SOCIAL AND PSYCHOLOGICAL FACTORS AFFECTING FERTILITY

VIII. THE COMPARATIVE INFLUENCE ON FERTILITY OF CONTRACEPTION AND IMPAIRMENTS OF FECUNDITY[1]

P. K. WHELPTON AND CLYDE V. KISER

THE extent to which childlessness and small families result from defects in the reproductive system and from deliberate efforts to space pregnancies, limit their number, and terminate them by illegal abortion is a question which has been discussed at length. The case histories accumulated by physicians and (more recently) planned parenthood clinics, as well as the field studies of demographers, show conclusively that an important proportion of childless couples want a child but either are not able to conceive or, if conception occurs, the wife cannot carry the fetus to term. Similarly, some of the couples with one or more children want an additional child but are physiologically unable to have it. At the same time such records and the information regarding the manufacture of contraceptive materials and appliances make clear the fact that efforts to prevent conception except when desired are widespread and effective. Finally, these sources and surveys by other agencies indicate that an important proportion of unwanted pregnancies are terminated by illegal abortion.[2] Heretofore, however, there

According to definitions adopted by the Population Association of America fecundity is the physiological ability to participate in reproduction, and fertility is the use of this ability (*i.e.* the production of children). The fecundity of couples is considered to be impaired in this analysis (1) if the wife could not conceive, (2) if conception required a long period of exposure, (3) if an unduly large proportion of the actual pregnancies were terminated by miscarriage (unintentional abortion) or therapeutic abortion, or (4) if a physician said that conception probably was impossible or that if it occurred the pregnancy probably could not end in a live birth.

[2] For example of studies of the incidence of sterility, the use of contraceptives and the practice of illegal abortion, *see:*

seems to have been no single investigation in which information bearing on all of these matters was collected from a large and representative group of the population as was done in the Study of Social and Psychological Factors Affecting Fertility, in Indianapolis.[3] In consequence, it should be of value to determine the relative influence of impaired fecundity and deliberate family limitation in reducing the fertility of the 1,977 couples covered by this study.[4]

One procedure which might be suggested for such an analysis is (a) divide the couples into two groups, those normal (or above) in fecundity and those below normal, (b) subdivide each of these groups into two subgroups according to whether the couples did or did not try to control family size and spacing, and (c) compare the birth performance of these four subgroups. This procedure is impractical because almost all of the native white, urban, Protestant couples with at least an eighth grade education either try to regulate the number or spacing of their children or know that they do not need to do so because it is difficult or impossible for conception to occur. Among the

Meaker, Samuel R.: HUMAN STERILITY. Baltimore, The Williams and Wilkins Company, 1934.

Kiser, Clyde V.: Voluntary and Involuntary Aspects of Childlessness. The Milbank Memorial Fund *Quarterly,* January, 1939, xvii, No. 1, pp. 50–68.

Hotchkiss, Robert S.: FERTILITY IN MEN. Philadelphia, J. B. Lippincott Company, 1944.

Siegler, Samuel L.: FERTILITY IN WOMEN. Philadelphia, J. B. Lippincott Company, 1944.

Stone, Abraham: Infertility. *American Journal of Nursing,* September, 1947, xlvii, pp. 606–608.

Riley, John Winchell and White, Matilda: The Use of Various Methods of Contraception. *American Sociological Review,* December 1940, Volume 5, Number 6, pp. 890–903.

The Accident of Birth, *Fortune,* February 1938, Volume 17, pp. 83–86, 108, 110, 112, 114.

Pearl, Raymond: *The Natural History of Population.* London, Oxford University Press, 1939, pp. 192–197.

Wiehl, Dorothy G.: A Summary of Data on Reported Incidence of Abortion. The Milbank Memorial Fund Quarterly, January 1938, xvi, No. 1, pp. 80–88.

[3] This study included a large and typical sample of the native-white Protestant couples with at least an eighth grade education, married in 1927–29, the wife under 30 and the husband under 40 at marriage, and living in Indianapolis in 1941. Information was gathered relating to the 12 to 15 years of married life.

[4] Schedules were completed for 1,080 couples, but because of the sampling plan which was followed these couples are considered to be representative of 1,977 couples. *See* Whelpton, P. K. and Kiser, Clyde V.: Social and Psychological Factors Affecting Fertility. V. The Sampling Plan. The Milbank Memorial Fund *Quarterly,* January, 1946, xxiv, No. 1, pp. 49–93.

1,977 couples in this Study there are only six who never used contraceptives and who also had not been obviously below normal in their ability to conceive during at least 2 years of their married life.[5]

In view of the foregoing the best procedure appears to be to use the experience of the couples in this study while they were apparently normal in fecundity and were not practicing contraception as a basis for estimating what their birth performance would have been if these conditions had existed throughout their married life. This gives a theoretical measure of the fecundity—the potential maximum fertility—of the group. In other words it shows the expected size of family of couples found relatively infrequently in the urban population, namely, those who during the first 12 to 15 years of their married life are normal or above in fecundity and do not resort to contraception or illegal abortion. The extent to which this high potential level of fertility is reduced by sterility and the less serious defects of the reproductive system can be measured by comparing the foregoing estimate with an estimate of birth performance based on the experience without contraception of *all* couples, including those with impaired fecundity. The differences between the two sets of estimates should represent the reduction due to low fecundity and sterility.

A. Estimating the Reduction in Fecundity (The Physiological Capacity to Reproduce) Caused by Defects in the Reproductive System

In order to estimate the number of pregnancies and live births that would occur to all couples, and to those normal (or above) in fecundity, if contraception and illegal abortion were not practiced, it is necessary to have the following information:

1. The proportion of couples that would have a first conception, a second conception, etc., if contraceptives were not used,[6]

---

[5] Two of these six wives were sterilized a few months before the interview, after each had had eleven pregnancies.

[6] "Abstinence" (avoiding coitus for a period of at least one month except for

ORDER OF PREGNANCY	ALL 1,977 COUPLES			COUPLES ASSUMED NORMAL (OR ABOVE) IN FECUNDITY					
	Number of Couples[1]	Per Cent of Couples on Preceding Line	Per Cent of 1,977 Couples	1,680 Couples (85 Per Cent)		1,483 Couples (75 Per Cent)		1,186 Couples (60 Per Cent)	
				Number of Couples	Per Cent of 1,680 Couples	Number of Couples	Per Cent of 1,483 Couples	Number of Couples	Per Cent of 1,186 Couples
	A	B	C	D	E	F	G	H	I
1st	1,783	90.2[2]	90.2	1,680	100.0	1,483	100.0	1,186	100.0
2nd	1,605	90.0	81.2	1,605	95.5	1,483	100.0	1,186	100.0
3rd	1,418	88.4	71.7	1,418	84.4	1,418	95.6	1,186	100.0
4th	1,276	90.0	64.6	1,276	76.0	1,276	86.1	1,186	100.0
5th	1,149	90.0	58.1	1,149	68.4	1,149	77.5	1,149	96.8
6th	1,034	90.0	52.3	1,034	61.5	1,034	69.7	1,034	87.2
7th	931	90.0	47.1	931	55.4	931	62.8	931	78.4
8th	837	90.0	42.4	837	49.8	837	56.5	837	70.6
9th	754	90.0	38.1	754	44.9	754	50.8	754	63.5
10th	678	90.0	34.3	678	40.4	678	45.8	678	57.2

[1] The data for the first, second, and third pregnancies are from Appendix Tables A, C, and D. Those for subsequent pregnancies assume a 10 per cent decrease after each pregnancy in the number of couples able to conceive, as explained in the text.
[2] The per cent of the 1,977 couples able to have a first conception.

Table 1. Couples able to have pregnancies of various orders (if contraception not practiced) among all couples, and among three groups assumed normal (or above) in fecundity.

2. The months of uncontrolled exposure required by each couple for the first, second, and each subsequent conception,

3. The duration of the first, second, and each subsequent pregnancy (with an allowance for the puerperium), assuming no illegal abortion,

4. The ratio of live born children to pregnancies, by order of pregnancy, assuming no illegal abortion.

The proportion of the couples studied who would have had a first, second, and third pregnancy if contraception had not been practiced, and the number of months of exposure without

reasons of separation or sickness), and "free period" (avoiding coitus for a few days before and after the supposed time of ovulation) are classified as contraceptive practices in this analysis. Douching shortly after coitus also is considered a contraceptive practice on an "action" basis, even for the wives who insisted that it was done only for cleanliness and not to prevent conception. If motivations were being analysed (as in other articles in this series) douching "for cleanliness only" would not be considered a contraceptive practice. Lactation is not considered a contraceptive practice here even though it was prolonged because the wife believed it would lessen the risk of conceiving.
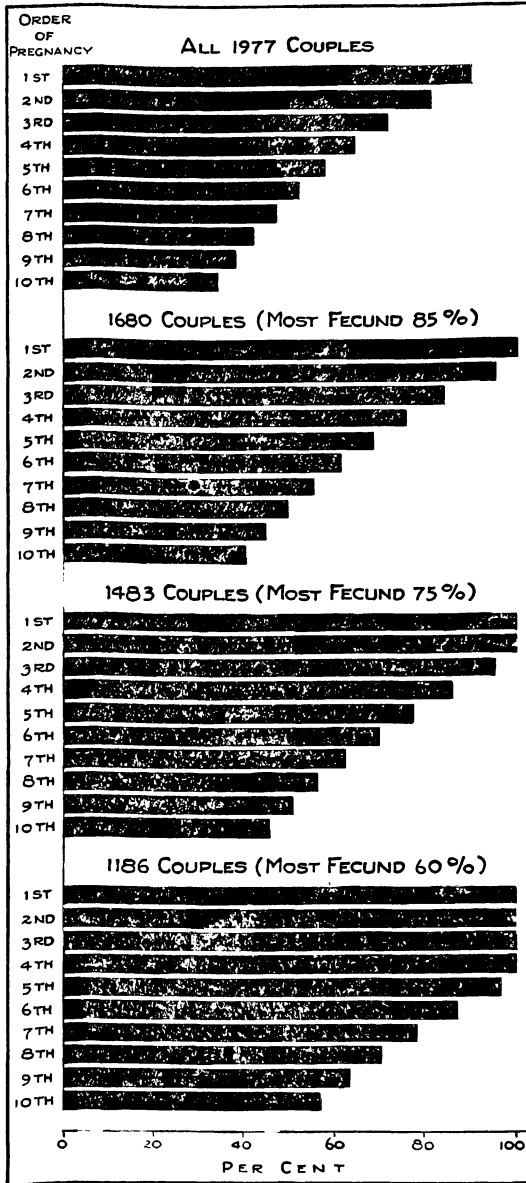
Fig. 1. Estimated percentages of couples able to have given numbers of pregnancies if no contraceptives were used.

Estimates are presented for all couples in the Indianapolis Study and for couples classified as "normal or above" in fecundity under three different assumptions. (*See* Table 1.)

contraception which would have been required for each conception, are estimated from the specific information about the various couples according to a procedure explained in the Appendix. The estimates indicate that approximately 90 per cent of the 1,977 couples would have had a first pregnancy, 81 per cent a second, and 72 per cent a third. (See Table 1, Column C.) The number of couples that had three (or more) conceptions and did not use contraceptives at all times after the third is too small to provide a basis for estimating in the same way the ability to have higher order pregnancies. In consequence these estimates are based on the relationships observed for the first three pregnancies, namely, that (a) 90.2 per cent of all couples could have had a first

pregnancy, (b) 90 per cent *of those able to have a first* could have had a second, and (c) 88.4 per cent *of those able to have a second* could have had a third. (See Table 1, Column B.) In view of the similarity of these percentages it is assumed that 90 per cent of the couples able to have a third pregnancy could have had a fourth, 90 per cent of those able to have a fourth could have had a fifth, etc. In other words, it is assumed that 64.6 per cent of all couples could have had a fourth pregnancy, 58.1 per cent a fifth, 52.3 per cent a sixth, 47.1 per cent a seventh, 42.4 per cent an eighth, 38.1 per cent a ninth, and 34.3 per cent a tenth.[7] (*See* Figure 1.)

Table 2. Couples able to conceive, by months of exposure required for first conception, second conception, and third conception, if contraception not practiced.[1]

MONTHS OF EXPOSURE[2]	FIRST PREGNANCY		SECOND PREGNANCY		THIRD PREGNANCY	
	Number of Couples	Per Cent	Number of Couples	Per Cent	Number of Couples	Per Cent
	A	B	C	D	E	F
1	598	33.5	169	10.5	196	13.8
2	211	11.8	167	10.4	146	10.3
3	165	9.3	108	6.7	115	8.1
4	87	4.9	131	8.1	109	7.7
5–6	156	8.8	181	11.3	213	15.0
7–9	108	6.1	223	13.9	129	9.1
10–12	150	8.4	152	9.5	88	6.2
13–16	61	3.4	150	9.3	118	8.3
17–24	37	2.1	86	5.4	125	8.8
25–48	113	6.3	123	7.7	139	9.8
49–84	44	2.5	83	5.2	32	2.3
85+	53	3.0	32	2.0	8	0.6
ALL COUPLES	1,783	100.0	1,605	100.0	1,418	100.0

[1] *See* Appendix for an explanation of the procedure followed in obtaining these estimates.
[2] Because "months of exposure" was coded to the nearest whole number the line for 1 month includes periods of less than 1.50 months, that for 2 months includes periods of 1.50 to 2.50 months, that for 3 months includes periods of 2.51 to 3.49 months etc.

[7] The computations for this article were carried to more decimal places than are shown in the text and tables, and each figure was rounded independently. In consequence, what appear to be arithmetic errors occur in several places. For example, Table 1, Column A shows 1,276 couples able to have a fourth pregnancy and 90 per cent of them, or 1,149, able to have a fifth. This appears incorrect because .9 × 1,276 = 1,148.4. The original calculations are 1,418.2 × .9 = 1,276.4 and 1,276.4 × .9 = 1,148.8. The latter is rounded to 1,149.

A high proportion of the couples able to have had a first pregnancy would have conceived shortly after marriage if contraceptives had not been used—over one-third within six weeks and over half within $3\frac{1}{2}$ months. (See Table 2, Columns A and B.) The proportion that would have conceived during each additional month is small, however, being approximately 5 per cent during the fourth month, and less than one per cent during most months after the first year. Nevertheless, nearly 12 per cent of the couples would not have conceived during the first two years of marriage but would have had at least one conception at a later date.

