Evaluation of the Impact of Family Planning Programs on Fertility: Using Prevalence Model for Selected Districts in Iran 2001

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Abstract

***Keywords**: Evaluation Research, Natural Fertility, Gross and Net Potential Fertility, Births averted, Prevalence model*

This article evaluates the fertility impact of family planning program[1] by using prevalence model in Iran. Prevalence model, which introduced by John Bongaarts, estimates potential fertility and the number of births averted by program and non-program sources by using population and acceptor based data. The difference between potential fertility and observed fertility is related to contraception. The greater the differences between potential and observed fertility, the higher the impact of family planning program on fertility.

The study uses the Base Line Survey-2001 (BLS-2001) data, collected by Statistical Center of Iran (SCI) and UNFPA-Iran in selected districts of Bushehr (Bushehr and Kangan Districts), Golestan (Gonbadkavoos and Minoodasht Districts), Kurdistan (Marivan and Divandareh Districts), Sistan & Bluchestan (Zahedan and Zabol Districts) and Tehran provinces (Islamshahr District).

The results of the study indicate that Marivan and Zahedan districts had the high and low reduction rates in TFR and CBR, respectively. The findings also, show that the high reduction in ASFR belongs to age groups 30-34 in Marivan, 35-39 in Islamshahr, Gonbadkavoos and Bushehr, 40-44 in Zabol, Divandareh and Kangan districts and 45-49 in Zahedan and Minoodasht districts. In terms of each method contributions in reducing fertility, results show that the highest contribution of program contraceptives in preventing births in different districts

are female sterilization in Bushehr, Divandareh and Islamshahr, and pill in other districts.

1-Introduction

Evaluation is the application of social science research procedures to judge and improve the ways in which social policies and programs are conducted, from the earliest stages of defining and designing programs through their development and implementation (Rossi and freeman, 1993). Evaluation results should inform program management, strategic planning, the design of new projects or initiatives, and resource allocation.

The evaluation of family planning programs includes both program monitoring and impact assessment. Monitoring is used to determine how well the program is carried out at different levels and at what cost; it tracks change that occurs over time in the resource inputs production, and use of services. Impact assessment measures the extent to which this change can be attributed to the program intervention (cause and effect) (Bertrand J.T. et al, 1996: 7).

Inflow of advanced medical products to non developed countries, especially after world war Π, led to high decrease in mortality rates of these societies. The governments started the programs for reducing fertility in those countries. National and international agencies tried to reduce fertility by implementing family planning programs. Since the implementations of these programs were at the time of other attempts of the development of these countries, many argue that the decline in fertility of these countries is related to development programs, but not to the family planning programs. The initial question of this research is that:

- *How much the fertility decline in a region can be attributed to family planning programs?*

Evaluation results are important inputs into strategic planning and program design. Measures of program performance, output, and population outcomes describe the current state of the demand for services and the program environment. In short, those responsible for implementing programs and those who fund programs should require that evaluation be an integral part of any intervention. In the current climate of budgetary constraints, evaluation results point to the most rational use of scarce resources-human and material- to achieve results. The important goal of this paper is to answer the question of research mentioned above.

2-Review of literature

There are many studies on evaluation research of family planning programs. Only three most recent studies in this field have been reported here.

-John Bongaarts, (1993) in his study on "The Fertility Impact of Family Planning Programs" provides new estimates of gross and net impact on fertility reductions from family planning (FP) programs for 31 developing countries in Africa, Latin America, and Asia. He made a comparison of net and gross measures, and the interaction with the level of development is identified. He reached the conclusion that FP has been crucial in reducing fertility in many countries. Without FP, the total annual number of births in the late 1980s would have been 164 million instead of 120 million. In his study, the prevalence method (Bongaarts modified version) was used, based on statistics on source of

contraceptives. This method estimates contraceptive prevalence by source and then estimates fertility decline attributable to program contraceptive. The estimation procedure assigns effectiveness as 95% for modern methods and 6% for traditional methods. The prevalence estimates for program and non-program sources are indicated. The average averted births equal 1.3 births/ woman, which was 27% of the average observed fertility of 4.8 births/ woman. China had the largest number of births averted. Net fertility reduction estimates relied on regression estimation based on the level of each country's development and the average of the 1982 and 1989 program effect scores calculated by lapham and Mauldin and by Mauldin and Ross. The largest net effects in births averted were in China. The net weighted average was 1.39 births implies about a 50% impact on fertility decline (Bongaarts, J, 1993: Abstract).

-Robert J.Magnani, David R.Hotchkiss, Curtiss Florence and liegh Anne Shafer (1998) in their study on "Contraceptive Use Intentions and Subsequent Use : Family Planning Program Effects in Morocco" take the advantage of panel survey data and linked information on the supply environment for family planning services in Morocco to attempt to bridge this research gap. In the analysis, contraceptive use during the 1992-95 periods is related to contraceptive intentions in 1992, individual-, household-, and community –level determinants of contraceptive behavior, and family planning supply factors. Estimation procedures are used that control for unobserved joint determinants of contraceptive intentions and use. While evidence of a significant enabling/facilitating role of family planning service is indeed found, the findings also suggest that family planning

program factors influence contraceptive intentions in important ways (Magnai, R.J. and et al, 1998: 3).

- Gustavo Angeles, David K. Guilkey and Thomas Mroz(2001) in their article on: "The Determinants of Fertility in rural Peru: Program Effects in the Early Years of the National Family Planning Program", data from the 1991 Peru Demographic and Health Survey(PDHS 91), linked Peru Situation Analysis(PSA 92) community and facility data set collected in 1992, and a unique region-level data set gathered specifically for their analysis examine the determinants of fertility in rural Peru before and after July 1985. Particular attention is paid to assess the effect of family planning services on fertility. The empirical model that is used combines a model of the timing and spacing of births with a model of the timing of the placement of family planning (FP) services in communities. This modeling strategy allows controlling for the non-random placement of FP services that could potentially bias the measures of program impact. The results of this paper show that for all age groups except the youngest, fertility appears to be declining, and the rate of the decline seems to have accelerated in the 1980s. Public FP services were virtually non-existent in rural Peru during the 1970s and the expansion in services really started after the passage of the National Policy on Population in 1985, the timing and extent of the fertility decline appear to coincide with the growth of the government provision of FP services. Data set allows estimating the determinants of the annual probability of a birth for every year between 1972 and 1991. Clearly, any change in FP policy will not have an immediate impact on fertility (Gustavo, A. and et al, 2001: Abstract).

Some other studies:

- Bongaarts, J. (1986) applied the prevalence method for selected countries.

-Caserline et al, (1988) applied the Proximate Determinants Decomposition method to successive surveys in the Philippines.

-Guilkey and Cochrane, (1994) applied random effects model in 1988/89 Zimbabwe DHS and 1989/90 Zimbabwe Service Availability Survey.

