minimum stock of 5 months of sales, thus making a total minimum stock of 750,000 cycles.

Table 22 Survey Results of Local Contraceptive Manufacturers : Oral Contraceptive (in cycles)

Company	1981 Production	Minimum Stock	Annual Capacity
1. Schering (Bangkok) Ltd.	1,500,000	375,000	2,200,000
2. The Borneo Co. (Thailand) Ltd.	900,000	375,000	1,100,000
Total	2,400,000	750,000	3,300,000

Injectable Contraceptive Production (Table 23)

The five local manufacturers of injectable contraceptive have a total annual production capacity of no less than 12.6 million "3-month" doses. One manufacturer expresses confidence that his production facility can meet total domestic demand for injectable contraceptives in the next three to five years.

Table 23 Survey Results of Local Contraceptive Manufacturers : Injectables (in 3-month doses)

Company	1981 Production	Minimum Stock	Annual Capacity
1. Udomphon (Phihalab) Co.Ltd.	100,000	25,000	600,000
2. A.N.B. Laboratory Co. Ltd.	N.A. ¹	N.A.	6,000,000 (20,000/day)
3. General Drugs House Co. Ltd.	55,000	9,000	N.A.
4. Vesco Pharmaceutical L.P.	N.A.	100,000*	6,000,000 (20,000/day)
5. Olan Bangkok L.P.	N.A.	N.A.	N.A.

*As of August 20 th, 1982. The company has a contract to supply GPO 300,000 cycles of injectables by September 20 th, 1982

¹ N.A. means that the information is unavailable.

Condom Production (Table 24)

There are two local manufacturers of condoms. The first manufacturer manufactures condoms from raw rubber material while the second manufacturer imports rubber sacs and processes them further locally into finished products. The first manufacturer also produces other rubber-related products such as pacifiers. The 1981 production figure of 21.6 million pieces was produced in the first quarter of the year. About the same amount of condom units was produced in the first quarter of 1982. As of August 1982, it was reported that the stock at the factory is at a level of 7.2 million condoms.

Table 24 Survey Results of Contraceptive Manufacturers : Condom (inpieces)

Company	1981 production	Stock	Annual Capacity
1. The Royal Industry Co. Ltd.	21,600,000	7,200,000*	86,400,000
2. Diethelm Pharmachem Ltd.	N.A.	N.A.	N.A.

* As of August 10th, 1982

If given at least one year to prepare for procurement of important raw materials, which are mostly imported, and to accelerate their production processes, most manufacturers interviewed express confidence that they can meet the total domestic demands for the above three contraceptive products in the next five years.

Analysis of Domestic Consumption of Contraceptives

Domestic Distribution of Oral Contraceptive outside NFPP

The annual domestic distribution of oral contraceptives by local distributors outside NFPP-related programs has been estimated by private sources as follows :

Year	Distribution (million cycles)
1969	3.2
1970	2.9
1971	3.3
1972	3.2
1973	3.9
1974	3.4
1975	3.6
1976	2.9
1977	2.9
1978	3.3
1979	3.5
1980	2.9
1981	3.1

It should be noted here that the annual demand outside NFPP-related programs has remained quite stable over the years with an average of 3.24 million cycles. The total annual capacity of domestic production of oral contraceptives is 3.3 million cycles and thus enough to cover the current demand in the commercial (non-NFPP) sector.

The market shares for oral contraceptives are distributed among local distributors as follows :

Distributor	Market Share (%)
Schering	40
Organon	30
Wyeth International	20
Others	10
Total	100

Estimates from Import/Export Figures

An attempt based on a number of assumptions, to estimate domestic consumption of oral contraceptives, injectable contraceptives, and condoms (NEPD and the commercial sector) in a very rough fashion has been made from import and export figures.

First, import and export figures of contraceptive products were obtained (Tables 25 and 26 respectively). The figures shown are gross weights (including packaging weights) in kilograms. Import figures under "contraceptives" include injectables, tablets, gels and capsules. Since the major

Table 25 Import Figures of Contraceptive Products

Year	Contraceptive (kg.) (Injectables, tablets, gels and capsule)	Rubber sacs (kg.)
1977	18,864	19,796
1978	36,170	19,961
1979	24,316	30,112
1980	80,230	39,771
1981	111,783	37,051

Source : Department of Customs

Table 26 Export Figures of Contraceptive Products

Year	Contraceptive (kg.)	Rubber sacs (kg.)
1977	-	-
1978	30	8,804
1979	100	13,756
1980	-	20,934
1981	-	16,943