Most couples not using contraceptives require a longer period for the second and third conceptions than for the first, presumably because most wives do not resume ovulation until two or more months after the end of a pregnancy. Among the couples in this study that are classified as able to have a second or third pregnancy less than 14 per cent could have conceived for the second or third time within six weeks of the end of the preceding puerperium,[8] compared with 33.5 per cent that could have conceived within 6 weeks of marriage. (*See* Figure 2.) Six weeks to 6 months of uncontrolled exposure would have been sufficient for the second and third conceptions of over one-third of the couples, and 6 months to 2 years for about one-third. The proportion requiring more than two years of exposure in order to conceive is slightly larger for the second and third conceptions (14.9 and 12.7 per cent) than for the first (11.8 per cent).

A large majority of the pregnancies not terminated by illegal abortion were reported to have lasted nine months, namely, 84.3 per cent of the first pregnancies, 86.3 per cent of the second, 80.3 per cent of the third, 82.9 per cent of the fourth, and 77.6 per cent of those of higher order.[9] (*See* Table 3.) Related to the above is the high proportion of the pregnancies terminated

[8] It is assumed that the puerperium lasts one month after the end of each pregnancy.

[9] The 84 pregnancies reported as terminated by illegal abortion are disregarded here because these proportions are used for estimating the impact of impaired fecundity on birth performance. These 84 pregnancies constituted 2.2 per cent of all
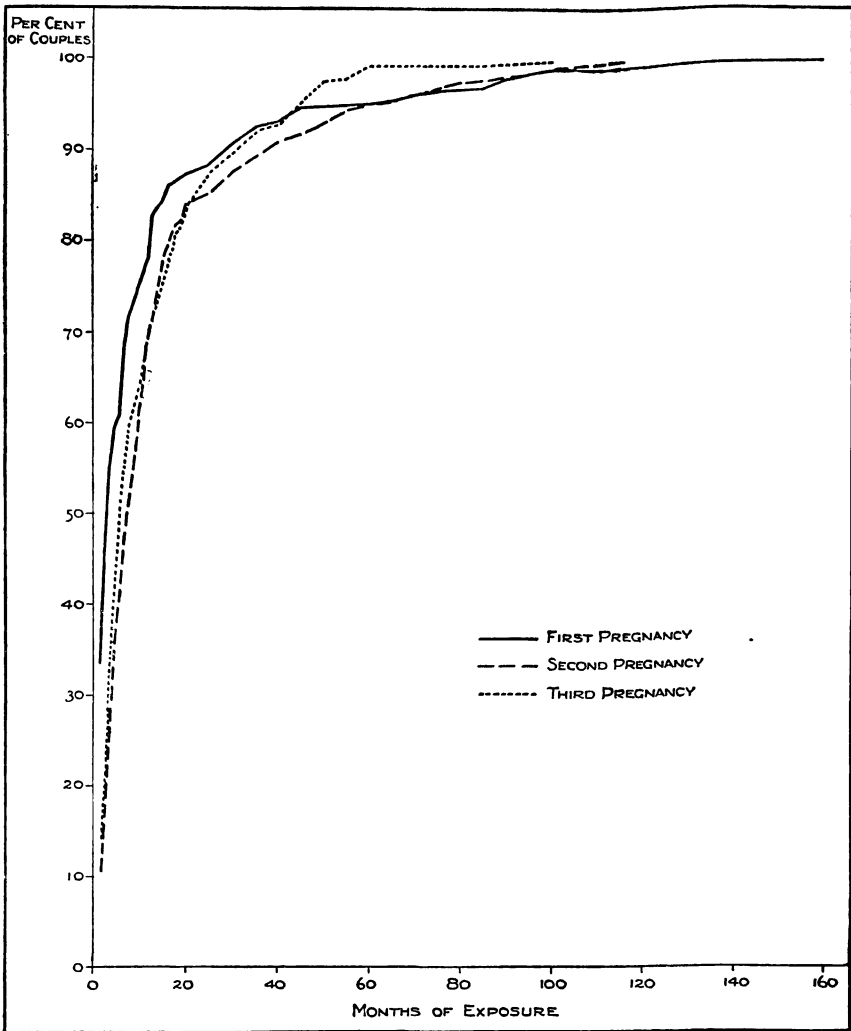
Fig. 2. Percentages of couples requiring less than specified number of months of noncontraceptive exposure for first, second, and third pregnancies. The cumulative percentages are for couples able to have a pregnancy of the specified order and are based on more detailed data than those shown in Table 2.

legally which resulted in a live birth (or twins), namely, 90.8 per cent of the first pregnancies, 90.4 per cent of the second, 83.4 per cent of the third, 84.6 per cent of the fourth and 81.2

pregnancies. The reported durations of these pregnancies are as follows: 37 one month, 30 two months, 13 three months, and 4 four months.

The few pregnancies reported as lasting ten months are included with those reported as lasting nine months.

MONTHS	FIRST PREGNANCY		SECOND PREGNANCY		THIRD PREGNANCY		FOURTH PREGNANCY		FIFTH AND SUBSEQUENT PREGNANCIES	
	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent	Num-ber	Per Cent
1	11	.7	13	1.1	4	.7	1	.4	4	2.4
2	30	1.8	47	4.1	27	4.9	12	5.1	5	2.9
3	43	2.6	27	2.3	31	5.7	7	3.0	7	4.1
4	17	1.0	9	.8	13	2.4	3	1.3	7	4.1
5	7	.4	2	.2	5	.9	5	2.1	3	1.8
6	17	1.0	9	.8	1	.2	3	1.3	2	1.2
7	55	3.3	5	.4	7	1.3	2	.9	2	1.2
8	79	4.8	45	3.9	20	3.7	7	3.0	8	4.7
9	1,386	84.3	992	86.3	439	80.3	194	82.9	132	77.6
TOTAL	1,645	100.0	1,149	100.0	547	100.0	234	100.0	170	100.0

Table 3. Pregnancies by duration in months and ordinal number.[1]

[1] Eighty-four pregnancies which were terminated by illegal abortion are excluded because of the use made of the percentages in the text. None of these pregnancies was reported to have lasted more than 4.5 months. Forty-seven pregnancies which were in progress at the interview also are excluded.

per cent of those of higher order. (*See* Figure 3 and Table 4.[10])

[10] As shown in Table 4, the proportion of pregnancies terminating in miscarriage (unintentional abortion) increases from 6.7 per cent for first pregnancies to 15.9 per cent for fifth and subsequent pregnancies combined. This situation appears at first glance to differ widely from that among the women who had attended a birth control clinic and were studied by Stix and Notestein. The latter found "no consistent variation in the proportion of stillbirths or spontaneous abortions by order of pregnancy, except that both appeared to be slightly higher in first pregnancies than in later ones." (*See* Stix, R. K. and Notestein, F. W.: CONTROLLED FERTILITY. Baltimore, The Williams and Wilkins Company, 1940, pp. 82–83.) The actual proportions of pregnancies terminated by spontaneous abortions in those data extended from only 4.7 per cent for fifth pregnancies to 6.8 per cent for first pregnancies. Much of the difference disappears, however, when the Stix-Notestein data are made more comparable with the Indianapolis data by eliminating the illegal abortions from the percentage bases. The range then extends from 7.2 per cent *for first pregnancies* to 10.2 per cent *for sixth and later pregnancies,* but with little or no relation of the intermediate proportions to order of pregnancy.

It is possible that the more marked relation of miscarriages to order of pregnancy in the Indianapolis data is due in part to the erroneous reporting of illegal abortions as miscarriages. As previously noted, only 84 pregnancies (2.2 per cent of the total number) were reported as terminated by illegal abortion, which seems unduly low in comparison with the results of other studies. Most of the latter, however, relate to birth control clinic patients, a highly selected group, or to small samples and areas not fully comparable with Indianapolis. After reviewing available data and taking their deficiencies into consideration, Wiehl concluded that possibly about 5 per cent of the pregnancies of urban white married women in this country are illegally aborted. This percentage probably varies significantly from city to city, depending on a wide variety of factors. (*See* Wiehl, Dorothy G.: A Summary of Data on Reported Incidence of Abortion. The Milbank Memorial Fund *Quarterly,* January, 1938, xvi, No. 1, pp. 80–88.)

Although these proportions are based on the experience of couples regardless of contraceptive practice, they are used in the present analysis for estimates concerning normal fecundity in the absence of contraceptive practice. This seems justified since the available evidence suggests that, *if illegal abortions are excluded,* there is no relationship between (a) the use of contraceptives, and (b) the duration of pregnancies of given order or the proportion of pregnancies of given order terminating in live births.[11]
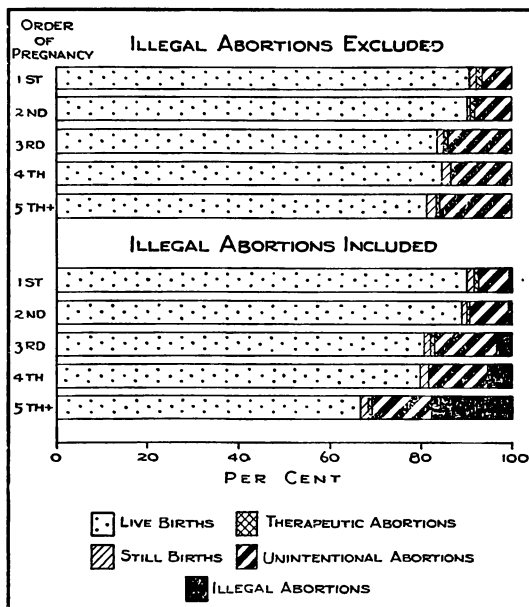

Fig. 3. Percentage distribution, by result, of pregnancies of specified order experienced by couples in the Indianapolis Study. (*See* Table 4.)

The foregoing distributions do not automatically subdivide the 1,977 couples into (a) those that were below normal in their ability to produce living children and (b) those that were normal or above normal, but they do provide a basis for exercising judgment as to where the dividing point should be established. Because there are no fixed rules regarding the proportion of cases that should be classified as normal, above normal, and below normal in various distributions, it is desirable here to make three assumptions, two representing the probable extremes, and the third a medium position. One extreme is that a relatively small proportion (approximately 20 per cent) of the couples in each distribution were normal in fecundity, and

[11] If the couples in this study (excluding those who terminated their first pregnancy by illegal abortion and those whose first pregnancy was in progress at the

Table 4. Pregnancies by type of termination and ordinal number.[1]

TERMINATION	FIRST PREGNANCY		SECOND PREGNANCY		THIRD PREGNANCY		FOURTH PREGNANCY		FIFTH AND SUBSEQUENT PREGNANCIES	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Illegal	7	.4	8	.7	19	3.4	13	5.3	37	17.9
Legal	1,645	99.6	1,149	99.3	547	96.6	234	94.7	170	82.1
All Pregnancies	1,652	100.0	1,157	100.0	566	100.0	247	100.0	207	100.0
Pregnancies Terminated Legally										
One Live Birth	1,488	90.5	1,028	89.5	449	82.1	194	82.9	131	77.1
Live Born Twins	5	.3	11	1.0	7	1.3	4	1.7	7	4.1
Stillbirth	26	1.6	3	.3	9	1.6	5	2.1	4	2.4
Miscarriage (Unintentional Abortion)	110	6.7	96	8.4	77	14.1	31	13.2	27	15.9
Therapeutic Abortion	16	1.0	11	1.0	5	.9	—	—	1	.6
TOTAL	1,645	100.0	1,149	100.0	547	100.0	234	100.0	170	100.0

[1] Pregnancies in progress at the interview are excluded. Two pregnancies which produced one live born and one stillborn twin are included with those producing one live birth.

relatively large proportions (approximately 40 per cent each) above normal and below normal. The other extreme is that a relatively large proportion (approximately 70 per cent) of the couples in each distribution were normal, and relatively small proportions (approximately 15 per cent each) above normal and below normal. The medium assumption considers 50 per cent of the couples as normal, 25 per cent as above normal, and 25 per cent as below normal. Since the normal and above normal groups are combined in this analysis, 1,186 couples (60 per cent of the 1,977 couples studied) were normal or above according to the first assumption, 1,680 according to the second, and 1,483 according to the third.

The application of these percentages may be illustrated with reference to the first pregnancy. The 1,186 couples who are classified as normal (or above) in ability to have a first conception on the 60 per cent basis include the 1,090 who would have conceived within five months of marriage,[12] and 96 of the

interview) are grouped by their use of contraceptives prior to the first conception, the distribution of first pregnancies by type of termination is as follows:

USE OF CONTRACEPTIVES	NUMBER OF FIRST PREG-NANCIES	PER CENT TERMINATING IN			
		Live Birth	Still Birth	Unintentional Abortion	Therapeutic Abortion
Not Used Before First Conception	525	90.9	1.5	7.0	.6
Used Before First Conception	1,120	90.7	1.6	6.5	1.2
Conception Occurred in Spite of Contraceptives	647	89.8	1.9	7.4	.9
Conception Occurred After Contraceptives were Discontinued	473	92.0	1.3	5.3	1.5
ALL COUPLES	1,645	90.8	1.6	6.7	1.0

The variations between the groups in the percentage of pregnancies ending in live births are not significant. (The 34 pregnancies producing live born twins and the two pregnancies producing one live born and one stillborn twin are included in the "Live birth" column.)

[12] Table 2 shows 1,061 couples able to conceive within four months of marriage and 156 requiring five or six months. Of the latter 29 reported five months and 127 reported six months.

127 requiring six months. Similarly, the 1,680 classified as normal or above on the 85 per cent basis include the 1,676 who would have conceived within forty-two months, and four of the five requiring forty-three months. To set the upper and lower dividing points between normal and subnormal at six and forty-three months appears reasonable, for it is believed that few people would claim that any couples whose first pregnancy could begin within six months of marriage are below normal in

Table 5. Average number of months required for conception (if contraception not practiced) and for duration of pregnancy and puerperium, by order of pregnancy, for all couples and for three groups assumed normal (or above) in fecundity.