- **Angeles et al (1995)** applied the random effects model to the measurement of the fertility Impact of family planning in rural Tanzania, 1969-1991

- Magnani, R. et al (1999), the Impact of the family planning supply Environment on contraceptive Intentions and use in Morocco

- **Dominic J. Mancini. et al, (2001)** the effects of structural characteristics on family planning performance in cote d'lvoire and Nigeria.

3- Conceptual Framework

The conceptual framework is the basis for identifying appropriate program indicators and specifying the pathways by which program inputs produce outputs and ultimately changes the behavior of the target population. A conceptual framework that shows the linkages between family planning program inputs and fertility change is shown in figures 1 and 2.

The framework recognizes that fertility and other impacts are the consequences of both the demand for and supply of family planning services. Demand for children and demand for family planning services are affected by a number of political, socioeconomic, cultural, and individual factors. Thus, an increase in the

availability of family planning services is more likely to translate into higher levels of use in a country where these other factors exert a positive rather than negative influence on demand. The family planning supply environment (figure II) is also shaped by the political and administrative systems within which the program operates. Political support for the family planning program, funding of the program, and the legal and regulatory environment affect program organization and success.

Inputs to the family planning program in the form of personnel, facilities and space, equipment and supplies, etc, are transformed through program activities. These program activities consist of the planning and implementation of the principal family planning program functions: management, training, distribution of contraceptives and related supplies, IEC efforts, and research and evaluation. Collectively, the results in these functional areas create the principal program outputs-accessibility, quality, and well-regarded family planning services. These outputs attract clients to the program and, jointly for family planning, determine the impact of the program on the target population (Bertrand J.T, et al, 1996:17).

Figure 1: Conceptual Framework of FP Demand and Program Impact on Fertility

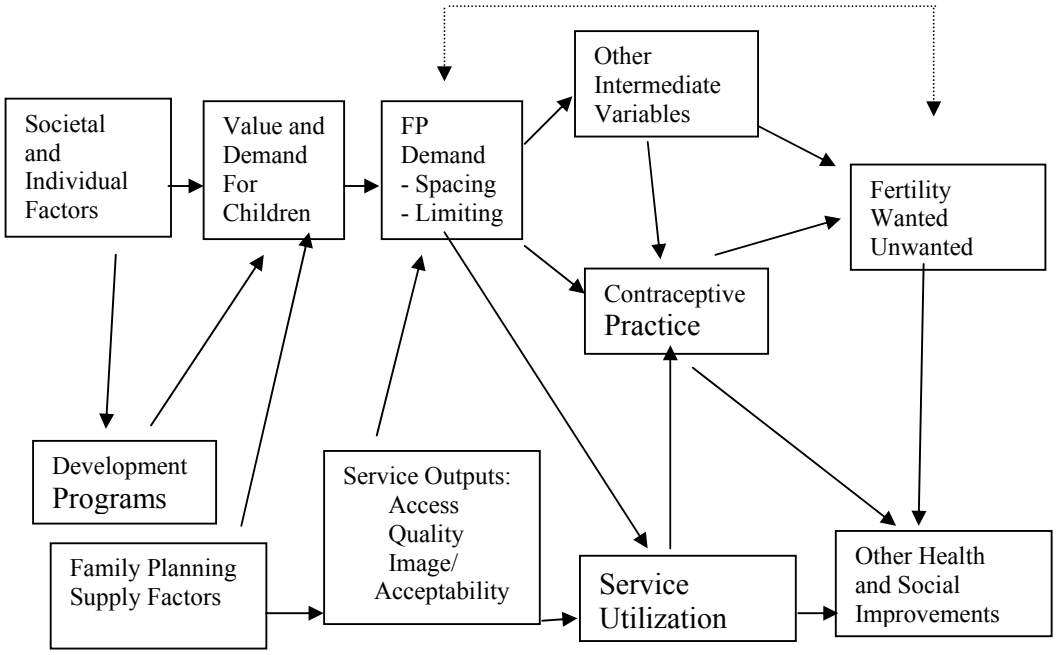
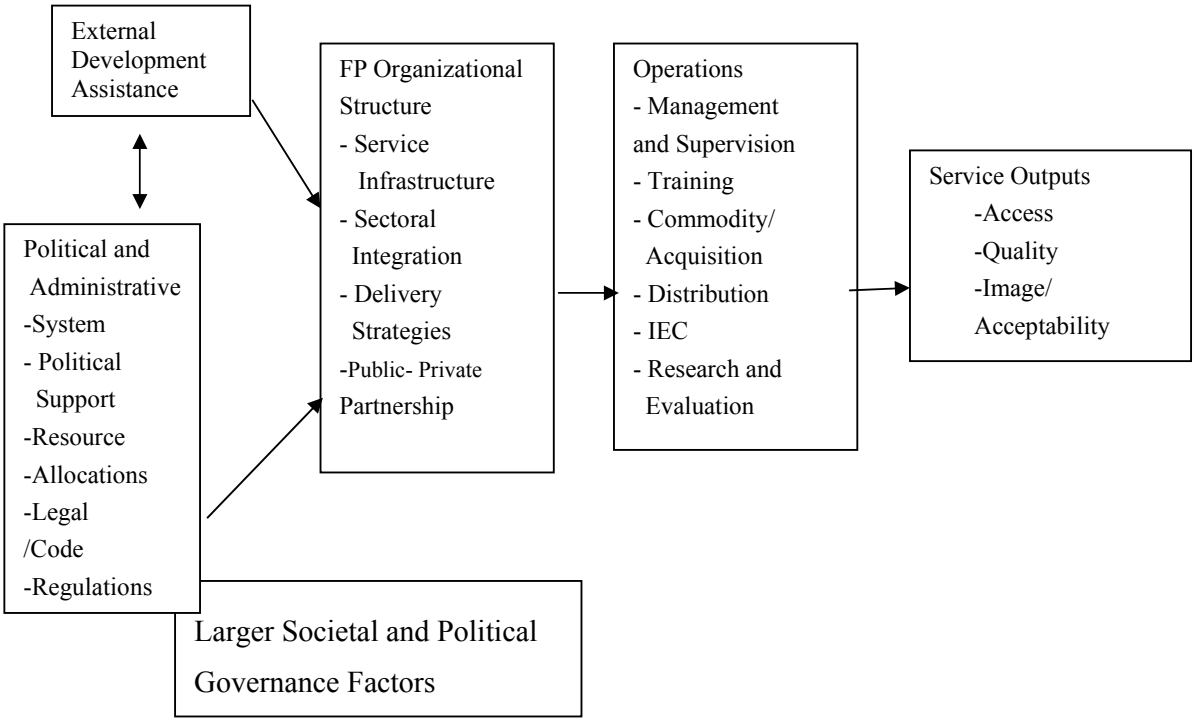


Figure 2: Conceptual Framework of Family Planning Supply Factors



Source: Bertrand J.T. et al, 1996:18

4- Methodology of Research

4-1- Existing Methods of Evaluation of Family Planning Programs

Jane T. Bertrand and et al 1996 in their book on “Evaluating Family Planning Programs, with Adaptations for Reproductive Health" classified the existing methods of Impact Assessment approach in family planning program evaluation as :

4-1-1-Preferred Methods:

-Randomized experiments

-Quasi-experiments

-Multilevel Regression methods

4-1-2-Alternative Methods:

-Decomposition (Proximate Determinants Model)

-Prevalence method.