Source : Department of Customs

forms of contraceptives imported are oral and injectable contraceptives, the analysis that the import figures under "contraceptives" are for injectables and tablet forms only. The export figures under "contraceptives" are assumed to be for tablet forms. The weight figures in kg. were then converted to cycles of oral contraceptives and "3-month" doses of injectable contraceptives by using the corresponding weight ratio and practice-contraceptive-prevalence ratios between the two products. The weight of a cycle of oral contraceptive used was 5 gms. while the weight of a "3-month" doses of injectable contraceptives used was 2 gms. The practice-contraceptive-prevalence ratios between oral and injectable contraceptives were obtained from CPS 1 (1978) and CPS 2 (1981). The ratio of 4 : 1 from CPS 1 was used for years 1977, 1973 and 1979 while the ratio of 3 : 1 from CPS 2 was used for years 1980 and 1981. Estimates from import and export figures are shown in Tables 27 and 28 for oral contraceptives in cycles and injectable contraceptives in "3-month" doses.

Table 27 Estimates (1,000 cycles) of Import and Export Quantities of Oral Contraceptives

Year	Import	Export	Import-Export
1977	3,651	-	3,651
1978	7,000	16	6,984
1979	4,706	20	4,686
1980	15,343	-	15,343
1981	21,386	-	21,386

Table 28 Estimates (1,000 "3-month" doses) of Import and Export Quantities of Injectable Contraceptives

Year	Import	Export	Import-Export
1977	305	-	305
1978	584	-	584
1979	392	-	392
1980	1,744	-	1,744
1981	2,430	-	2,430

The estimates from import and export figures for condoms are shown in Table 29. (The weight of a condom used was 0.2 gm.)

Table 29 Estimates (1,000 pieces) of Import and Export Quantities of Condoms

Year	Import	Export	Import-Export
1977	98,980	-	98,980
1978	99,805	44,020	55,785
1979	150,560	68,780	81,780
1980	198,855	104,670	94,185
1981	185,255	84,715	100,540

Now if we take domestic consumption to be import-export+domestic production, the domestic consumption figures for 1981 are 23.3 million cycles of oral contraceptives, more than 2.6 million "3 month" doses of injectable contraceptives and more than 122 million condoms.

Thus, it appears from the above domestic consumption figures and the survey results that the annual domestic production capacity of oral contraceptive was less than the total domestic demand by about 20 million cycles in 1981.

Conclusion

In brief, it has been found that three types of contraceptives, namely, oral contraceptives, injectable contraceptives, and condoms are produced locally. Two major local manufacturers of oral contraceptives have a total annual production capacity of 3.3 million cycles, which could meet the present demand in the commercial sector (outside NFPP programs). There are at least ten local manufacturers of injectable contraceptives with a total annual production capacity of no less than 7.15 million "3-month" doses. There are two local manufacturers of condoms, one of them has an annual production capacity of 86.4 million pieces.

Given enough lead time, most manufacturers interviewed expressed confidence that they could meet the demand for the three above contraceptive products in the next five years.

FOOTNOTES

1. Chira Hongladarom, Suchart Prasith-rathsint and Pichit Lerttamrab, *A Feasibility Study of Reducing the Population Growth of Reducing the Population Growth of Thailand to 1.5 Percent Per Annum by the End of the Fifth Five Year Plan*, Bangkok : National Economic and Social Development Board, 1980.

2. Anthony F. Boni, *Thailand : Forecasting of Contraceptive Requirements, 1981-1986*. mimeograph, December 1980.
3. Anthony F. Boni, *Thailand : Forecasting of Contraceptive Requirements, 1980-1986*. mimeograph, December 1980.
4. W. Parker Mauldin *et. al.*, "Retention of IUD's : An International Comparison," *Studies in Family Planning*, vol. 1, no. 13 (April 1967), pp. 1-12, and also W. Parker Mauldin, "Births Averted by Family Planning Program," *Studies in Family Planning*, vol. 1, no. 33 (August 1968), pp. 1-7.
5. Gerald Zatuchini, "International Pospartum Family Planning Program : Report on the First Year," *Studies in Family Planning*, vol. 1, no. 22 (August 1967), pp. 21-22.
6. William J. Kelley, "Estimation of Births Averted by Family Planning Program : The Parity Approach," *Studies in Family Planning*, (February 1971), pp. 197-201.