ORDER OF PREGNANCY	All 1,977 Couples		COUPLES ASSUMED NORMAL (OR ABOVE) IN FECUNDITY					
			1,680 Couples (85 Per Cent)		1,483 Couples (75 Per Cent)		1,186 Couples (60 Per Cent)	
	Months	Cumulative Months	Months	Cumulative Months	Months	Cumulative Months	Months	Cumulative Months
	A	B	C	D	E	F	G	H
1st Conception[1]	10.8	10.8	6.2	6.2	3.6	3.6	2.2	2.2
1st Pregnancy[2]	9.4	20.2	9.8	16.0	10.0	13.6	10.0	12.2
2nd Conception[1]	13.9	34.1	13.9	29.9	9.1	22.7	5.5	17.7
2nd Pregnancy[2]	9.4	43.5	9.4	39.3	9.9	32.6	10.0	27.7
3rd Conception[1]	11.4	54.9	11.4	50.7	11.4	44.0	6.2	33.8
3rd Pregnancy[2]	9.0	64.0	9.0	59.7	9.0	53.0	10.0	43.8
4th Conception[3]	9.7	73.7	9.7	69.4	9.7	62.8	7.4	51.2
4th Pregnancy[2]	9.2	82.8	9.2	78.6	9.2	71.9	9.6	60.8
5th Conception[3]	8.5	91.4	8.5	87.2	8.5	80.5	8.6	69.4
5th Pregnancy[2]	9.0	100.4.	9.0	96.2	9.0	89.5	9.0	78.4
6th Conception[3]	7.8	108.1	7.8	103.9	7.8	97.2	7.8	86.2
6th Pregnancy[2]	9.0	117.1	9.0	112.9	9.0	106.2	9.0	95.2
7th Conception[3]	7.3	124.4	7.3	120.2	7.3	113.5	7.3	102.5
7th Pregnancy[2]	9.0	133.4	9.0	129.2	9.0	122.5	9.0	111.5
8th Conception[3]	7.0	140.4	7.0	136.2	7.0	129.5	7.0	118.5
8th Pregnancy[2]	9.0	149.4	9.0	145.2	9.0	138.5	9.0	127.5
9th Conception[3]	6.9	156.3	6.9	152.0	6.9	145.4	6.9	134.4
9th Pregnancy[2]	9.0	165.2	9.0	161.0	9.0	154.3	9.0	143.4
10th Conception[3]	6.9	172.1	6.9	167.9	6.9	161.2	6.9	150.3
10th Pregnancy[2]	9.0	181.1	9.0	176.9	9.0	170.2	9.0	159.3

[1] The average numbers of months of uncontrolled exposure required for conception (Columns A, C, E, and G) are computed from the distributions in Table 2.

[2] The average duration of the pregnancies (Columns A, C, E, and G) are computed from the distributions in Table 3.   One month is added to allow for the puerperium.

[3] Columns A, C, E and G are estimated as explained in Section IV of the Appendix.

their ability to have their first conception, or that any couples unable to conceive within forty-three months are normal in that respect. The medium estimate (75 per cent) includes the 1,476 couples who would have conceived within twelve months and seven of those requiring a thirteenth month.

If only the 1,186 couples needing six months or less to become pregnant for the first time, in the absence of preventive practices, are assumed to be normal (or above) in fecundity, the average number of months necessary for that conception is 2.2. (*See* Table 5, Column G.) But if the 1,680 couples able to have conceived within forty-three months are considered normal or above, the average number of months for such couples is 6.2. (*See* Column C.) The average for the medium assumption is 3.6 months.

The application of the assumptions regarding the dividing line between the subnormal and normal couples to the distribution of pregnancies by their duration is similar to the foregoing. The 1,186 couples include 66.5 per cent of the 1,783 couples who could have conceived, according to Table 1. Since 84.3 per cent of the first pregnancies not terminated by illegal abortion lasted nine months and 90.8 per cent ended in live births (Tables 3 and 4) is it assumed that the first pregnancies of all of the 1,186 couples would have been of this type in the absence of control measures. The 1,680 couples, in contrast, amount to 94.2 per cent of the 1,783 couples assumed able to conceive. In consequence they include the 93.9 per cent whose first pregnancy lasted five months or longer and some of the 1.0 per cent with a termination at four months. Similarly, they include the 90.8 per cent whose first pregnancy produced a live birth (or twins) and part of the 8.3 per cent with a stillbirth or a miscarriage. If pregnancies ending in illegal abortion are ignored, the average length of the first pregnancy (including the puerperium) was 9.4 months for all couples. It would be 9.8 months for the 1,680 couples, and 10.0 months for the 1,483 and the 1,186 couples. For all couples there were 911 live births per 1,000 first pregnancies. The corresponding ratio would be 966

for the 1,680 couples, and 1,004 (because of twins) for the 1,483 and the 1,186.[13]

The procedure for subsequent pregnancies is like that for the first except for the fact that according to the low estimates of fecundity (assuming 85 per cent of the couples to be normal or above) the 1,680 couples include the total number (1,605) classified as able to have had a second conception, and 75 of the 372 classified as unable to have done so. The number able to have had subsequent pregnancies decreases with order of pregnancy, only 678 being classified as able to have had a tenth pregnancy. (*See* Table 1, Column A.) In the medium estimate of fecundity, the 1,483 couples are assumed able to have had a first and second pregnancy but the group becomes smaller thereafter. (Column F.) In the high estimate, the decrease does not begin until after the fourth pregnancy. (Column H.)

The average number of months of uncontrolled exposure required for a conception of each order (assuming no use of contraceptives) and the average duration of each pregnancy are given in Table 5, Columns A, C, E, and G. The cumulative average numbers of months for successive events are given in Columns B, D, F, and H of the same table. According to the average experience of the 1,977 couples it would have taken 149.4 months to have eight pregnancies and 165.2 months to have nine. Since the period from marriage to interview averaged 157.3 months, each of the 837 couples in Table 1 assumed able to have had eight pregnancies would have had sufficient time for eight but the period remaining thereafter (7.9 months) would have been too short to complete the ninth pregnancy. If this remainder is pooled for the 754 couples[14] able

---

[13] It should be noted that the average number of months required for conception is shorter according to the high estimate of fecundity (based on 60 per cent of the couples) than it is according to the low, but that the reverse is true for the average duration of pregnancy. The latter tends to make the number of pregnancies in a given period smaller for the high estimate than for the low. Its effect on live births is offset by the direct relation between duration of pregnancy and proportion of pregnancies ending in a live birth.

[14] 7.9 months for each of 754 couples gives a total of 5,978 months. Dividing it by 15.9 months (the time required for the ninth conception and pregnancy), gives 376.

to have a ninth and divided by the average number of months required for the ninth conception and pregnancy, it is found adequate for 376 pregnancies.

Among the 1,680 couples assumed normal (or above) in fecundity on the 85 per cent basis the 837 assumed able to have had eight pregnancies would have completed the eighth in 145.2 months and had 12.1 months remaining—still too short a period for the ninth conception and pregnancy. In the aggregate, however, there could have been 576 ninth pregnancies. Because of the shorter average period required for the first two conceptions, 754 of the 1,483 couples in the medium group would have had time for nine pregnancies, and 128 couples could have had a tenth. Similarly, 754 of the 1,186 couples would have had time for a ninth pregnancy and 596 could have had a tenth.

The total number of pregnancies that would be expected to occur if contraceptives were not used can be computed from the foregoing calculations of time requirements and the data in Table 1 regarding the proportion of couples assumed physiologically able to have a pregnancy of each order. The results for the couples assumed normal (or above) in fecundity are given in Table 6. The 1,977 couples would have had a total of 10,409 pregnancies, or 5,265 pregnancies per 1,000 couples.[15] The low estimate for couples of normal fecundity (which assumes that 85 per cent of the couples are in this category at each period) is 6,252 pregnancies per 1,000 couples. The medium estimate is 7,076, and the high estimate is 8,468 (based on 60 per cent of the couples).

The number of live births per 1,000 couples is somewhat smaller than the number of pregnancies but the variations between the groups are somewhat larger—the cause in each case being pregnancy wastage. Among the 1,977 couples there would

[15] According to Table 1, 1,783 of the 1,977 couples could have had a first pregnancy, 1,605 a second, 1,418 a third, 1,276 a fourth, 1,149 a fifth, 1,034 a sixth, 931 a seventh, and 837 an eighth. These numbers add to 10,033 pregnancies. In addition (as shown above) 376 couples could have had a ninth pregnancy, making a total of 10,409 pregnancies or 5,265 pregnancies per 1,000 couples.

have been 4,594 live births per 1,000 couples if no contraceptives has been used and no pregnancies aborted illegally. (*See* Table 6.) The corresponding figure is 5,507 for the 1,680 couples, 6,325 for the 1,483 couples, and 7,769 for the 1,186.[16]

The extent to which the fertility of the couples studied would have been reduced by impairments of fecundity if contraception and illegal abortion had not been practiced may be meas-

Table 6. Fecundity—number of pregnancies and live births if neither contraception nor illegal abortion was practiced—of all couples, and of three groups assumed normal (or above) in fecundity.[1]

PREGNANCIES AND LIVE BIRTHS	ALL 1,977 COUPLES	COUPLES ASSUMED NORMAL (OR ABOVE) IN FECUNDITY		
		1,680 Couples (85 Per Cent)	1,483 Couples (75 Per Cent)	1,186 Couples (60 Per Cent)
	A	B	C	D
Total Number of				
Pregnancies	10,409	10,507	10,492	10,045
Live Births	9,083	9,254	9,379	9,216
Rate per 1,000 Couples				
Pregnancies	5,265	6,252	7,076	8,468
Live Births	4,594	5,507	6,325	7,769
Percentage Reduction in Rate Due to Impairments of Fecundity[2]				
Pregnancies	—	15.8	25.6	37.8
Live Births	—	16.6	27.4	40.9

[1] Based on Tables 2 and 5, as explained in text.
[2] The difference between the rates in Columns A and B (or A and C, or A and D) expressed as a percentage of the rate in Column B (or Column C, or Column D).

[16] It is interesting to compare the above estimates of the normal inherent capacity for reproduction with the actual performance of the six couples who were not obviously subnormal in fecundity (except that two of these wives were sterilized shortly before the interview) and who did not resort to contraception or illegal abortion. These six couples had 38 pregnancies and 43 live births. The expected numbers are 51 pregnancies and 47 live births according to the high estimates of fecundity, 42 pregnancies and 38 live births according to the medium estimates, and 38 pregnancies and 33 live births according to the low estimates. The actual reproductive performance of these six couples, therefore, is the same as the low estimate with respect to pregnancies and between the medium and high estimates with respect to live births.

ured by comparing these pregnancy and birth rates for the 1,977 couples with those for the three groups of couples assumed normal (or above) in fecundity. In the absence of control measures, the defects in the reproductive system which prevent it from functioning normally would have reduced the birth rate by at least 16 per cent, probably by about 27 per cent, and perhaps by as much as 41 per cent. (*See* Table 6.)

In addition to knowing the average number of pregnancies and live births that would have occurred to all couples and to the couples of normal fecundity if neither contraception nor illegal abortion had been practiced, it would be of interest to estimate the distribution of the couples by the number of these events. In order to make such estimates it would be necessary to use the distributions rather than the averages for the number of months required for each conception and pregnancy, and to know the interrelation between these distributions. (For example, it would be necessary to know how the 598 couples needing one month for the first conception are distributed by months required for the second conception, and to have similar information for each other group.) The latter information is not available as yet. It is possible that the distribution for both the high, medium, and low estimates would show a few couples with 12 or more pregnancies, for a couple married 157 months and having twelve ten-month pregnancies (including one month for each puerperium) would have thirty-seven months for conceptions, or an average of slightly over three months for each conception.[17] The lower limits are those in Table 1, however, for one of the basic assumptions is that all couples normal (or above) in fecundity can have one pregnancy (minimum estimate), two pregnancies (medium estimate), or four pregnancies (maximum estimate).

Before passing to the next section it should be pointed out again that the differences between the high, medium, and low

---

[17] Three and one-half months was a sufficiently long period for more than 54 per cent of all the couples to have their first conception, 27 per cent to have their second, and 32 per cent to have their third. (*See* Table 2, Columns B, D, and F.) The proportions are higher for the couples assumed normal (or above) in fecundity.

estimates of the inherent power of normal reproduction are caused primarily by the variations in the proportion of couples classified as able to have a pregnancy of each order, and only secondarily by the variations in the number of months required for each conception and pregnancy. This results in part from the fact that there is relatively little difference in the average duration of pregnancy for the three groups of couples classified as normal or above in fecundity. Furthermore, it occurs in spite of the fact that in obtaining the estimates for all couples and for each of the three groups it is assumed that 10 per cent of the couples classified as able to have a fifth pregnancy were unable to have a sixth, 10 per cent of those able to have a sixth were unable to have a seventh, and so on. Ten per cent is believed to be the best proportion to use in view of the data for the first three pregnancies. But if 5 per cent (instead of 10 per cent) were used for all couples and for the high estimate of normal, the pregnancy rates for the two groups would be 5,771 and 9,614. This gives a reduction of 40.0 per cent because of defects in fecundity, which is only slightly larger than the 37.8 per cent decrease obtained on the 10 per cent basis. (*See* Table 6.) Similarly, assuming a 15 per cent decrease in this connection gives a reduction in the fertility rate of 36 per cent, which is only slightly less than the reduction on the 10 per cent basis. The effect of such changes is smaller for the medium and low estimates than for the high estimates.

Finally, it should be emphasized again that the three estimates of reproduction with normal fecundity are not based on the experience of the same 1,680, 1,483, or 1,186 couples throughout the period studied. Instead, the medium estimates (for example) give a composite picture of (a) the 1,483 couples who required the shortest period of uncontrolled exposure for the first conception, (b) the 1,483 couples whose first pregnancy ended in a live birth, (c) the 1,483 couples who required the shortest period for their second conception, etc. As pointed out this procedure is followed because it is feasible to array the 1,977 couples with respect to each of these events, and select the upper

60, 75, or 85 per cent, or any other proportion desired. In contrast, unless standards of accuracy are lowered it is not feasible to make a single array of the 1,977 couples with respect to all such events. If the latter were done it probably would show birth rates in the neighborhood of 5,200 for an identical group of 1,680 couples, 5,800 for an identical group of 1,483 couples, and 7,000 for an identical group of 1,186 couples.[17a] These rates are 6 to 10 per cent below the rates of 5,507, 6,325, and 7,769 shown in Table 6 and based on the composite experience of the same numbers of couples selected independently for each conception and pregnancy.