Only the prevalence model has been described here, because the rest are beyond the scope of this paper.

4-2-Prevalence Model

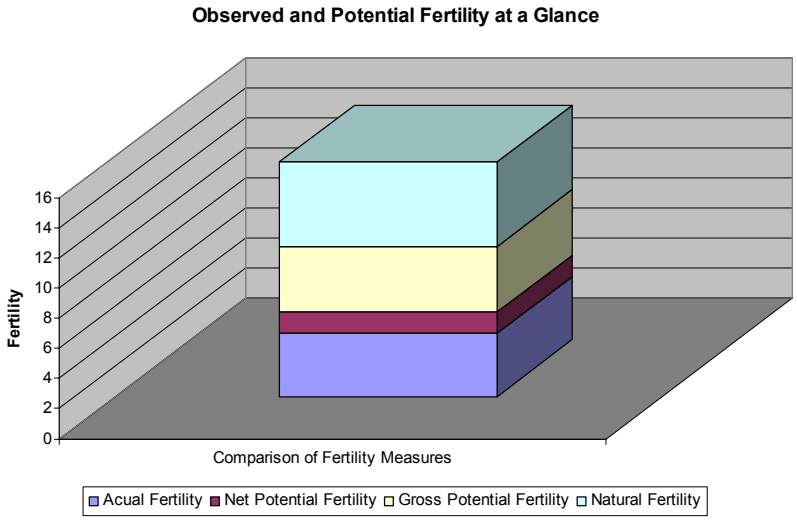
This model is one of the methods that estimate fertility impact of family planning programs by number of births averted by program. A crucial variable in these methods is potential fertility of the population. It is necessary to define this variable and its categories.

Potential fertility: the fertility a population subjected to a [family planning] program would have experienced in the absence of that program.

Gross potential fertility: the fertility level that would prevail if all users of program contraception were to discontinue contraception (i.e., without switching to non-program sources), which implied that program users can revert to natural fertility;

Net potential fertility: the fertility that would prevail if there had never been a program. In that case, many who would have been program users would have obtain their supplies from non-program sources.

Figure 3: fertility measures in general population



One of the most widely used measures is the number of births averted by a program in a given year. Trend analysis, standardization approach, standard couple-years of protection, component projection I and II, CONVERSE, regression analysis and others are the methods that estimate gross and net potential fertility. The important limitation of these methods is that, they are

generally of two major types: a) population based procedures that are based on macro-demographic data, and b) acceptor based procedures that use characteristics of contraceptive acceptors.

Prevalence model, introduced by John Bongaarts, includes both population based and acceptor based data .This procedure uses contraceptive prevalence rates and the proportion of currently married women using contraception both from program and non-program sources to estimate potential fertility and the number of births averted by program and non-program sources. The difference between potential fertility and observed fertility is related to contraception. The greater the differences between potential and observed fertility, the higher the impact of family planning programs on fertility.

The prevalence model is derived from a fertility model that describes the quantitative relationships between fertility and its proximate determinants. There are three types of this model:

4-2-1-Aggregate prevalence model

This version with assuming contraceptive use-effectiveness to equal 0.833, uses contraceptive prevalence rate (U) and total fertility rate (TFR) to calculate total natural fertility rate (TNFR) and natural crude birth rate (NCBR):

TNFR=TFR/ (1-0.90 * U)

NCBR=CBR/ (1-0.90 * U)

The contraceptive prevalence (U) is the summation of U' and U" (U' and U" represent the prevalence of contraception by program and non-program sources,

respectively). Gross potential fertility rate (GPFR) and gross potential crude birth rate (GPCBR) can be calculated by using the formulas given below:

GPFR = TFR*(1-0.90*U")/ [1-0.90(U'+U")]

GPCBR = CBR*(1-0.90*U")/ [1-0.90(U'+U")]

Now, the number of births averted by program and non-program sources could be calculated by using these formulas:

BA= (GPCBR-CBR)*POP

BAN= (NCBR-GPCBR)*POP

Where:

BA is the number of births averted by program;

BAN is the number of births averted by non-program sources;

POP is population size.

4-2-2- Age-specific prevalence model

As in the aggregate version, these relationships between variables exist for each age group:

NAFa=AFa/ [1-Ca*(U'a+U"a)];

PAFa=AFa*(1-Ca*U"a)/ [1-Ca*(U'a+U"a)];

BAa=(PAFa-AFa)*POPa ;

BANa= (NAFa-PAFa)*POPa .

Where:

a = age group of women;

AFa=age-specific fertility rate;

PAFa= potential age-specific fertility rate;

NAFa=natural age specific fertility rate;

Ca= elasticity coefficients, by age.

The estimation of age-specific natural and potential fertility rates and births averted by both sources requires that AFa, U'a, U"a and Ca be available as input measures. The first three are typically obtained from surveys, but coefficients Ca (that is the function of sterility and use-effectiveness level), mostly are not available. So these standard values can be used:

C (15-19) =0.620

C (20-24) =0.620

C (25-29) =0.823

C (30-34) =0.940

C (35-39) =1.022

C (40-44) =1.309

C (45-49) =1.898

4-2-3- Method specific prevalence model

This model is a procedure that allows the estimation of the contributions made by each method to the total number of births averted by either program or

non-program contraception. Getting BA and BAN from aggregate model and using the following formulas gives the BAm and BANm (m is each method):

BAm=BA* U'm * e'$_m$ / (U'*e');

BANm= BAN * U"m * e" / (U"*e").

Where:

e' $_m$= use-effectiveness of program method *m*;

e"$_m$= use-effectiveness of non-program method *m*;

$$e'=\sum_m U'm * e'm / U' \ ; \qquad U'=\sum_m U'm \ ;$$

$$e''=\sum_m U''m * e''m / U'' \ . \qquad U''=\sum_m U''m \ ;$$

Application of this method needs data for all variables. In terms of e'$_m$ and e"$_m$, often they are not available, so the standard estimations may be used as approximations.

John Bongaarts introduced following standards:

a)sterilization,1.0 b) IUD, 0.95 c) pill, 0.90 d) other, 0.70

But, The POLICY Project, introduced more accurate values:

a) condom 0.81	b)female sterilization 1.00	c) male sterilization 1.00
d) injectable 1.00	e) implant 1.00	f) pill 0.92
g) rhythm 0.50	h)traditional 0.50	i) vaginal barriers 0.81
j) vaginal tablet .81	k)withdrawal 0.50	l) other 0.50

4-3- Population and Sample Size

This article uses Base Line Survey-2001 (BLS-2001) data, collected by Statistical Center of Iran (SCI) and UNFPA in the selected districts of Bushehr, Golestan, Kurdistan and Tehran provinces. The population of this study is total population of Zahedan and Zabol districts from Sistan and Bluchestan province, Bushehr and Kangan districts from Bushehr province, Marivan and Divandareh districts from Kurdistan province, Gonbadkavoos and Minoodasht districts from Golestan province and Islamshahr district of Tehran province.

The sample size is women aged 15-49 and the interviewed number of women is given in the table 1.

Table 1: Number of Interviewed Women in Each District

	District								
	Kangan	Bushehr	Minoo dasht	Gonbad	Divan dareh	Marivan	Zahedan	Zabol	Islam shahr
Age									
15-19	334	353	389	379	349	354	400	437	414
20-24	314	253	271	330	254	266	311	350	297
25-29	242	207	231	244	209	256	237	225	180
30-34	166	192	159	185	181	205	174	186	171
35-39	130	174	176	153	127	148	147	139	173
40-44	120	158	122	118	120	125	93	128	145
45-49	90	97	104	94	106	102	77	91	108

4-4-Description of Input data

Using all versions of prevalence model needs data on some indices of fertility, contraceptive prevalence rate and population size. All of the indices are calculated for each district separately using BLS-2001 data. In terms of population size, it should be noted that actual data was not accessible for each district. So, the population size projected for each district, separately. The total population size for each district projected for year 2001 by using 1996 census and existing population growth rate (r=1.5). Then the total populations distributed by different age groups by using ADJAGE program of PAS Software with the assumption that distribution of populations are close to each other in years 1996 and 2001. Since the date of survey was different from this date, by using AGEINT program of PAS the population size is interpolated to date of survey.

Tables 2, 3 and 4 present the calculated variables for each district separately.

Table 2: Distribution of TFR, CBR, Population Size, U, U' and U" by Districts

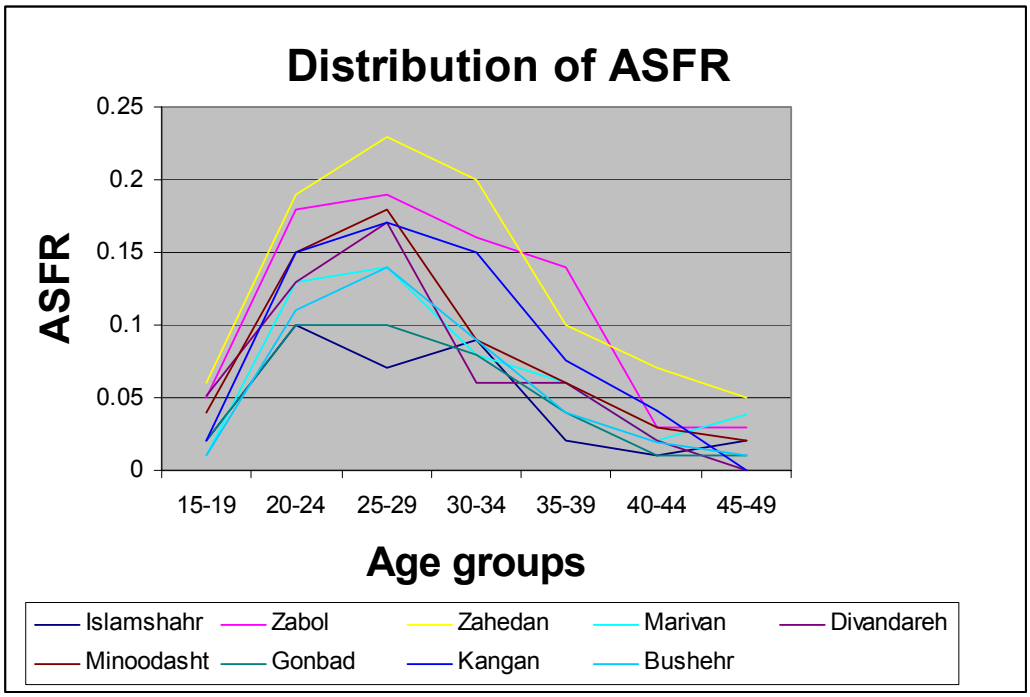
Districts	TFR	CBR	Pop size	U	U'	U"
Islamshahr	1.75	0.0138	428383	0.77	0.45	0.32
Zabol	4.0005	0.025	356424	0.54	0.45	.09
Zahedan	4.6	0.029	518859	0.5	0.35	0.15
Marivan	2.5	0.017	197216	0.78	0.68	0.1
Divandareh	2.5	0.018	90946	0.72	0.67	0.052
Minoodasht	2.9	0.019	299332	0.64	0.5	0.14
Gonbad	1.94	0.014	438414	0.69	0.49	0.2
Kangan	3.07	0.021	83435	0.57	0.44	0.13
Bushehr	2.1	0.015	200186	0.75	0.46	0.29

Table 2 shows that the highest and lowest rate of TFR belong to Zahedan and Islamshahr districts, respectively. In terms of contraceptive prevalence rate (U) Marivan with 78% contraceptive use and Zahedan with 50% are the highest and the lowest, respectively.

Table 3: Distribution of Age Specific Fertility Rate (ASFR), by Districts

Districts	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Islamshahr	0.02	0.1	0.07	0.09	0.02	0.01	0.02
Zabol	0.05	0.18	0.19	0.16	0.14	0.03	0.03
Zahedan	0.06	0.19	0.23	0.2	0.1	0.07	0.05
Marivan	0.01	0.13	0.14	0.08	0.06	0.02	0.039
Divandareh	0.051	0.13	0.17	0.06	0.06	0.02	0
Minoodasht	0.04	0.15	0.18	0.09	0.06	0.03	0.02
Gonbad	0.02	0.1	0.1	0.08	0.04	0.01	0.01
Kangan	0.02	0.15	0.17	0.15	0.076	0.041	0
Bushehr	0.01	0.11	0.14	0.09	0.04	0.019	0.01

Figure 4: Distribution of ASFR in selected Districts.



The important point in terms of distribution of ASFR is that, except Zahedan, Zabol and Kangan, in other districts ASFR have a sharp decline after age 30, while the decline for those districts begin after age 35 for Kangan and age 40 for Zahedan and Zabol.