B. THE REDUCTION IN FERTILITY CAUSED BY CONTRACEPTION AND ILLEGAL ABORTION AMONG COUPLES NORMAL (OR ABOVE) IN FECUNDITY

In estimating from the data at hand the difference between potential and actual fertility which would result from contraception and illegal abortion if no couples were subnormal in fecundity, it is not feasible to follow the procedure used in preparing the estimates of fecundity in Section A. There it was a relatively simple matter to list the wives conceiving during periods of uncontrolled exposure by the length of that exposure, for these facts can be determined fairly accurately. Moreover, the experience of these couples provides what appears to be a reasonable basis for distributing the couples whose pregnancies begin in spite of attempts at prevention. Some of the remaining couples have been sterilized, or have had long periods of uncontrolled exposure with no conception, and obviously should be classified as unable to conceive. Only the relatively few remaining couples present serious problems. The parallel procedure here would be to list the couples normal or above in fecundity by months required to conceive with their actual practice of contraception, and use this information as a basis for distributing the others. Unfortunately, there are no simple criteria for determining whether the couples who practice con-

[17a] These estimates are based on the birth rate of 5,861 for the 1,444 couples classified as "relatively fecund," which is shown in Section V of the Appendix.

traception throughout an interpregnancy interval are normal, or below or above normal, in fecundity at that time.

The most practical approach appears to be to identify and set aside the couples with the more serious impairments of fecundity, and ascertain the fertility of the remaining couples. Three estimates are made on this basis, utilizing as before the experience of 85, 75, and 60 per cent of the 1,977 couples and omitting respectively, the 297, 494, and 791 couples of lowest fecundity. In this case, however, the experience of the same couples is used throughout the entire period.

The numbers of couples with serious impairments of fecundity are given below, grouped by severity of impairment:[18]

1. Could not conceive	194
2. Could conceive, but could not carry fetus to term	19
3. Could conceive once, but not twice	178
4. Could conceive twice, but could carry only first fetus to term	3
5. Could conceive twice, but not three times	187
6. Could conceive three times, but could carry only first two fetuses to term	6
7. Could conceive and carry to term three times, but not more	142
8. Could conceive and carry to term four times, but not more	127
9. Could conceive and carry to term more than four times	1,121
10. Total	1,977

If the foregoing data are used in classifying the couples according to their inherent ability to reproduce, the 1,680 couples assumed to be normal (or above) in fecundity on the 85 per cent basis include all of the 1,977 couples except the 213 in groups 1 and 2, and 84 of the 178 in group 3. Among these 1,680 couples there were 2,227 pregnancies and 1,959 live births per 1,000 couples. (*See* Table 7, Column A.) The 1,483 couples normal (or above) on the 75 per cent basis include the 1,396

18 For a discussion of the basis for this grouping see the Appendix.

couples in groups 6 to 9 and 87 of the 187 in group 5. The rates for these 1,483 couples are 2,364 pregnancies and 2,074 live births per 1,000. The 1,186 couples normal (or above) on the 60 per cent assumption include the 1,121 in group 9 and 65 of the 127 in group 8. The high estimates of the normal rates obtained on this basis are 2,474 pregnancies and 2,159 live births per 1,000 couples.

A comparison between the foregoing estimates of reproduction which assume the actual incidence of contraception and illegal abortion, and the estimates in Section A which assume no contraception or illegal abortion, shows the importance of

Table 7. Fecundity and fertility of three groups of couples assumed normal (or above) in fecundity.

PREGNANCIES AND LIVE BIRTHS	COUPLES ASSUMED NORMAL (OR ABOVE) IN FECUNDITY		
	1,680 Couples (85 Per Cent)	1,483 Couples (75 Per Cent)	1,186 Couples (60 Per Cent)
	A	B	C
Fecundity (Reproduction assuming no Contraception nor Illegal Abortion)[1]			
1. Number of Pregnancies	10,507	10,492	10,045
2. Number of Live Births	9,254	9,379	9,216
3. Pregnancies per 1,000 Couples	6,252	7,076	8,468
4. Live Births per 1,000 Couples	5,507	6,325	7,769
Fertility (Actual Reproduction)[2]			
5. Number of Pregnancies	3,742	3,505	2,934
6. Number of Live Births	3,293	3,076	2,561
7. Pregnancies per 1,000 Couples	2,227	2,364	2,474
8. Live Births per 1,000 Couples	1,959	2,074	2,159
Percentage Reduction Due to Contraception and Illegal Abortion[3]			
9. Pregnancies	64.4	66.6	70.8
10. Live Births	64.4	67.2	72.2

[1] The data in this deck are from Table 6, Columns B, C, and D. The couples composing the group shown in each column are not the same throughout the period studied.

[2] Each group consists of the same couples at all times. Pregnancies in progress at the time of the interview are excluded.

[3] The difference between the rates in lines 3 and 7 (or 4 and 8) expressed as a percentage of the rates in line 3 (or 4).

these control measures in reducing the fertility of couples normal (or above) in fecundity. According to the low estimate, contraception and illegal abortion reduced the pregnancy rate of couples of normal fecundity by 64.4 per cent (from 6,252 to 2,227 per 1,000) and the birth rate by the same per cent (from 5,507 to 1,959 per 1,000 couples). (*See* Table 7.) The high estimates show somewhat larger decreases, namely, 70.8 per cent for pregnancies (from 8,468 to 2,474 per 1,000 couples) and 72.2 per cent for live births (from 7,769 to 2,159). Finally, the medium estimates show reductions of 66.6 per cent for pregnancies and 67.2 for live births.[19]

The estimates of the extent to which contraception and illegal abortion cause the actual fertility of couples normal (or above) in fecundity to be below their potential fertility may be compared with those in Section A showing the extent to which defects in the reproductive mechanism reduce fertility in the absence of control measures. The latter are substantially smaller. Thus, if contraception and illegal abortion had not been practiced, the impairments which existed would have lowered the pregnancy rate per 1,000 couples by at least 15.8 per cent and possibly by 37.8 per cent and the live birth rate by at least 16.6 per cent and possibly by 40.9 per cent, with 25.6 and 27.4 per cent as medium estimates. (*See* Table 6.) But contraception and illegal abortion together lowered the

[19] A previous article indicated that among the 1,444 couples classified as "relatively fecund" during the field work, contraception as practiced reduced fertility 70.4 per cent below that expected in the absence of contraception but with the existing impairments in the fecundity of this "relatively fecund" group. *See* Whelpton, P. K. and Kiser, Clyde V.: Social and Psychological Factors Affecting Fertility. VI. The Planning of Fertility. The Milbank Memorial Fund *Quarterly*, January, 1947, xxv,No. 1, p. 104 (Reprint p. 250). The more rigorous method described in Section V of the Appendix of this article shows reductions of 65.9 per cent in the pregnancy rate and 65.5 per cent in the birth rate, which should be more accurate than the foregoing.

In computing the hypothetical rates (assuming no contraception or illegal abortion) it is assumed that all pregnancies which would have begun would have been completed before the interview. To increase comparability, the actual pregnancy rates shown here exclude the 47 pregnancies in progress at the time of the interview. In consequence, these actual pregnancy rates are slightly below those including all pregnancies, which have been referred to in previous articles in this series. These actual pregnancy and birth rates also exclude adopted children, who are included with pregnancies and births in rates which have been referred to in previous articles in connection with discussons of family planning.

pregnancy rate of couples normal (or above) in fecundity by between 64.4 and 70.8 per cent and the live birth rate by between 64.4 and 72.2 per cent. The latter reductions are approximately two to four times the size of the former.

It may be argued that the influence of contraception and illegal abortion is exaggerated by the above-mentioned data. The reason (pointed out above) is that the medium estimates of fecundity in Section A are based on the combined experience of (a) the 1,483 couples who could have conceived with the least delay after marriage, (b) the 1,483 couples whose first pregnancy would have ended in a live birth, (c) the 1,483 couples who could have had their second pregnancy with the least delay after their first, etc. The experience of some couples is used for one of these events but not for others. In contrast, the 1,483 couples used in obtaining the medium estimate in this section form a constant group, selected on the basis of capacity to reproduce throughout the period studied. The bias due to this procedural difference is small, however, for it is very unlikely that the use of a constant group in Section A would reduce the medium estimate of the pregnancy rate from 7,076 per 1,000 couples to less than 6,500, or that of the birth rate from 6,325 to less than 5,800.[20] On this basis the reduction in fertility due to control measures would be 63.6 per cent for pregnancies and 64.2 per cent for live births instead of 66.6 and 67.2, respectively, which is still far greater than the reduction due to impaired fecundity.

C. The Reduction in Fertility Due to Impaired Fecundity, With the Actual Practice of Contraception and Illegal Abortion

In Section A the estimated reproduction rates of couples of normal (or higher) fecundity were compared with those of all couples, assuming no contraception or illegal abortion. Section B was limited to couples of normal fecundity, their estimated

---

[20] The estimates for the 1,444 "relatively fecund" couples shown in Section V of the Appendix are 6,564 and 5,861, respectively.

rates assuming no control measures being compared with their actual rates. This section contrasts the actual rates of couples of normal fecundity with those of all couples. The desire here is to estimate the extent to which defects in the reproductive system reduced fertility with contraception and illegal abortion practiced as they were by the group in question.

The statistical groundwork for this section is laid in the preceding, where it is estimated that the couples normal (or above) in fecundity, and using contraception and illegal abortion as they did, had a pregnancy rate of between 2,227 and 2,474 and a birth rate of between 1,959 and 2,159 per 1,000 couples, depending on where the line is drawn between normal and subnormal fecundity. (*See* Table 8, Columns B and D.) Medium estimates are 2,364 pregnancies and 2,074 births. For all couples the pregnancy rate is 1,937 and the birth rate 1,699. (Column A.) It appears, therefore, that defects in the reproductive

Table 8. Fertility—actual number of pregnancies and live births—of all couples and of three groups assumed normal (or above) in fecundity.

PREGNANCIES AND LIVE BIRTHS	ALL 1,977 COUPLES	COUPLES ASSUMED NORMAL (OR ABOVE) IN FECUNDITY		
		1,680 Couples (85 Per Cent)	1,483 Couples (75 Per Cent)	1,186 Couples (60 Per Cent)
	A	B	C	D
Total Number of				
Pregnancies[1]	3,829	3,742	3,505	2,934
Live Births	3,358	3,293	3,076	2,561
Rate per 1,000 Couples				
Pregnancies[1]	1,937	2,227	2,364	2,474
Live Births	1,699	1,959	2,074	2,159
Percentage Reduction Due to Impairments of Fecundity[2]				
Pregnancies[1]	—	13.0	18.0	21.7
Live Births	—	13.3	18.1	21.3

[1] Excluding pregnancies in progress at the time of the interview.
[2] The difference between the rates in Columns A and B (or A and C, or A and D) expressed as a percentage of the rates in Column B (or C, or D).

mechanism reduced the pregnancy rate by between 13.0 and 21.7 per cent and the birth rate by between 13.3 and 21.3 per cent, with 18.0 and 18.1 per cent as medium estimates for pregnancies and births, respectively. In other words, if the impairments of fecundity had not existed, the number of pregnancies for the group studied would have been larger by between 15.0 and 27.7 per cent and the number of live births larger by between 15.3 and 27.1 per cent, with 22.0 and 22.1 per cent as medium estimates for pregnancies and births.[21]

Because of the importance of estimating correctly the extent to which defects of the reproductive system reduce fertility with the actual resort to contraception and illegal abortion, it is of interest to compare the foregoing estimates with the opinions of the wives regarding the number of additional children they would have had if they and their husbands had been of normal fecundity. This question was asked directly of the wife if the couple was classified as "relatively sterile" at the time of interviewing.[22] Closely related information was obtained from

[21] It should be noted that the estimated decrease in the birth rate caused by sterility and low fecundity is significantly larger when based on the hypothetical situation of no contraception or illegal abortion (16.6 to 40.9 per cent in Table 6) than when based on the actual conditions with respect to these events (13.3 to 21.3 per cent in Table 8). Although the former is of theoretical interest, the latter is of more practical importance.

[22] For interviewing purposes couples were classified as "relatively sterile" if they had three or fewer live births and knew (or had good reason to believe) that (a) they could not conceive during a period of at least twenty-four consecutive months (if never pregnant) or thirty-six consecutive months (if pregnant one or more times), or (b) if conception occurred the pregnancy would end in wastage. Other couples were classified as "relatively fecund." In the absence of more positive information, coitus without some form of contraception "always" or "usually" and not resulting in pregnancy during the periods mentioned was considered an adequate reason for classifying a couple as "relatively sterile." The 533 couples classified as "relatively sterile" during the field work include the following numbers of those classified as below normal in fecundity in this section: low assumptions, 284 of 297; medium assumptions, 447 of 494; high assumptions, 533 of 791. The differences result in part from the constant use of contraceptives. For example, 121 couples practiced contraception "always" or "usually" during the period studied, thought they could have conceived at any time, and were classified as "relatively fecund" when interviewed. Subsequent analysis of the data shows that 513 couples practiced contraception similarly for varying periods beginning at marriage and then tried to have a child, and that 52 found they could not do so. It is believed that 13 of the 121 couples would have had the same experience if they had stopped contraception. In consequence, in obtaining the low estimates of fecundity in this section these 13 couples are added to the 284 "relatively sterile" couples who could not conceive, raising the total to 297.

the small number of "relatively fecund" couples whose fertility may have been reduced by impaired fecundity.

Among the 533 "relatively sterile" couples there were only sixty-one wives who thought that they would not have borne more children if they could have done so. Twenty-three of these had had one or more conceptions after the last wanted by the wife or husband (or both). A few of the others had had no conceptions; the rest had wanted the children that had been born, but no more.

Of the 462 wives who thought they had had fewer children than they would have had if they and their husbands had been normal in fecundity, 146 (nearly one-third) set the reduction at one child (or "one or two"), 169 (over one-third) set it at two, and 147 (nearly one-third) set it at "two or three" or more. (*See* Table 9.) The total reduction amounts to approximately 1,024 children. As would be expected there is an inverse relation between the actual number of living children and the number

Table 9. The "relatively sterile" couples, by the actual number of children living at the interview and by the number of additional children the wife thinks there would have been if the couple had been normal in fecundity.[1]

NUMBER OF ADDITIONAL CHILDREN IF NORMAL IN FECUNDITY	ACTUAL NUMBER OF LIVING CHILDREN				ALL COUPLES	
	0	1	2	3	Number	Per Cent
0	13	8	26	14	61	11.7
0 or 1 (Perhaps 1)	—	—	8	—	8	1.5
1	—	66	33	4	103	19.7
1 or 2 (At least 1)	17	15	3	—	35	6.7
2	103	41	23	2	169	32.3
2 or 3 (At least 2)	25	6	1	—	32	6.1
3	27	23	—	—	50	9.6
3 or 4 (At least 3)	8	2	—	—	10	1.9
4	39	—	—	—	39	7.5
4 or 5 (At least 4)	6	—	—	—	6	1.1
5 or More	6	—	4	—	10	1.9
Not Reported	8	2	—	—	10	—
ALL COUPLES	252	163	98	20	533	100.0

[1] Adopted children are not counted. Thus, a couple with two adopted children who reported they would have no additional children is classed as a childless couple who would have two additional children.

that the wife thought were prevented by impairments. Only two of the twenty wives with three children thought they would have had at least two additional children if fecundity had been normal, but 214 of the 252 childless wives thought they would have had two or more children if they could have done so. In contrast, fourteen of the twenty wives with three children, but only thirteen of the 252 childless wives, thought that family size had not been affected by sterility or low fecundity.