Table 4: Distribution of Contraceptive Prevalence Rate from Program and Non-Program Sources by Age

District	15-19		20-14		25-29		30-34		35-39		40-44		45-49	
	U'	U"	U'	U"	U'	U"	U'	U"	U'	U"	U'	U"	U'	U"
Islamshahr	.16	.19	.33	.3	.39	.43	.46	.38	.61	.3	.57	.26	.41	.21
Zabol	.24	.03	.36	.07	.48	.05	.54	.1	.49	.13	.57	.12	.37	.03
Zahedan	.17	.05	.27	.11	.39	.13	.34	.18	.47	.19	.44	.18	.32	.13
Marivan	.17	.08	.46	.11	.8	.09	.82	.12	.89	.14	.75	.09	.49	.04
Divandareh	.67	.04	.6	.05	.6	.07	.73	.05	.67	.03	.72	.03	.69	.04
Minoodasht	.16	.18	.47	.07	.53	.13	.58	.17	.56	.18	.57	.09	.37	.13
Gonbad	.24	.07	.45	.13	.56	.19	.53	.22	.52	.22	.6	.17	.29	.01
Kangan	.17	.09	.39	.1	.45	.15	.51	.17	.53	.15	.5	.1	.4	.04
Bushehr	.14	.22	.36	.19	.42	.3	.55	.28	.54	.35	.48	.34	.44	.29

4-5-Data analysis

The data has been analyzed by PMS Package[2]. The data were ready for all versions of prevalence model, so all of the models were used to estimate natural fertility, gross potential fertility and number of births averted by program and non-program sources.

The first version, the aggregate prevalence model, was used to estimate, total natural fertility rate, natural crude birth rate and number of births averted. Table 5 shows the application of this version in sample size by using APMS spreadsheet.

Table 5: Application of aggregate model for selected districts of Iran, BLS-2000

District	TNFR	NCBR	GPFR	GPCBR	BA	BAN
Islamshahr	5.7	0.45	4.08	0.032	7835	5506
Zabol	7.8	0.049	7.23	0.046	7296	1379
Zahedan	8.33	0.054	7.25	0.047	8987	3652
Marivan	8.49	0.059	7.69	0.053	7093	1082
Divandareh	7.21	0.054	6.88	0.051	2936	231
Minoodasht	6.99	0.046	6.12	0.04	6280	1702
Gonbad	5.13	0.038	4.23	0.032	7614	2998
Kangan	6.3	0.043	5.6	0.038	1461	409
Bushehr	6.5	0.049	4.83	0.036	4087	2583

Figure 5:

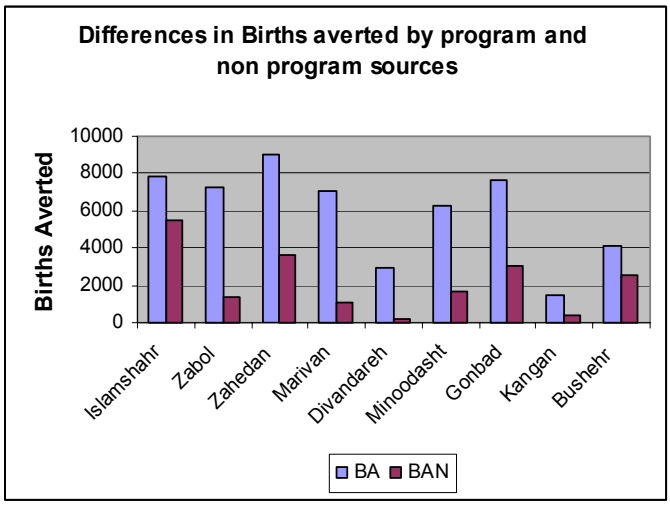


Figure 6:

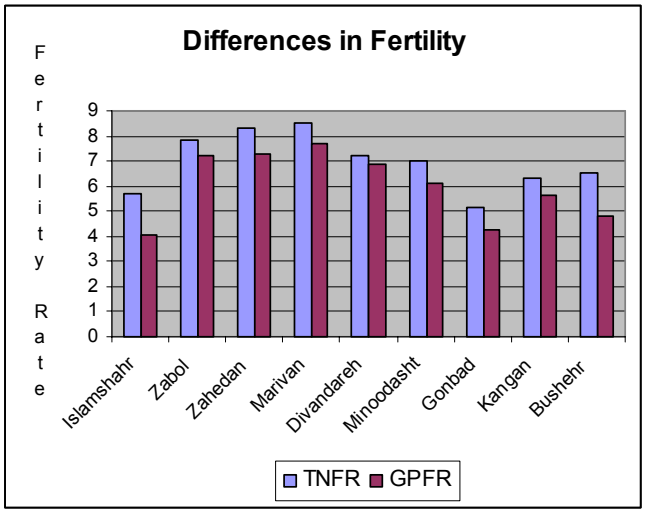


Table 5 and related figures (5 and 6) show that in the absence of any kind of contraceptives (program or non-program), Marivan and Gonbadkavoos would have the highest and lowest fertility rates, respectively. In terms of births averted by program source Zahedan and Kangan have the highest and lowest numbers, respectively. It should be noted that BA or BAN are crude measures of program

impact and they cannot indicate the strength or weakness of program as they don't include population size.

The age specific method, which is the second version of prevalence model, was used to estimate all of the indices of previous version by age groups. Table 6 indicates the results for the sample of the study. ASPMS spreadsheet estimates this model outputs.

Table 6: The results of Age-specific model for selected districts of Iran

District	Index	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Islamshahr	NAFa	0.034	0.16	0.23	0.47	0.47	NA[3]	NA
	PAFa	0.02	0.13	0.15	0.3	0.32	NA	NA
	BAa	92	661	1333	311	3977	NA	NA
	BANa	113	603	1769	2579	2007	NA	NA
Zabol	NAFa	0.06	0.24	0.35	0.43	0.4	0.34	0.14
	PAFa	0.06	0.23	0.33	0.38	0.34	0.29	0.13
	BAa	223	756	1654	2091	1755	1666	495
	BANa	28	161	194	418	478	365	44
Zahedan	NAFa	0.07	0.25	0.41	0.39	0.31	0.4	0.4
	PAFa	0.07	0.2	0.36	0.33	0.25	0.31	0.30
	BAa	258	902	2494	1984	1887	1905	1371
	BANa	73	396	831	1044	749	762	571
Marivan	NAFa	0.01	0.21	0.57	0.72	NA	NA	NA
	PAFa	0.012	0.19	0.52	0.63	NA	NA	NA
	BAa	16	561	2959	2934	NA	NA	NA
	BANa	8	142	360	425	NA	NA	NA
Divandareh	NAFa	0.09	0.22	0.39	0.23	0.22	4.84	0
	PAFa	0.09	0.21	0.36	0.22	0.21	4.64	0
	BAa	198	364	641	385	309	8887	0
	BANa	13	34	83	30	16	391	0
Minoodasht	NAFa	0.05	0.22	0.40	0.31	0.26	0.26	0.88
	PAFa	0.046	0.21	0.36	0.26	0.21	0.23	0.65
	BAa	87	837	1723	1391	1012	1075	2585
	BANa	100	137	431	405	323	187	928
Gonbad	NAFa	0.022	0.17	0.28	0.28	0.18	BA	BA
	PAFa	0.021	0.15	0.23	0.22	0.14	BA	BA
	BAa	96	1048	2141	2007	1181	BA	BA
	BANa	29	316	733	850	506	BA	BA
Kangan	NAFa	0.028	0.22	0.33	0.42	0.26	0.2	0
	PAFa	0.03	0.2	0.29	0.35	0.22	0.17	0
	BAa	14	206	397	452	301	201	0
	BANa	8	53	129	153	84	41	0
Bushehr	NAFa	0.014	0.17	0.34	0.41	0.46	BA	BA
	PAFa	0.01	0.15	0.26	0.302	0.297	BA	BA
	BAa	15	328	948	1545	1670	BA	BA
	BANa	24	170	669	789	1071	BA	BA

In table 6 NAFa represents natural ASFR (i.e., ASFR in the absence of any kind of contraceptives), PAFa denotes gross potential ASFR and BAa and BANa are

the number of births averted by program and non-program sources in each age group. Next section interprets this table in more details.

The last version of this method, that is method-specific model, estimates the number of births averted by program and non-program sources attributable to each method. MSPMS spreadsheet applies this model.

Table 7: Application of Method - Specific Model in Selected Districts of Iran

District	Index	Condom	Female str.	Indictable	IUD	Male stri.	Implant
Islamshahr	BAm	364.00	2960.00	300.00	1870.00	712.00	112.00
	BANm	152.34	832.88	0.00	541.64	107.47	0.00
Zabol	BAm	245.00	1798.00	801.00	34.00	35.00	89.00
	BANm	89.17	22.02	22.02	84.54	0.00	0.00
Zahedan	BAm	692.00	2039.00	826.00	608.00	110.00	248.00
	BANm	293.26	72.41	108.62	278.06	36.21	0.00
Marivan	BAm	279.84	1596.38	1179.42	1338.10	119.13	190.61
	BANm	39.96	0.00	0.00	347.31	0.00	16.44
Divandareh	BAm	75.50	1225.78	447.43	308.73	18.64	247.02
	BANm	10.49	6.47	6.47	80.79	6.47	0.00
Minoodasht	BAm	159.95	2073.44	987.35	446.85	14.11	42.32
	BANm	89.84	591.54	0.00	88.73	0.00	18.49
Gonbad	BAm	321.37	1947.68	613.16	380.88	198.37	54.10
	BANm	56.54	907.35	0.00	290.35	23.27	23.27
Kangan	BAm	122.33	309.80	85.19	104.09	27.11	7.74
	BANm	4.96	12.26	0.00	35.29	0.00	0.00
Bushehr	BAm	834.66	1346.72	81.62	264.45	234.66	20.40
	BANm	185.73	76.43	0.00	176.10	91.72	0.00

Table 7: Continued

District	Index	Pill	Rhythm	withdrawal	other
Islamshahr	BAm	1516.56	0.00	0.00	0.00
	BANm	1359.47	53.73	2458.34	0.00
Zabol	BAm	4292.06	0.00	0.00	0.00
	BANm	830.47	0.00	308.24	22.02
Zahedan	BAm	4462.08	0.00	0.00	0.00
	BANm	1632.13	36.21	1176.67	18.10
Marivan	BAm	2389.33	0.00	0.00	0.00
	BANm	242.07	16.44	411.12	8.22
Divandareh	BAm	613.17	0.00	0.00	0.00
	BANm	29.78	3.24	87.39	0.00
Minoodasht	BAm	2556.40	0.00	0.00	0.00
	BANm	340.14	27.73	545.33	0.00
Gonbad	BAm	4098.06	0.00	0.00	0.00
	BANm	684.94	34.90	977.15	0.00
Kangan	BAm	805.17	0.00	0.00	0.00
	BANm	95.83	3.06	238.97	18.38
Bushehr	BAm	1304.69	0.00	0.00	0.00
	BANm	562.53	45.86	1421.60	22.93

Table 7 shows the contribution of each contraceptive method in the number of births averted by program and non-program sources. The table shows that pill and female sterilization contributions in most of the districts are higher than the other methods.

4-6-Interpretation of results

This section interprets the findings in previous section. Table 5 shows, the highest number of births averted by program and non-program sources that are in Zahedan and Islamshahr districts, respectively. The row data will not give accurate estimation of the impacts, therefore the rates of reduction in fertility indices should be used to obtain accurate estimates. Subtracting TFR from GPFR and dividing the results by GPFR and multiplying by 100 gives the reduction rate in fertility which is the result of program source contraception. The greater the

rate the higher the impact of family planning program in a given district. The reduction rate of CBR could also be calculated in similar procedure. Table 8 presents the reduction rate in TFR and CBR as a result of program contraception.

Table 8: TFR and CBR reduction rates by program contraception

Districts	% reduction in TFR	% reduction in CBR
Islamshahr	0.571078	0.56875
Zabol	0.44668	0.456522
Zahedan	0.365517	0.382979
Marivan	0.674902	0.679245
Divandareh	0.636628	0.647059
Minoodasht	0.526144	0.525
Gonbadkavoos	0.541371	0.5625
Kangan	0.451786	0.447368
Bushehr	0.565217	0.583333

Figure 6: % reduction in TFR and CBR

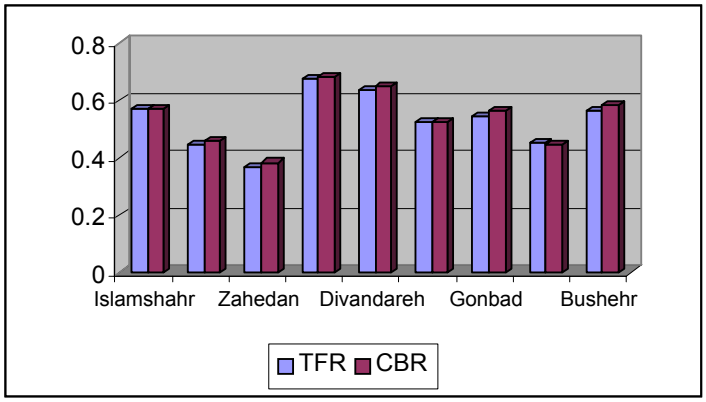


Table 8 shows the high reduction rate in TFR and CBR in Marivan district, and the low reduction rate in Zahedan district. Family planning programs had the highest and lowest impact on fertility in these two districts, respectively. The impact of family planning programs on fertility was revealed to be the highest in

Marivan and the rest of the districts of Divandareh, Islamshahr, Bushehr, Gonbadkavoos, Minoodasht, Kangan, Zabol and Zahedan have impacts from higher to lower respectively.