Although most of the 1,444 "relatively fecund" couples could have had a child every two or three years throughout their married life there were forty who were sterilized for medical reasons.[23] It is almost certain that fourteen of these forty would have had no more children prior to the interview if their ability to reproduce had been normal, for eleven had been sterilized within a year, and three had not wanted additional children and had practiced contraception successfully for a long period. Among the remaining twenty-six couples there are 14 who said they wanted additional children and probably would have had eighteen to twenty-two more, and twelve who said they had all they wanted but probably would have had twelve to sixteen more in spite of their attempts at prevention. Although some of the 1,404 "relatively fecund" couples that had not been sterilized for medical reasons were somewhat below normal in their ability to reproduce, their use of contraceptives indicates that these defects did not have a significant effect in reducing the number of children.

Combining the 1,024 additional children that the "relatively sterile" wives thought would have been born if fecundity had been normal and the foregoing estimates of thirty to thirty-eight for the "relatively fecund" couples gives a total of 1,054 to 1,062. This is almost one-third of the 3,226 children that were living when the couples were interviewed. In other words,

---

[23] In each of these cases sterilization occurred either less than three years before the interview or after there had been at least four live births, otherwise the couple would have been classified as "relatively sterile." The forty couples do not include three that were sterilized merely because they preferred it to continuing to practice contraception.

the foregoing material indicates that impairments of the reproductive system reduced the number of children by nearly 25 per cent.

The fact that the foregoing estimate exceeds the medium estimate of 18.1 per cent for live births in Table 8 does not prove that the latter is too low. On the contrary, there are two reasons for thinking that 25 per cent is too high. One is the implicit assumption by the wives that the number of additional children mentioned could have been obtained by the same number of additional pregnancies. In practice, however, approximately 10 per cent of the additional pregnancies would have ended in wastage, and part of them would not have been made up by still more pregnancies.

A second and much more important reason is the well-known tendency to exaggerate in replying to such a question. Some idea of the importance of this bias may be obtained by comparing the number of children that the 244 childless "relatively sterile" wives said they would have had—619 (or 2,537 per 1,000 couples)—with the actual number of children among the "relatively fecund" couples—1,944 per 1,000 couples. The latter rate is 23.4 per cent below the former. Since there is no reason for expecting a difference between these two groups with respect to size of family, this comparison indicates that the opinions of the childless "relatively sterile" wives regarding the number of children they would have borne should be reduced by 23.4 per cent to allow for "wishful thinking." Similarly, the 279 "relatively sterile" wives with one or more children said they would have had 798 children—2,860 per 1,000 couples— if they could have done so. This rate would have to be reduced by 25.0 per cent to make it equal the actual rate of 2,144 per 1,000 for the "relatively fecund" wives with one or more children.

Making the above-mentioned allowances for the tendency of "relatively sterile" wives to overstate the number of children that they would have had with normal fecundity is equivalent to saying that in the absence of impairments the reproductive

rates for all of the couples studied would have been slightly above those for the "relatively fecund" couples. In this group there were 2,239 pregnancies, 2,023 live births, and 1,944 living children per 1,000 couples. (*See* Table 10, Column B.) Allowing generously for the effect of the minor impairments which were found in this group would not raise these rates more than 3 per cent, *i.e.*, to more than 2,306, 2,084, and 2,002.[24] For all couples, however, the corresponding rates are 1,937, 1,699, and 1,632. On this basis the defects of the reproductive system lowered the pregnancy rate by 16.0 per cent, and the birth rate and the number of children by 18.5 per cent, with contraception and abortion practiced as they would have been if the defects had not existed. These percentages agree closely with the medium estimates in Table 8, which would be expected in view of the fact that the 494 couples classified as below normal in fe-

Table 10. Fertility of all couples, "relatively fecund" couples, and "relatively sterile" couples.

FERTILITY	ALL 1,977 COUPLES	1,444 "RELATIVELY FECUND" COUPLES		533 "RELATIVELY STERILE" COUPLES
		Actual	Desired[1]	
	A	B	C	D
Rate per 1,000 Couples				
Pregnancies[2]	1,937	2,239	2,306	1,118
Live Births	1,699	2,023	2,084	820
Living Children	1,632	1,944	2,002	786
Per Cent Reduction in Rate Due to Impaired Fecundity[3]				
Pregnancies[2]	16.0	2.9	—	51.5
Live Births	18.5	2.9	—	60.6
Living Children	18.5	2.9	—	60.7·

[1] Includes a maximum (3 per cent) allowance for the pregnancies, births, and children that were prevented by the defects of the reproductive system which occurred among "relatively fecund" couples.
[2] Pregnancies in progress at the time of the interview are excluded.
[3] The difference between the rates in Columns A and C (or B and C, or C and D) expressed as a percentage of the rate in Column C.

[24] The increase of 30 to 38 live births (mentioned above) amounts to 0.9 to 1.2 per cent. It appears quite unlikely that the allowance should exceed 3 per cent.

cundity in that connection include 447 of the 533 "relatively sterile" couples.

The foregoing estimates indicate that if the impairments of fecundity had never existed the birth rate would have exceeded the actual figure by about 22 per cent.[25] It should be emphasized, however, that the discovery and perfection of means of treating these impairments so as to permit normal reproduction would not increase the birth rate to this extent. The main reason is that many couples with subnormal fecundity would not take advantage of the curative treatments, even if they could do so at no expense. Some of them seem to believe that their condition is "natural" or represents "God's will," and that if they were meant to have a child (or additional children) they would do so. Many of the wives apparently dislike to consult a physician about reproductive problems and undergo the examinations that they think would be suggested, consequently they do not do so unless forced to it by pain or sickness. Some of those who are examined do not take the treatments that are suggested, especially if an operation is involved. Husbands are less likely than wives to consult physicians, ostensibly because they are sure that it is the wife who is at fault, but in part because at heart they fear that if they were found defective it would be a reflection on their manhood. In other words, many of the wives and husbands who say they want more children but cannot have them do not want them in sufficient degree to take the steps which might well make their wish come true.

The extent to which control measures and defects of the reproductive system independently and in combination caused the actual reproduction rates to be below the normal capacity to reproduce may be seen by comparing Tables 6, 7, and 8, and is shown graphically in Figure 4. The medium estimate of the normal reproductive ability of the couples in this study during the twelve to fifteen years since marriage is a birth rate of 6,325 per 1,000. Impairments would have lowered this rate to 4,594

---

[25] The actual birth rate in Table 8 is 1,699, and the medium estimate assuming no impairments of fecundity is 2,074. The former is 18.1 per cent smaller than the latter; the latter is 22.1 per cent larger than the former.
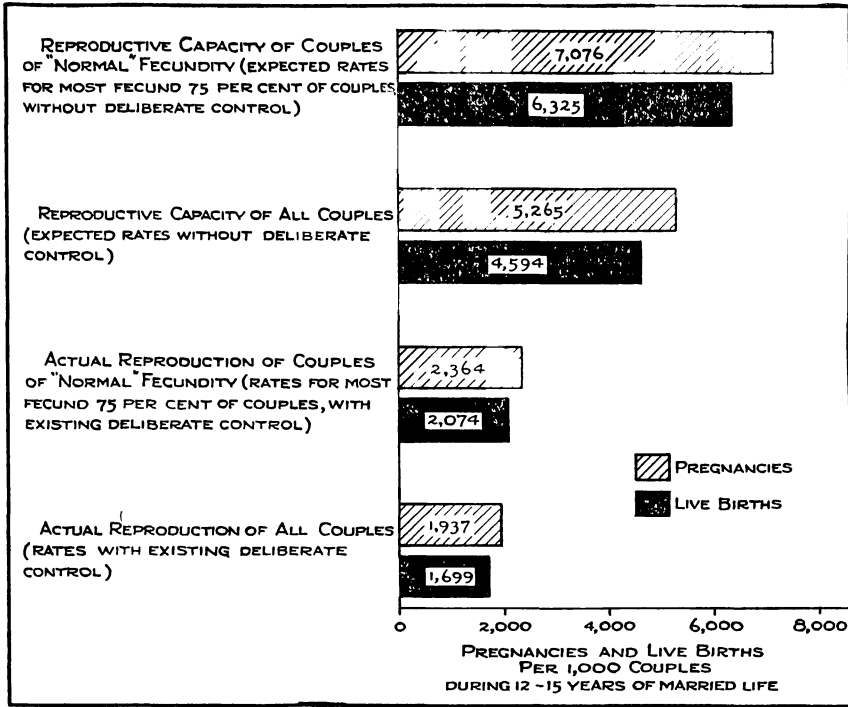
Fig. 4. Reductions in pregnancy and live birth rates due to low fecundity and contraception. (*See* Tables 6, 7, and 8.)

(a reduction of 27.4 per cent) if no control measures had been used. If all couples had been normal (or above) in fecundity, contraception and abortion would have caused the birth rate to be 2,074, or 67.2 per cent below the estimated normal capacity. Actually, because of impairments and deliberate control, the birth rate was 1,699, or 73.1 per cent below capacity. In other words, partly because of defects in the reproductive system, but primarily because of contraception and illegal abortion, the number of births to the couples studied was only 26.9 per cent of the number that could have occurred if all of the couples had been normal (or above) in fecundity.

D. CONTROL MEASURES AND IMPAIRED FECUNDITY AS CAUSES OF CHILDLESSNESS

In addition to analysing the relative importance of control

measures and defects in the reproductive system as causes of the difference between the actual fertility rates and the reproductive capacity of normal couples, it is of interest to consider briefly their relative importance in causing childlessness.

Among the 1,977 couples in this study 322, or 16.3 per cent, had never had a pregnancy. The analysis of the ability to conceive, made in the first part of the Appendix, leads to the conclusion that 194 of the 322 couples (60.2 per cent) were unable to become pregnant, and 128 (39.8 per cent) could have had one or more pregnancies but prevented them by using contraceptives. This classification gives a high estimate of the importance of sterility and a low estimate for control measures, because it ignores the fact that among the 194 couples classified as unable to conceive there are fifteen who didn't want children, and consequently practiced contraception "always" before they learned they were definitely sterile. Combining these fifteen couples with the 128 gives a total of 143—44.4 per cent of the 322—that would not have had a pregnancy even if they could have done so. This is a high estimate of the importance of control measures in preventing conception, and leaves 55.6 per cent as a low estimate of the importance of defective fecundity. Medium estimates of 42.1 per cent for voluntary action and 57.9 per cent for physiological causes are obtained by dividing equally between the two groups the fifteen couples influenced jointly by both types of causes.

Estimates of the influence of impairments and control measures as causes of childlessness differ from those for ability to conceive, because of pregnancy wastage. This affects the classification not only of the sixty couples who conceived but had no live birth, but also that of seven of the 322 who did not conceive. These seven could have conceived but did not do so, and are among the 128 classified correctly as never pregnant because of control measures. In analysing ability to bear a child (as distinguished from ability to conceive) they need to be treated differently. Three of the seven couples wanted children, and prevented conception only because a physician said it would

be physiologically impossible for the wife to produce a living child. For these couples childlessness was involuntary. (*See* Table 11, line 6.) The other four wives were given the same medical advice in connection with treatments for "female trouble," but said they and their husbands previously had planned not to have children. These couples may be classified

Table 11. Couples with no live birth because of control measures and because of impaired fecundity, according to three assumptions regarding joint causation.[1]

ABILITY TO HAVE AND DESIRE FOR A CHILD	TOTAL	BECAUSE OF CONTROL MEASURES			BECAUSE OF IMPAIRED FECUNDITY		
		High	Medium	Low	High	Medium	Low
	A	B	C	D	E	F	G
1. Could Not Conceive	194	15	7.5	—	194	186.5	179
2. Wanted a Child	167	—	—	—	167	167	167
3. Did Not Want a Child[2]	27	15	7.5	—	27	19.5	12
4. Could Conceive But Did Not	128	125	123	121	7	5	3
5. Could Not Have a Live Birth	7	4	2	—	7	5	3
6. Wanted a Child	3	—	—	—	3	3	3
7. Did Not Want a Child[3]	4	4	2	—	4	2	—
8. Could Have a Live Birth	121	121	121	121	—	—	—
9. Conceived, But Had No Live Birth	60	42	23	4	56	37	18
10. Could Not Have a Live Birth[4]	18	—	—	—	18	18	18
11. Could Have Live Births Pregnancies Ended by :	42	42	23	4	38	19	—
12. Unintentional Wastage[4]	36	36	18	—	36	18	—
13. Illegal Abortion	6	6	5	4	2	1	—
14. Wanted a Child	2	2	1	0	2	1	—
15. Did Not Want a Child[5]	4	4	4	4	—	—	—
16. Total with No Live Birth	382	182	153.5	125	257	228.5	200
17. Per Cent of Total	100	47.6	40.2	32.7	67.3	59.8	52.4

[1] The high assumption is that the factor in question is decisive in cases of possible joint causation ; the low assumption is that the other factor is decisive. The medium assumption is midway between the high and the low. The one couple whose first pregnancy was in process at interview is excluded.
[2] Fifteen of these couples practiced contraception "always" before they knew they were definitely sterile, because they did not want children.
[3] These couples prevented conception by using contraceptives "always" or "usually."
[4] Each of these couples wanted a child.
[5] These couples prevented additional pregnancies by using contraceptives "always" or "usually."

either as childless from choice or from necessity, depending on whether high or low estimates are desired. (*See* line 7.)

Among the sixty couples who conceived but had no live birth there are eighteen who were told by their physician that it would be impossible to prevent subsequent pregnancies from ending in wastage. Each of these couples, therefore, should be classified as childless because of defects in the reproductive system. (*See* Table 11, line 10.) The sixty also include four who did not want children, terminated by illegal abortion the pregnancies which occurred, and prevented additional pregnancies by contraception. Each of these couples should be classified as childless because of control measures. (*See* Table 11, line 15.)