The reduction rate can be calculated for different age groups. Subtracting AFa from PAFa and dividing the results by PAFa and then, multiplying it by 100, gives the percentage of reduction in ASFR in different age groups. Table 9 presents the reduction rate in ASFR, by age groups.

Table 9: Reduction rate in ASFR by age groups

District	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Islamshahr	0.00	0.23	0.53	0.70	0.94	NA	NA
Zabol	0.17	0.22	0.42	0.58	0.59	0.90	0.77
Zahedan	0.14	0.05	0.36	0.39	0.60	0.77	0.83
Marivan	0.17	0.32	0.73	0.87	NA	NA	NA
Divandareh	0.43	0.38	0.53	0.73	0.71	1.00	NA
Minoodasht	0.13	0.29	0.50	0.65	0.71	0.87	0.97
Gonbad	0.05	0.33	0.57	0.64	0.71	NA	NA
Kangan	0.33	0.25	0.41	0.57	0.65	0.76	NA
Bushehr	0.00	0.27	0.46	0.70	0.87	NA	NA

Figure 7: % reduction in ASFR

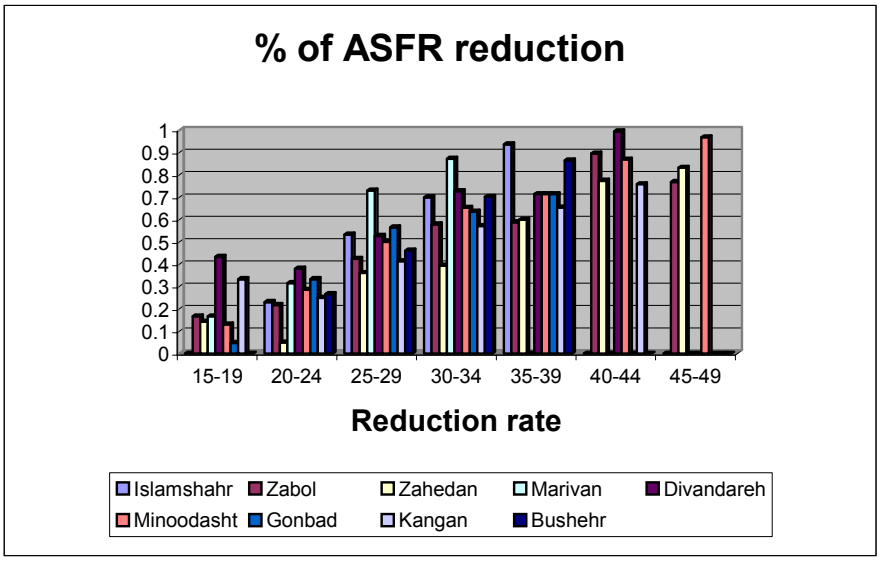


Table 9 shows that the high reduction in ASFR belong to age groups 30-34 in Marivan, 35-39 in Islamshahr, Gonbadkavoos and Bushehr, 40-44 in Zabol, Divandareh and Kangan districts and 45-49 in Zahedan and Minoodasht districts.

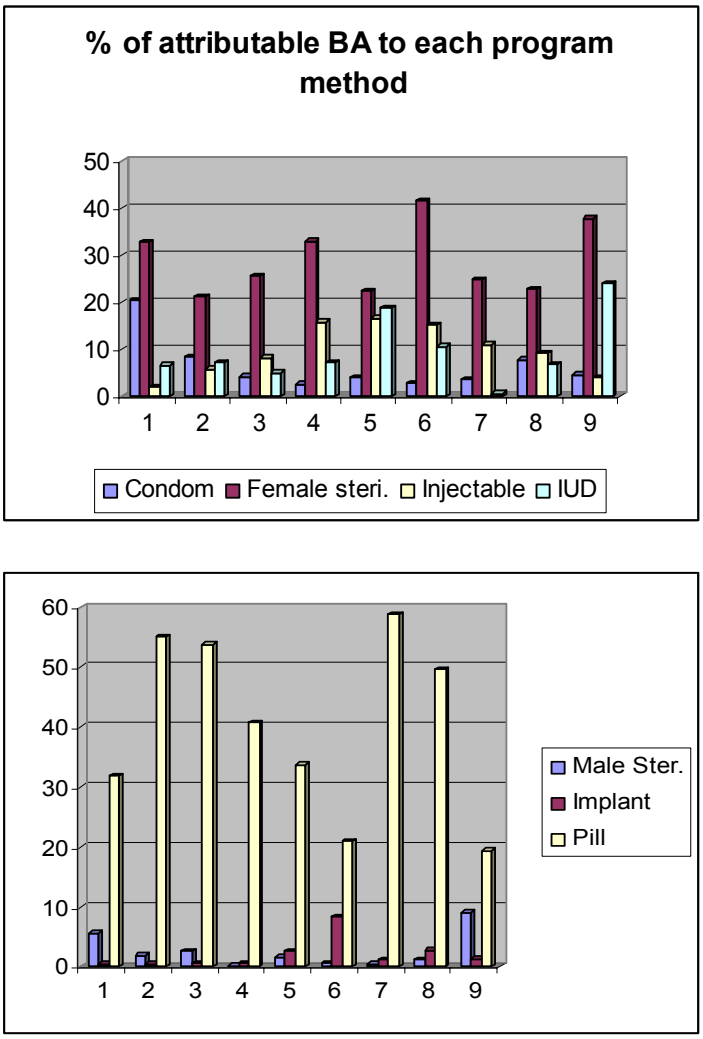
The high reduction in age group 15-19 belong to Gonbadkavoos, 20-24; Divandareh, 25-29; Marivan, 30-34; Marivan, 35-39; Islamshahr, 40-44 Divandareh and 45-49 Minoodasht. The important point in reduction rate of ASFR is that reduction rate increases as the age goes up. This means the program prevents high risk pregnancies at high age groups.

The calculation of reduction rate in fertility indices is possible by types of contraceptive methods, also. For doing so, BAm should be divided by BA then multiplied by 100. This rate tells about percentage of births averted by program attributable to each method. Table 10, presents the percentage of births averted by program source of each method.

Table 10: Percentage of Attributed BA to Each Program Method

District	Bushehr	Kangan	Gonbad	Minoo dasht	Marivan	**Divan dareh**	**Zabol**	**Zahedan**	Islam shahr
Condom	20.4	8.4	4.2	2.5	3.9	2.6	3.4	7.7	4.6
Female steri.	32.9	21.2	25.6	33.0	22.5	41.7	24.7	22.7	37.8
Injectable	2.0	5.8	8.1	15.7	16.6	15.2	11.0	9.2	3.8
IUD	6.5	7.1	5.0	7.1	18.9	10.5	0.5	6.8	23.9
Male Ster.	5.7	1.9	2.6	0.2	1.7	0.6	0.5	1.2	9.1
Implant	0.5	0.5	0.7	0.7	2.7	8.4	1.2	2.8	1.4
Pill	31.9	55.1	53.8	40.7	33.7	20.9	58.8	49.7	19.4

Figure 8: Contribution of each method in BA



1,2,3,4,5,6,7,8 and 9 are districts: Islamshahr, Zabol, Zahedan, Marivan, Divandareh, Minoodasht, Gonbad, Kangan and Bushehr respectively.

The table shows that the highest contribution of program contraceptives in preventing births in different districts are female sterilization in Bushehr , Divandareh and Islamshahr , and pill in other districts.

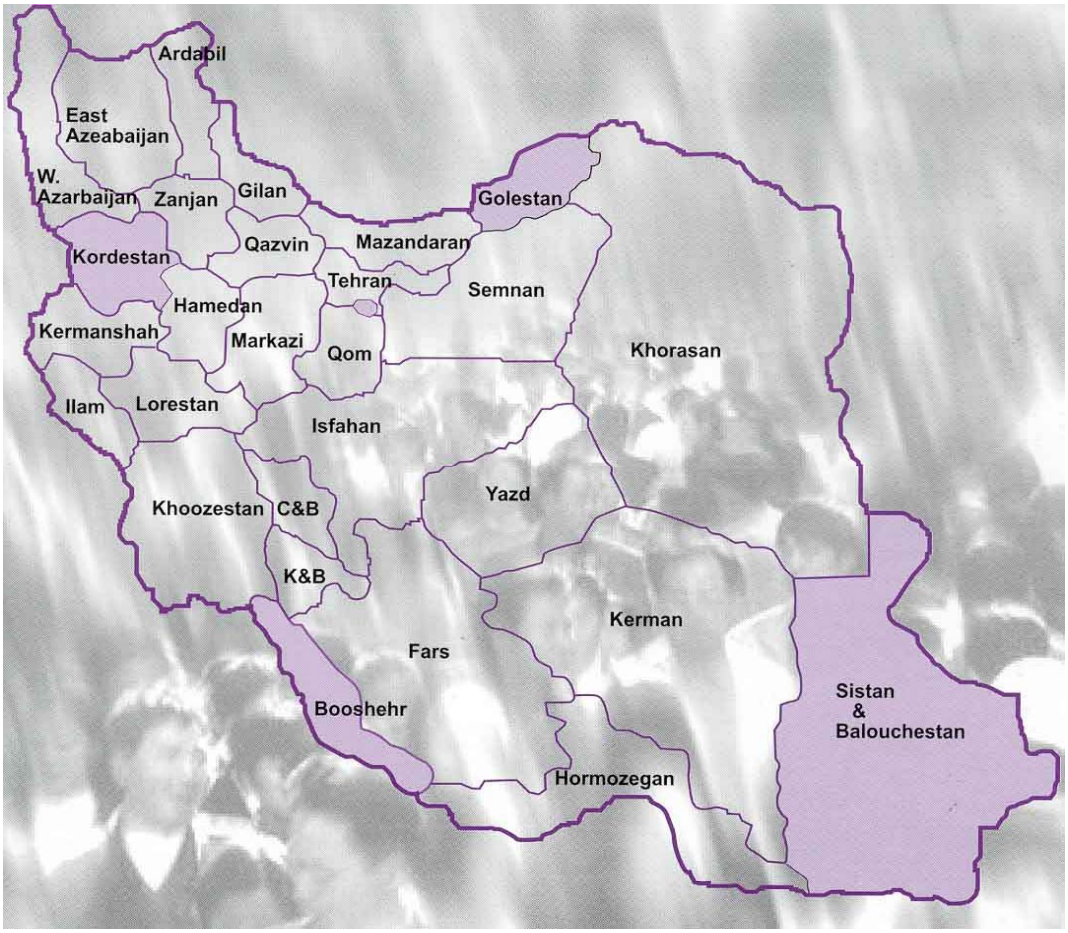
5-Discussion

Application of Bongaarts prevalence model for evaluation purposes gives a clear amount of changes in fertility indices attributable to family planning programs with a relatively simple computational procedure. Another advantage of using this model is that it does not require special studies to be undertaken. Assuming standard schedules of use-effectiveness and fecundity, the method requires only data that are normally available in DHS-type surveys.

There are also some limitations and practical considerations of this model. First, if data on use-effectiveness and proportion of women who are fecund (not normally collected in DHS-type surveys) are not available, the method requires the assumption that standard schedules apply. Application of these standards has other limitations, what I experienced in application of these standards was that, the last third standards for age groups 35-39, 40-44 and 45-49 are sensitive for high rates of contraceptive prevalence. If contraceptive prevalence rates are more than 0.97, 0.76 and 0.52 for last three age groups respectively estimated natural and potential fertility will be negative. Second, it does not directly measure effects of program inputs. Program inputs are inferred from changes in contraceptive prevalence (and estimated program contributions to changes in prevalence). Third, the method is sensitive to: (1) accuracy of survey data on source of contraception and (2) definitions and reporting (in survey interviews) of program and non-program contraception. Fourth, the method provides the measure of gross impact, but it does not account for source substitution and program catalytic effects (i.e. increases in non-program contraception that are the result of program promotional

efforts. Finally, the method is limited to measuring impact in terms of fertility (Bertrand, J.T. et al, 1996:68).

Map of Iran (highlighted areas are the study areas)



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Acronyms:

TFR: Total Fertility Rate

U: Prevalence of Contraception among Currently Married Women

U': Prevalence of Contraception from Program sources

U": Prevalence of Contraception from Non-Program Sources

TNFR: Total Natural Fertility Rate

GPFR: Gross Potential Total Fertility Rate

CBR: Crude Birth rate

GPCBR: Gross Potential Crude Birth Rate

NCBR: Natural Crude Birth Rate

BA: Births Averted by the Program Contraception

BAN: Births Averted by Non-Program Contraception

Pop: Population

a: age group of women

U' a: Prevalence of program contraception, by age

U" a: Prevalence of non-program contraception, by age

AF a: age-specific fertility rate

PAFa: Potential age - specific fertility rate

NAFa: Natural age- specific fertility rate

BAa: births averted by program contraception, by age

BANa: births averted by non-program contraception, by age

POPa: Number of women in age group a

Ca: Elasticity coefficients, by age

P.N.B.: Potential Number of Births

BAm: Births averted by method m obtained from program sources

BANm: Births averted by method m obtained from non-program sources

U'm: Prevalence of program method m

U"m: Prevalence of non-program method m

e' m: use-effectiveness of program method m

e"m: use-effectiveness of non-program method m

U' : Prevalence of program contraception

U": Prevalence of non-program contraception

e': use-effectiveness of program contraception

e": use-effectiveness of non-program contraception

Endnotes

[1] The family planning program in this study refers to the family planning program run by MOH of Iran.
[2] PMS is an Excel file developed by the author in order to use the prevalence model easily.
[3] Not Applicable