The remaining thirty-eight of the sixty couples whose pregnancies ended in wastage are more difficult to classify. It can be argued that (a) two should be classified as childless from choice, because they did not want their only pregnancy when it occurred and terminated it by illegal abortion, and (b) thirty-six should be classified as childless because of impaired fecundity, for if the reproductive system had functioned perfectly their pregnancies would have ended in live births. (*See* Table 11, lines 12 and 14.) On the other hand, it can be argued equally well that (c) the two couples should be classified as childless because of impaired fecundity, for after they had been married several years they wanted a child but could not have one because of premature menopause, and (d) the thirty-six couples should be classified as childless from choice, because they could have conceived again and had living children if they had not used contraceptives effectively. The procedures suggested in "a" and "d" give a high estimate of the importance of voluntary control and a low estimate for low fecundity; those suggested in "b" and "c" do the reverse. All are used accordingly.

Combining the foregoing statements in one way shows that if no attempts at controlling fertility had been made as many as 67.3 per cent of the 382 childless couples would still have been in that category. (*See* Table 11, line 17.) On this basis only

32.7 per cent were childless from choice. Another combination shows that if the reproductive system had functioned perfectly as many as 47.6 per cent of the 382 couples would still have been childless because of preventive measures, which leaves 52.4 per cent as a low estimate of the proportion childless because of impairments. Intermediate estimates, obtained by dividing equally the couples that could be subject to joint causation, are that 59.8 per cent of the childlessness was involuntary and 40.2 per cent voluntary.

On the basis of the previously-cited study of a group of childless women in New York City, Kiser estimated that 70–80 per cent of the childlessness among native-white wives in the group was involuntary.[26] Several factors may account for the greater importance of involuntary than of voluntary causes in that group than among the Indianapolis couples. First, the proportion of childlessness itself was relatively low in the New York group (an estimated 11 per cent as compared with 19.3 per cent for the Indianapolis group).[27] It is reasonable to expect that the lower this proportion the higher the ratio of involuntary to voluntary childlessness. Second, the New York group was not restricted to members of any religion or educational class

[26] Among 152 never-pregnant native-white wives in the New York Study 74 per cent reported that they had never practiced contraception, 62 per cent stated that they were disappointed in their childless condition, and 55 per cent declared that they had consulted a physician to ascertain the reasons for their childless condition. *See* Kiser, *op. cit.,* pp. 63 and 66.

NOTE: The New York Study included foreign-born white as well as native-white wives. The figures cited in this article, however, relate to native-whites since the Indianapolis group was restricted to native-white couples.

[27] Eleven per cent childless may seem too low for a group unselected with respect to education and religion. In his article, Kiser presented data indicating that the proportion would be about 50 per cent higher if, instead of relating to women under 50 and married 10 years or more, it related to women 40 years of age and over regardless of duration of marriage. "Judging from the Bushwick material, the total rate of childlessness among women under 50 and married 10 years or more is lower than a rate based upon wives 40 years of age and over, only as a result of differences in the age-at-marriage distributions. Within specific bridal ages no significant differences were found in rates of childlessness for the 2 types of populations. The dual restrictions with regard to maximum age of wife and minimum duration of marriage result in a subnormal representation of relatively late ages at marriage." (Kiser, *op. cit.* pp. 60–61.) By virtue of methods of selection, the ages at marriage of wives in the Indianapolis Study are somewhat lower than those for the New York group but this difference apparently is more than compensated by differences in other characteristics mentioned in the text.

whereas the Indianapolis group was limited to Protestants with at least an eighth grade education.[28] Third, the New York couples had been married at an earlier period (1900–1926) than the Indianapolis couples (1927–1929). The average duration of marriage probably was also longer for the New York couples than for the Indianapolis couples.[29]

In view of the relation which is believed to exist between the extent of childlessness and the ratio of involuntary to voluntary causes it is desirable to supplement the foregoing comparison by making direct comparisons of the extent to which the two groups contained couples who were childless (a) because of control measures and (b) because of impaired fecundity. Wives who were childless because of control measures constitute between 6.3 and 7.8 per cent of all wives in the Indianapolis group and between 2.0 and 3.0 per cent in the New York group, the former being 2 to 4 times as large as the latter. In contrast, wives who were childless because of impairments constitute 10.1 to 10.3 per cent of all wives in the Indianapolis group and 8.0 to 9.0 per cent in the New York group, the former in this case being 1.1 to 2.3 percentage points above the latter. These differences (due to impairments) are smaller than those due to contraception and illegal abortion.

Indirect evidence indicates that the proportion of couples purposely preventing all pregnancies is higher in the Indianapolis group than in the New York group in part because of the differences in religion and educational attainment pointed out above.[30] The differences of 1.1 to 2.3 percentage points in the proportion of couples childless because of impaired fecundity might well be due to differences in sampling methods or to sampling errors. It is highly desirable that information on this

---

[28] Many studies have shown that fertility is lower (a) among Protestants than all other religious groups combined, and (b) among persons who finished at least the eighth grade than those who left school before reaching it. It would be expected that the lower fertility of these groups would be associated with higher proportions of childless couples.

[29] The New York group was limited to wives under 50 (in 1935–1936) and married at least ten years. The Indianapolis group was restricted to wives under 45 (in 1941) and married twelve to fifteen years.

[30] A later article in this series will analyze the relation between deliberate avoidance of pregnancy and educational attainment beyond the eighth grade.

matter be collected from other groups so that the situation of the population as a whole may be evaluated more accurately.

SUMMARY

The Indianapolis Study is one of the first in which information regarding the effect on family size of contraception, illegal abortion, and defects in the reproductive system was collected from a large sample of an important group of the population.

The experience of couples who were unable to have a first pregnancy, a second pregnancy, etc. and the number of months of uncontrolled exposure required for conception by couples who conceived during periods when contraceptives were not used, provide a basis for estimating the number of pregnancies and births that would have occurred in the absence of any control measures. This represents fecundity—the physiological capacity to reproduce. The estimate for all couples is 5,265 pregnancies and 4,594 births per 1,000 couples during the twelve to fifteen years from marriage to interview.

High, medium, and low estimates of *normal* fecundity are obtained by utilizing, respectively, the experience of the most fecund 60 per cent, 75 per cent, and 85 per cent of the couples. The differences between these estimates and those for all couples indicate that the average ability of all couples to bear children was at least 16 per cent and possibly as much as 41 per cent below the normal ability, because of defects in the reproductive system. The medium estimate is 27.4 per cent. The reduction is due mainly to the impairments which make it impossible for some couples to bear any children, or additional children, rather than to those which increase the time required to conceive by the couples who can do so.

A comparison of the actual fertility rate and the estimated reproductive capacity of the couples that appear normal (or above) in fecundity indicates the effect of voluntary control measures, namely, contraception and illegal abortion. High, medium, and low estimates of fecundity (based on 60, 75, and 85 per cent of the couples) show that voluntary control reduced the birth rate by 72.2, 67.2, and 64.4 per cent, respectively.

Contrasting the actual birth rate of all couples with that of couples who appear normal (or above) in fecundity indicates the extent to which defects in the reproductive system lower fertility with the actual practice of contraception and illegal abortion. High, medium, and low estimates of this reduction are, respectively, 21.3, 18.1, and 13.3 per cent.

The actual number of children is about 24.7 per cent smaller than the number the wives thought they would have had if they had been physiologically able to have all they desired. This estimate of the reduction due to impairments not only is higher than those just mentioned, but appears to be exaggerated. If it is reduced by 23.4 per cent (which appears necessary to eliminate the bias) it becomes 19 per cent, or slightly above the medium estimate. An intermediate estimate of the effect of low fecundity is yielded by comparing the birth rate of the couples classified as "relatively fecund" during the field work with the rate for all couples. The latter is 18.5 per cent below the former.

The discovery of methods of curing sterility and raising low fecundity would not increase the birth rate to the extent suggested by these percentages, for with present attitudes toward reproductive matters an important proportion of the couples with impairments would not take advantage of the curative treatments even if they were free.

An analysis of the information regarding the 382 couples with no live birth indicates that between 32.7 and 47.6 per cent were childless because of control measures and between 52.4 and 67.3 per cent because of impaired fecundity. Medium estimates are 40.2 and 59.8 per cent.

Wives who were childless because of sterility constitute only a slightly higher proportion of all wives among these Indianapolis couples than among the native-white wives in New York City studied by Kiser. In contrast, wives who were childless because of control measures constitute 2 to 4 times as large a proportion of all wives in the Indianapolis group as in the New York group.

APPENDIX

*I. Estimating the Number of Couples that Would Have Had One or
More Conceptions if Contraceptives Had Not Been Used,
and Their Distribution by Months of Exposure
Required for the First Conception*

Of the 1,977 couples in the Study, 1,655 had one or more preg-
nancies. The first conception of 999 couples occurred when contra-
ception was not being practiced, 525 having made no attempt at post-
ponement, and 453 having discontinued preventive measures in order
to have a child.[1] More than half of the wives in the first group con-
ceived within 4½ months of marriage (or of the time that they began
intercourse with their future husbands if this preceded marriage),
and more than three-fourths within twelve months.[2] (*See* Appendix
Table A, Columns A and B.) The period of uncontrolled exposure
necessary for the first conception averaged 11.4 months in length.

The 453 couples whose first pregnancy began while contraception
was discontinued in order to have a child waited for various periods
after marriage before trying to conceive. Nearly one-fourth stopped
contraception during the first year and over one-fifth during the sec-
ond, but nearly one-fourth waited until five or more years had passed.
For the group as a whole the average length of this period was 39.8
months. Because of the delay it might be expected that longer periods
of uncontrolled exposure were required for conception by this group
than by the first. Instead, the reverse appears to be true. Over two-
thirds of these couples reported that conception occurred within 4½
months, and nearly seven-eighths that it occurred within twelve
months. The average length of the period was 8.8 months. (*See* Ap-
pendix Table A, Columns C and D.)

It is possible, of course, that the shorter time required for con-
ception by the second group than by the first is not real, but reflects
biases in the data. In the first place there may be a tendency (a)

---

[1] For an explanation of what constitutes contraception *see* text, footnote 6. The
first conception of twenty-one couples occurred when contraception was discontinued
for reasons other than wanting a child (*e.g.* couldn't afford to buy contraceptives,
thought themselves sterile).

[2] These fractions (and the average of 11.4 months which follows) are based on
the distribution of 482 of the 525 wives, namely, those who reported length of ex-
posure to the risk of conception before marriage as well as afterward. The forty-
three wives from whom this information was not obtained were pregnant when
married and probably conceived with less exposure than the 482. None of these
couples used contraceptives before the first conception.

to understate the length of the period from the date when preventive measures were discontinued to the date when conception occurred, or (b) to fail to report long periods. The possibility of such bias has been suggested in discussions of similar situations found in other studies.[3] Secondly, the length of the period between marriage and

Appendix Table A. Months of exposure without contraception required for first conception by (1) couples whose first conception occurred during such a period, and (2) other couples (estimated).[1]

MONTHS OF EXPOSURE[2]	COUPLES WHOSE FIRST CONCEPTION OCCURRED DURING A PERIOD									ESTIMATES FOR	
	Before Contraception Was Begun		When Contraception Was Discontinued in Order to Conceive		When Contraception Was Not Practiced[3]		All Couples Who Conceived		Couples Who Did Not Conceive		All Couples
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
	A	B	C	D	E	F	G	H	I	J	K	L
1	140	29.0	177	39.1	320	33.5	554	33.5	44	13.6	598	30.2
2	48	10.0	63	13.9	113	11.8	196	11.8	16	4.8	211	10.7
3	42	8.7	45	9.9	89	9.3	154	9.3	11	3.4	165	8.4
4	26	5.4	21	4.6	47	4.9	81	4.9	5	1.6	87	4.4
5–6	40	8.3	44	9.7	84	8.8	145	8.8	11	3.4	156	7.9
7–9	40	8.3	18	4.0	60	6.3	104	6.3	4	1.4	108	5.5
10–12	52	10.8	27	6.0	83	8.7	144	8.7	7	2.1	150	7.6
13–24	35	7.3	17	3.8	54	5.6	94	5.6	4	1.3	98	4.9
25–48	36	7.5	22	4.9	62	6.5	107	6.5	5	1.7	113	5.7
49–84	7	1.5	8	1.8	17	1.8	29	1.8	15	4.6	44	2.2
85+	16	3.3	11	2.4	27	2.8	47	2.8	6	1.8	53	2.7
Not Reported[4]	43	—	—	—	43	—	—	—	—	—	—	—
Can't Conceive	—	—	—	—	—	—	—	—	194	60.2	194	9.8
TOTAL	525	100.1	453	100.1	999	100.0	1,655	100.0	322	100.0	1,977	100.0

[1] *See* text for an explanation of the method of estimating.
[2] Because "months of exposure" was coded to the nearest whole number the line for 1 month includes periods of less than 1.50 months, that for 2 months includes periods of 1.50 to 2.50 months, that for 3 months includes periods of 2.51 to 3.49 months, etc.
[3] Includes 21 couples whose 1st conception occurred during a period when contraception was discontinued for reasons other than wanting a child. (*e.g.* couldn't afford to buy contraceptives, thought themselves sterile, etc.).
[4] Some of these wives stated that they were pregnant when married. The others presumably were, for they reported that the first pregnancy lasted nine months and terminated less than eight months after marriage. It is assumed in Columns B and F that the group is distributed like the wives reporting months of exposure.

[3] Stix, Regine K. and Notestein, Frank W.: CONTROLLED FERTILITY, AN EVALUATION OF CLINIC SERVICE. Baltimore, The Williams and Wilkins Company, 1940, p. 68.
    Beebe, Gilbert Wheeler: CONTRACEPTION AND FERTILITY IN THE SOUTHERN APPALACHIANS. Baltimore, The Williams and Wilkins Company, 1942, p. 65.

conception for couples who did not attempt to postpone the first child may be less than the estimate of 11.4 months because this estimate does not utilize the experience of the forty-three couples whose first conception occurred before marriage and who did not report the months of uncontrolled premarital exposure. Indirect evidence shows conclusively that if preventive measures are not used the average months of exposure prior to the first conception is less for wives who conceive before marriage than for those who conceive after marriage. However, this bias is offset in part (and may be more than offset) by the bias in the opposite direction resulting from the tendency for couples who were having intercourse without contraceptives before marriage to conceal from the interviewers the fact of such exposure.

On the other hand there are reasons for believing that some of the difference between the two groups with respect to months of exposure required for the first conception is real. The most important is the fact that couples who think it will be difficult or impossible for them to conceive are more likely than other couples to refrain from using contraceptives until after the first (or a later) pregnancy. As brought out in a previous report 74.2 per cent of the couples classified as "relatively fecund" but only 54.6 per cent of those classified as "relatively sterile" admitted attempts to postpone the first pregnancy.[4] In consequence, "relatively sterile" couples constitute a higher proportion of the 525 couples whose first conception occurred before contraception was begun than of the 453 couples who stopped contraception in order to conceive, the percentages being 29 and 18 respectively.

In view of the foregoing it seems desirable to assume that the experience of the 956 couples whose first pregnancy began during uncontrolled exposure and who reported the months of such exposure may be used to represent that of the forty-three couples not reporting, and the 656 couples whose first conception occurred in spite of preventive efforts. More specifically, the assumption for the latter is that if contraceptives had not been used before the first pregnancy, or if their use had been discontinued before that event, the distribution of the 656 couples by months of uncontrolled exposure required for the first conception would be the same as that of the 956 couples.

---

[4] Whelpton, P. K. and Kiser, C. V.: Social and Psychological Factors Affecting Fertility. VI. The Planning of Fertility. The Milbank Memorial Fund *Quarterly*, January, 1947, xxv, No. 1, p. 66. (Reprint p. 212.)

For an explanation of the terms "relatively fecund" and "relatively sterile" as used in this analysis *see* text, footnote 22.

Nearly 60 per cent would have conceived within 4½ months, 83 per cent would have done so within twelve months, and the average number of months of uncontrolled exposure required for the first conception would have been 10.3. (*See* Appendix Table A, Columns F, G, and H.)

The 322 couples who did not conceive may be considered in three groups: (a) The ninety couples that made no attempt to prevent the first pregnancy during the twelve to fifteen years from marriage to interview,[5] and twelve couples who used contraceptives for a time, but later were told by a doctor that they never could have had a child. These 102 couples are classified as unable to have conceived unless treated successfully for sterility. (b) The ninety-three couples that tried to avoid pregnancy during certain periods of their married life but during other long periods discontinued contraception or practiced it only "sometimes." It is assumed that seventy-nine of these couples could not have conceived, and that fourteen would have conceived in from five to eight years if contraception had not been practiced for so long a time.[6] (c) The 119 couples that practiced contraception regularly and successfully all of the time from marriage to interview, and the eight that did so for several years after marriage and until an operation was performed which made pregnancy im-

---

[5] Only couples married twelve to fifteen years were included in the Study.

[6] The ninety-three couples are subdivided in accordance with the length of the period during which contraception was discontinued or practiced only "sometimes," as shown below:

LENGTH OF PERIOD DURING WHICH CONTRACEPTION WAS NOT PRACTICED (Months)	PROPORTION OF COUPLES NOT CONCEIVING DURING SUCH A PERIOD WHO ARE ASSUMED		AVERAGE MONTHS OF EXPOSURE ASSUMED REQUIRED FOR COUPLES ASSUMED ABLE TO CONCEIVE
	Unable to Conceive (Per Cent)	Able to Conceive (Per Cent)	
0– 9.9	5	95	55
10–19.9	15	85	60
20–29.9	25	75	65
30–39.9	35	65	70
40–49.9	45	55	75
50–59.9	55	45	80
60–69.9	65	35	85
70–79.9	75	25	90
80–89.9	85	15	95
90–99.9	95	5	100
100 or More	100	0	—

possible. It is assumed that if these 127 couples had never tried to prevent pregnancy their experience would have been like that of the 513 couples who practiced contraception successfully for a shorter period and stopped to have a child. On this basis 114 would have succeeded, and thirteen would have found themselves unable to do so. Altogether, therefore, 194 of the 322 never pregnant couples are classified as unable to have conceived and 128 as able to have done so. (*See* Appendix Table A, Column I.)

When adequate weight is given to the different types of control-free experience among the 1,977 couples before the first pregnancy, it is found that there is a tendency for couples to cluster at two extremes. Approximately 30 per cent would have had their first conception in six weeks if contraception had not been practiced, and nearly 50 per cent in $3\frac{1}{2}$ months. At the other extreme, approximately 10 per cent of the couples would never have been able to conceive and an additional 5 per cent would have required more than four years of uncontrolled exposure. (*See* Appendix Table A, Columns K and L.)[7]

II. *Estimating the Number of Couples that Would Have Had Two or More Conceptions if Contraceptives Had Not Been Used, and Their Distribution by Months of Exposure Required for the Second Conception*

These estimates are made like those for the first conception except for an allowance for the anovulatory period which is believed to continue after the puerperium in a large majority of cases, and during which conception cannot occur. If contraception is not practiced after the first puerperium the anovulatory period is part of the period of uncontrolled exposure. But if preventive measures are used for a time and then discontinued, the months without ovulation from the end of the puerperium to the discontinuance of contraception should be added to the subsequent period of uncontrolled exposure. It is assumed in this analysis that ovulation is resumed after pregnancy at the same time as menstruation.

Although 31 per cent of the couples studied did nothing to postpone or prevent the first conception, all but 13 per cent of those with one or more pregnancies began contraception when intercourse was resumed after the first pregnancy. Of the 213 couples who continued

---

[7] In some cases, of course, the condition postponing or preventing conception could have been corrected by treatment or surgery.

to have uncontrolled exposure, over one-fourth conceived again within six months of the end of the first puerperium, over one-fifth during the next six months, and one-sixth during the second year, but nearly one-fifth could not have a second conception. On the whole the group consists of couples who did not conceive relatively soon after marriage. For example, 74 per cent of the couples whose first conception occurred in one month commenced preventive measures when that pregnancy ended. (*See* Appendix Table B, Columns B and C.) In contrast, only 39 per cent of those who did not try to postpone the first pregnancy but nevertheless did not conceive until sixteen or more months had elapsed, tried to postpone or prevent the second pregnancy. For this reason the couples whose second pregnancy began before the initial resort to contraception would be expected to require a longer period of exposure for the second conception than the couples whose second pregnancy began under other conditions.

The second conception of 351 couples occurred in a period when control measures were discontinued for that purpose. A few of these couples wanted the second as soon as possible after the first, usually because the first had ended in wastage. Over three-fourths of the

Appendix Table B. Couples whose first conception occurred before contraception was practiced, by months of exposure before first conception, and by resort to contraception at end of first puerperium.

MONTHS OF EXPOSURE BEFORE FIRST CONCEPTION[1]	ALL COUPLES	COUPLES BEGINNING CONTRACEPTION AT END OF FIRST PUERPERIUM		COUPLES NOT BEGINNING CONTRACEPTION AT END OF FIRST PUERPERIUM	
		Number	Per Cent of All Couples	Number	Per Cent of All Couples
	A	B	C	D	E
1	140[2]	102	74.5	35	25.5
2–3	90	58	64.4	32	35.6
4–7	83	45	54.2	38	45.8
8–15	92	46	50.0	46	50.0
16 or More	77	30	39.0	47	61.0
Not Reported	43[3]	28[3]	65.1	15[3]	34.9
TOTAL	525[2]	309	59.2	213	40.8

[1] Because "months of exposure" was coded to the nearest whole number the line for 1 month includes periods of less than 1.50 months, that for 2 months includes periods of 1.50 to 2.50 months, that for 3 months includes periods of 2.51 to 3.49 months, etc.

[2] Three of these couples became definitely sterile during the first puerperium.

[3] These wives were pregnant when married.

group waited until at least a year had elapsed, and one-fourth waited more than four years. The delay apparently had little effect on the time required for conception once preventive measures were stopped, for more than half of the group conceived within six months (including the previous months of amenorrhea, if any, after the puerperium) and over 77 per cent within a year. (*See* Appendix Table C, Columns C and D.) The average length of the period for this group is 10.3 months, which is well below the corresponding figure of 17.5 months for the 174 couples that had not practiced contraception at any time before the second conception.

Appendix Table C. Months of exposure without contraception required for a second conception by (1) couples whose second conception occurred during such a period, and (2) other couples (estimated).[1]

MONTHS OF EXPOSURE[2]	COUPLES WHOSE SECOND CONCEPTION OCCURRED DURING A PERIOD								ESTIMATES FOR			
	Before Contraception Was Begun		When Contraception Was Discontinued in Order to Conceive		When Contraception Was Not Practiced[3]		All Couples Who Had a Second Conception		Couples Who Did Not Have a Second Conception		All Couples	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
	A	B	C	D	E	F	G	H	I	J	K	L
1	4	2.3	49	14.0	56	10.2	119	10.2	50	6.1	169	8.5
2	10	5.7	46	13.1	56	10.2	119	10.2	48	5.9	167	8.5
3	10	5.7	26	7.4	37	6.8	79	6.8	29	3.6	108	5.5
4	11	6.3	32	9.1	45	8.2	96	8.2	35	4.3	131	6.6
5–6	23	13.2	36	10.3	66	12.0	141	12.0	40	5.0	181	9.2
7–9	20	11.5	56	16.0	76	13.9	162	13.9	61	7.6	223	11.3
10–12	28	16.1	27	7.7	56	10.2	119	10.2	33	4.0	152	7.7
13–16	22	12.6	28	8.0	54	9.9	115	9.8	35	4.3	150	7.6
17–24	12	6.9	16	4.6	31	5.7	66	5.7	20	2.5	86	4.4
25–48	16	9.2	26	7.4	42	7.7	89	7.6	34	4.2	123	6.2
49–84	16	9.2	4	1.1	22	4.0	47	4.1	36	4.4	83	4.2
85+	2	1.1	5	1.4	7	1.3	15	1.3	17	2.1	32	1.6
Can't Conceive	—	—	—	—	—	—	—	—	372	46.0	372	18.8
TOTAL	174	100.0	351	100.0	548	100.0	1,167	100.0	810	100.0	1,977	100.0

[1] *See* text for an explanation of the method of estimating.
[2] Because "months of exposure" was coded to the nearest whole number the line for 1 month includes periods of less than 1.50 months, that for 2 months includes periods of 1.50 to 2.50 months, that for 3 months includes periods of 2.51 to 3.49 months, etc.
[3] Includes twenty-three couples whose second conception occurred during a period when contraception was discontinued for reasons other than wanting a child. (*e.g.* couldn't afford to buy contraceptives, thought themselves sterile, etc.)

In view of the foregoing it might be assumed that if contraception had not been practiced the 619 couples who conceived for the second time in spite of their efforts to the contrary would be distributed by time required for conception like the 351 couples who planned their second rather than like the 174 who let nature take its course. On the other hand, it is possible that conception cannot occur as readily during the first few weeks after menstruation is resumed following a pregnancy as it can later. If so, a period of exposure after the discontinuance of contraception should be increased by more than the preceding period of amenorrhea (after the puerperium) to make it the equivalent of the omission of any preventive efforts between pregnancies. Because of these conflicting possibilities the experience of all of the 548 couples whose second pregnancy began in a period when contraception was not practiced is used to represent that of the 1,167 couples having a second pregnancy.[8]

The next group to be considered consists of the 488 couples who had only one pregnancy. Seven of these couples became sterile at the end of the first pregnancy, and forty-five before many months had elapsed. Some of the latter did not use contraceptives after the first puerperium but others did even though conception probably was impossible because of diseased ovaries or other reasons. Each of these couples is classified as unable to have had a second conception.[9] Another subgroup (sixty-one couples) practiced contraception for a time, and then stopped but did not conceive. Forty-eight of these couples either had a long period of uncontrolled exposure (over forty-four months) or became definitely sterile at the end of a shorter period. It is assumed that they would not have conceived a second time if no attempt at control had been made after the first pregnancy, but that the remaining thirteen would have done so. The months of uncontrolled exposure required for conception by each of the latter is as-

---

[8] The second conception of twenty-three couples occurred during periods when contraception was discontinued for reasons other than the desire for a child.

[9] This classification would be incorrect under certain conditions. For example, if a couple postponed the first pregnancy for several years, and if tumors were developing throughout this period and necessitated a hysterectomy shortly after parturition, it was impossible for the couple to have a second pregnancy at a later date, but two or more pregnancies would have been possible if no attempts at postponement had been made. No such situation is found among the fifty-two couples under consideration here. Instead, either (a) the first pregnancy was postponed for a period which is short in comparison to the period of uncontrolled exposure required for the first conception, or (b) sterility occurred primarily because of conditions associated with the first pregnancy rather than with the time elapsing from marriage to the first conception.

sumed to be approximately midway between the actual months of such exposure and 100.[10]

A large majority (over 76 per cent) of the 488 couples with only one pregnancy remain to be considered. Each of them practiced contraception for a long period—from the end of the first pregnancy to the interview (in most cases) or to the onset of definite sterility. The sixty "relatively sterile" couples in this subgroup are distributed primarily like the ninety-seven "relatively sterile" couples who stopped contraception to have a second pregnancy, thirty-six being classified as able to have conceived a second time, and twenty-four as unable to have done so. The 315 "relatively fecund" couples in the subgroup are distributed like all the 399 couples who stopped contraception to have a second pregnancy, 287 being classified as able to have conceived a second time and twenty-eight as unable to have done so.

The last group consists of the 322 couples with no pregnancy. The 194 classified as unable to have had a first pregnancy and sixteen of the twenty whose first pregnancy would have required more than five years of uncontrolled exposure are assumed unable to have had a second pregnancy. The remaining 112 couples classified as able to have had a first conception are assumed to be distributed with regard to a second like all couples with one or more. (*See* Table C, I and J.)

The tendency to cluster at the extremes, noted for the classification by months of uncontrolled exposure required for the first conception, is found again for the classification relating to the second conception. According to the foregoing estimates the second conception would have occurred within $3\frac{1}{2}$ months of the end of the first puerperium for over 22 per cent of the couples and during the next three months for about 16 per cent if contraception had not been practiced. At the other extreme nearly 19 per cent of the couples apparently could not have had a second pregnancy, and more than 5 per cent could have had it only after trying for more than four years. (*See* Table C, Columns K and L.)

III. Estimating the Number of Couples that Would Have Had Three or More Conceptions if Contraceptives Had Not Been Used, and Their Distribution by Months of Exposure Required for the Third Conception

Estimates for the third pregnancy are less satisfactory than those

---

[10] This estimate and the division into the 2 classes were made on the basis of the table in footnote 6 of appendix.

for the first and second pregnancies because less than 30 per cent of the couples conceived for the third time, and less than 10 per cent did so during a period when contraception was not practiced. Since the latter group contains 186 couples, however, the information about them and about the 372 couples classified as unable to have had a second pregnancy is used as a basis for estimating what would happen to the remaining 1,419 couples. The procedure followed is the same as for the second conception, and involves the following steps: (a) It is assumed that the 392 couples whose third conception occurred in spite of preventive measures would have required the same number of months of uncontrolled exposure as the 186 couples who conceived during such a period. (b) The 589 couples who had only two pregnancies are divided into two groups, namely, the 473 assumed able to have conceived for the third time, and the 116 assumed unable to have done so either because of the onset of definite sterility or because of trying unsuccessfully for a third pregnancy during long periods. (c) The 473 couples mentioned in "b" are distributed primarily like the 114 whose third conception occurred after they stopped preventive measures because they wanted a child. (d) The 438 couples who had fewer than two pregnancies but are classified as able to have two are subdivided into two groups, namely, seventy-one couples assumed unable to have a third and 367 assumed able. The latter are distributed by months of exposure primarily like the 114 couples whose third conception occurred when contraception was stopped for that purpose.

The estimates thus obtained are given in Appendix Table D. They show 1,418 couples (nearly 72 per cent) able to have had a third pregnancy, and 559 (over 28 per cent) unable to have done so. Most of the former would have conceived relatively soon after the end of the second puerperium, for over 23 per cent of all the couples are in the group conceiving within $3\frac{1}{2}$ months, and over 27 per cent are in the group requiring $3\frac{1}{2}$ to $12\frac{1}{2}$ months. The average months of uncontrolled exposure per couple is 11.4.

The distribution of couples by the length of the period required for the third conception in the absence of preventive measures is much like that for the second except for an increase in the proportion classified as unable to conceive (from less than 19 per cent to more than 28 per cent). More than half of this increase of 10 percentage points comes from a decrease in the proportion requiring more than nine

months to conceive; the remainder comes from a decrease in the seven to nine month group. The proportion classified as conceiving within $3\frac{1}{2}$ months is slightly higher for the third conception (23.1 per cent) than for the second (22.5 per cent). The estimated months of uncontrolled exposure required per couple conceiving averages less for the third (11.4 months) than for the second (13.9 months), which seems reasonable in view of the increase in the proportion of couples classified as unable to conceive.

Appendix Table D. Months of exposure without contraception required for third conception by (1) couples whose third conception occurred during such a period, and (2) other couples (estimated).[1]

	COUPLES WHOSE THIRD CONCEPTION OCCURRED DURING A PERIOD						ESTIMATES FOR					
MONTHS OF EXPOSURE[2]	Before Contraception Was Begun		When Contraception Was Discontinued in Order to Conceive		When Contraception Was Not Practiced[3]		All Couples Who Had a Third Conception		Couples Who Did Not Have a Third Conception		All Couples	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
	A	B	C	D	E	F	G	H	I	J	K	L
1	1	1.8	17	14.9	24	12.9	75	12.9	121	8.6	196	9.9
2	5	8.8	13	11.4	18	9.7	56	9.7	90	6.4	146	7.4
3	—	—	12	10.5	12	6.5	37	6.5	78	5.6	115	5.8
4	1	1.8	10	8.8	13	7.0	41	7.0	68	4.9	109	5.5
5–6	10	17.5	16	14.0	30	16.1	93	16.1	119	8.5	213	10.8
7–9	3	5.3	12	10.5	15	8.1	47	8.1	83	5.9	129	6.5
10–12	4	7.0	7	6.1	12	6.5	37	6.5	51	3.7	88	4.5
13–16	12	21.1	7	6.1	19	10.2	59	10.2	59	4.2	118	6.0
17–24	10	17.5	8	7.0	19	10.2	59	10.2	66	4.7	125	6.3
25–48	9	15.8	10	8.8	20	10.8	59	10.2	80	5.7	139	7.0
49–84	—	—	2	1.8	2	1.1	9	1.6	23	1.7	32	1.6
85+	2	3.5	—	—	2	1.1	6	1.1	2	0.2	8	0.4
Can't Conceive	—	—	—	—	—	—	—	—	559	39.9	559	28.3
TOTAL	57	100.0	114	100.0	186	100.0	578	100.0	1,399	100.0	1,977	100.0

[1] *See* text for an explanation of the method of estimating.

[2] Because "months of exposure" was coded to the nearest whole number the line for 1 month includes periods of less than 1.50 months, that for 2 months includes periods of 1.50 to 2.50 months, that for 3 months includes periods of 2.51 to 3.49 months, etc.

[3] Includes fifteen couples whose third conception occurred during a period when contraception was discontinued for reasons other than wanting a child. (*e.g.* couldn't afford to buy contraceptives, thought themselves sterile, etc.)

IV. Estimating the Average Number of Months of Uncontrolled Exposure Required for the Fourth and Subsequent Conceptions by Couples that Would Have Had These Conceptions if Contraceptives Had Not Been Used

Although 257 couples had a fourth pregnancy, only fifty-eight of these conceptions occurred in a period when contraception was not practiced. The average duration of uncontrolled exposure for the fifty-eight couples is 8.8 months, which is well below the corresponding figures of 12.0 months for the 186 third conceptions and 12.7 months for the 548 second conceptions which occurred during such periods. Because the decrease is so large and the number of cases so small it is believed advisable to base the time required for the fourth conception on the relation between the estimates for the second and third conceptions rather than on the experience of the fifty-eight couples.

The average months of uncontrolled exposure required for the second and third conceptions by couples classified as able to have had these conceptions is estimated as 13.94 months and 11.42 months, respectively, in Sections II and III. The latter figure is 81.9 per cent of the former. It is assumed that similar relationships but with rising percentages hold between subsequent conceptions. Specifically, the period of uncontrolled exposure required for the fourth conception by couples able to have had a fourth conception is assumed to be 85 per cent as long as that for the third conception. The corresponding assumptions for subsequent conceptions are 88 per cent for the fifth, 91 per cent for the sixth, 94 per cent for the seventh, 96 per cent for for the eighth, 98 per cent for the ninth and 100 per cent for the tenth. The resulting durations are 9.7 months for the fourth conception, 8.5 for the fifth, 7.8 for the sixth, 7.3 for the seventh, 7.0 for the eighth, and 6.9 for the ninth and subsequent conceptions. (*See* Table 5, Column A.) Since all couples classified as able to have a fourth or subsequent pregnancy are assumed to be of normal fecundity for purposes of the low and medium estimates, the foregoing averages are used for the 1,680 and the 1,483 couples. (*See* Table 5, Columns C and E.) In obtaining the maximum estimate the same figures are used for the fifth and subsequent pregnancies (for the same reason) and the figure for the fourth conception (7.4 months) is estimated by interpolation. (*See* Table 5, Column G.)

Although the foregoing assumptions regarding the decrease in the length of the period required for conception in the absence of preventive measures after the third pregnancy are arbitrary, some reduction seems called for because of the transfer of couples from the "able to conceive" category to the "unable" category. It is probable that the proportion of "slow breeders" who become unable to conceive exceeds the corresponding figure for the "rapid breeders."

V. Estimating the Fecundity of the "Relatively Fecund" and "Relatively Sterile" Couples, and the Reduction in Fertility Due to Control Measures

As mentioned in Section A it is not feasible to array the couples from most fecund to most sterile, and estimate what the reproductive performance of the upper 60, 75, or 85 per cent would have been if no contraceptives had been used and no pregnancies terminated illegally. It is feasible, however, to prepare such estimates for the 1,444 couples classified as "relatively fecund" and the 533 couples classified as "relatively sterile" when the field work was in progress.

The numbers of couples able to have a first, second, and third pregnancy and the number of months of uncontrolled exposure required for each conception are estimated for each of these groups according

Appendix Table E. Ability to conceive and months required for conception and pregnancy, by order of pregnancy, for "relatively fecund" and "relatively sterile" couples.[1]

ORDER OF PREGNANCY	1,444 "RELATIVELY FECUND" COUPLES				533 "RELATIVELY STERILE" COUPLES			
	Number of Couples Able to Conceive	Months Required for			Number of Couples Able to Conceive	Months Required for		
		Conception	Pregnancy	Cumulative Total		Conception	Pregnancy	Cumulative Total
	A	B	C	D	E	F	G	H
1	1,432	7.4	9.6	17.0	351	24.5	8.9	33.5
2	1,392	11.2	9.5	37.7	213	31.6	8.7	73.7
3	1,311	10.6	9.1	57.4	108	21.4	8.2	103.4
4	1,213	10.1	9.3	76.8	64	16.3	8.2	127.9
5	1,114	9.8	9.1	95.7	35	13.5	8.0	149.4
6	1,013	9.5	9.1	114.3	21	12.0	8.0	169.4
7	921	9.4	9.1	132.8	9	11.3	8.0	188.7
8	838	9.4	9.1	151.3	0			
9	754	9.4	9.1	169.8				

[1] See text for an explanation of the method of estimating. Columns C and G include one month for the puerperium.

to the procedure described for all couples in Sections I, II, and III of the Appendix, using the data in Appendix Tables A, C, and D.

The procedure for the fourth and subsequent pregnancies involves assumptions. Because the "relatively fecund" couples constitute 80.3 per cent of all the couples classified as able to have a first pregnancy, and 86.7 and 92.4 per cent, respectively, of those able to have second and third pregnancies, it is assumed that the corresponding percentages are 95, 97, 98 and 99 for the fourth to seventh pregnancies, and 100 for the eighth and subsequent pregnancies. The resulting numbers of couples classified as able or unable to conceive are shown in Appendix Table E, Columns A and E.

The assumptions regarding months of uncontrolled exposure required for conception follow the same principles as those for all couples. Among the "relatively fecund" couples this period is 94.5 per cent as long for the third pregnancy as for the second; among the "relatively sterile" couples the percentage is 67.8. The corresponding percentages for successive pairs of pregnancies are assumed to be 95.5, 96.5, 97.5, 98.5, 99.5, and 100 for the "relatively fecund" couples and 76, 83, 89, and 94, for the "relatively sterile" couples. The resulting durations are shown in Appendix Table E, Columns B and F.

The average length of each pregnancy (shown in Columns C and G) is computed from distributions for each group like those for all couples in Table 3. Similarly, the ratio of live births to pregnancies, by order of pregnancy, is computed from the data regarding termination of pregnancy, on which Table 4 is based. The average number of months married is assumed to be 157.3 for each group.[11]

Combining the foregoing information gives a total of 9,478 pregnancies for the "relatively fecund" and 778 for the "relatively sterile" couples if there had been no contraception or illegal abortion.[12] The

---

[11] This is the average for the 1,977 couples. The actual average for the "relatively fecund" couples is 157.27 months, and for the "relatively sterile" couples 157.47 months. In contrast to the procedure followed in Table 14 of the sixth article in this series, periods of sterility and of separation when not pregnant have been included in computing these averages.

[12] The average experience of the 1,444 "relatively fecund" couples shows that the eighth pregnancy could have been completed 151.3 months after marriage. (*See* Appendix Table E, Column D.) In other words, each of the couples on the first 8 lines of Column A could have had the pregnancies specified, which total 9,233. Subtracting 151.3 from 157.3 (the months married) leaves an average of 6.0 months for a ninth pregnancy. Pooling this for the 754 couples classified as able to have a ninth pregnancy, and dividing by 18.4 months (the average time required for the ninth conception and pregnancy) gives 245 ninth pregnancies. Adding 9,233 and 245 gives 9,478.

rates per 1,000 couples are 6,564 and 1,460, respectively. Applying the ratios of live births to pregnancies gives birth rates of 5,861 and 1,105.[13] The criteria used in the field classification, therefore, give a group of "relatively sterile" couples whose ability to conceive and ability to produce living children are, respectively, 22.2 per cent and 18.8 per cent of those of the "relatively fecund" couples.

Combining the estimates for the 2 groups gives totals of 10,256 pregnancies and 9,051 births, and rates of 5,188 pregnancies and 4,578 births per 1,000 couples. These rates are slightly below the rates of 5,265 pregnancies and 4,594 births shown for the 1,977 couples in Table 6, Column A. The differences result primarily from differences in the estimated months of uncontrolled exposure required for conception, for the numbers of "relatively fecund" and "relatively sterile" couples classified as physiologically able to have a pregnancy of each order are obtained by subdividing the total numbers so classified. The length of the periods required for conception, however, is computed and estimated independently for all couples, the "relatively fecund" and the "relatively sterile" couples. In view of this fact differences of less than 2 per cent in the final rates are not surprising.

The rates for the 1,444 "relatively fecund" couples—6,564 pregnancies and 5,861 births—are slightly over 7.0 per cent below the corresponding rates of 7,076 and 6,325 for the 1,483 couples constituting the most fecund 75 per cent of each array. (*See* Table 6, Column C.) The difference is due primarily to the fact that the rates for the 1,444 couples are based on the experience of an identical group of couples from marriage to interview, whereas those for the 1,483 couples represent the composite experience of the upper 75 per cent of the couples in each array (time required for each conception, and ability to carry to term and produce a living child).

The actual pregnancy and birth rates of the 1,444 "relatively fecund" couples are 2,239 and 2,023 per 1,000.[14] These are 34.1 and

---

[13] The number of live births per 100 pregnancies (excluding pregnancies terminated by illegal abortion or in progress at the time of the interview) is as follows:

	FIRST PREGNANCY	SECOND PREGNANCY	THIRD PREGNANCY	FOURTH AND SUBSEQUENT PREGNANCIES
"Relatively fecund" couples	93.5	93.1	87.1	87.7
"Relatively sterile" couples	81.2	80.3	63.8	60.0

[14] *See* reference 19 of the text.

34.5, respectively, of the foregoing rates which assume no contraception or illegal abortion. In other words, these estimates indicate that the deliberate efforts to restrict fertility which were made by these couples reduced their pregnancy rate by 65.9 per cent and their birth rate by 65.5 per cent. These reductions are somewhat smaller than those of 70.4 shown in a previous article, but should be more accurate because of the more rigorous procedure followed here.[15]

The actual pregnancy and birth rates of the 533 "relatively sterile" couples are 1,118 and 820 per 1,000. The estimates presented above indicate that these couples would have had rates of 1,460 and 1,105 if contraception had not been practiced and no pregnancies terminated illegally. It appears, therefore, that even though these couples had serious defects in their reproductive systems their attempts to postpone or prevent unwanted pregnancies reduced their fertility rates by between 23.4 and 25.8 per cent.

[15] *Ibid.*