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BY L. ERLENMEYER-KIMLING, PH.D., SUSAN NICOL, M.A., JOHN D. RAINER, M.D., AND W. EDWARDS DEMING, PH.D.

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Two cohorts of patients admitted to New York state hospitals in 1934-36 and in 1954-56 with the diagnosis of schizophrenia were compared to assess possible changes in marital and reproductive rates during the 20-year period. The authors found that patients of both sexes and all age groups in the later cohort showed increases in marital and reproductive rates in comparison with those in the earlier cohort. They attribute this trend to decreased length of hospital stay as well as more flexible social attitudes toward former patients and discuss its implications for population genetics and community problems.

THE LENGTH OF hospital stay for mentally ill patients has been significantly shortened during recent years as a result of advances in medical technology, increasing liberalization of hospital administrative policies, and growing interest in the legal rights and welfare of the mentally ill. Longer periods of residence in the community, coupled with more flexible social attitudes toward the released patient, may be altering the marital and reproductive patterns of persons afflicted with behavioral disorders. Changes in reproductivity [1] in categories of mental disease that are known to be genetically influenced have, in turn, potential implications for both behavior and population genetics.

Increases in the reproductivity of affected persons may present themselves as either a) differential gains in comparison with reproductivity of the general population or b) maintenance of relative standing while the birth rate of the general population is rising. In the first case, it is apparent that even a small gain in differential fertility could reduce a previously existing selective disadvantage. In the second case, the effects of reproductive trends that merely preserve a constant relationship between the birth rates of mentally ill persons and the population at large may be less obvious. Nevertheless, an absolute increase in the number of children born to disturbed parents may have an immediate impact upon social institutions as well as important, albeit indirect, consequences for behavioral evolution.

For several reasons, schizophrenia is the most interesting of the psychoses which may be undergoing reproductive changes in response to changes in hospitalization patterns. First, the role of genetic factors in the predisposition to schizophrenia is well recognized, despite the fact that the precise hereditary mechanisms are not yet fully understood. Second, schizophrenia, with an estimated expectancy in the population of about one percent, is one of the most common of the mental diseases. Third, schizophrenia has been associated heretofore with low repro-

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[1] In this paper, the terms reproductivity and fertility are used interchangeably and refer to reproductive performance (child per person), not to population replacement rate or biological capacity to reproduce.

ductive rates in comparison with the general population(6, 10, 12) and indeed has shown lower reproductivity than have most other diagnostic categories(8, 15, 16). Finally, the decreasing duration of hospital residence for schizophrenia is especially likely to expand opportunities for marriage and conception in a condition such as schizophrenia, which frequently requires admission well before completion of the reproductive period.

The above considerations prompted the present study, in which comparative data were collected on marital and reproductive rates, as well as on hospitalization patterns, for two large samples of schizophrenic patients admitted to New York state hospitals. One sample was drawn from admissions in 1934-36, i.e., before the introduction of current active treatment methods, and the second sample was drawn from admissions in 1954-56, after such methods had come into prominence. Prehospitalization data were obtained for all cases, and posthospitalization histories were traced for a subsample of cases.

Preliminary and interim reports(4, 5, 7) have shown some of the basic marriage and fertility trends up to the time of admission, with projections beyond that point. In this paper we consider certain aspects of the final data on patients whose histories were followed for several years beyond admission. More detailed analyses of the data presented here, as well as additional categories of information on the subjects, will appear in future publications.

Methodology

Under the design of the study, samples were drawn from all patients admitted to 11 New York state hospitals for the mentally ill during: 1) the calendar years 1934, 1935, and 1936 and 2) the calendar years 1954, 1955, and 1956. The procedure of selection and expansion followed well-known principles of sampling(3, chap. 15). The sampling unit was a consecutive hospital number in Brooklyn, Central Islip, Gowanda, Hudson River, Kings Park, Manhattan, Rochester, Rockland, St. Lawrence, and Utica state hospitals and in the New York State Psychiatric Institute.

The sizes of the samples are shown in table 1. To ensure comparability of diagnostic criteria for both survey periods, acceptance of index cases for the present study was not based on hospital diagnoses but rather

TABLE 1
Sizes of Samples by Survey Period

	DESCRIPTION OF CASES	BOTH PERIODS	1934-36	1954-56
1	Admissions drawn into the samples	9,790	5,479	4,311
2	Diagnosis not schizophrenic	6,453	3,557	2,896
3	Diagnosis schizophrenic (index cases)	3,337	1,922	1,415
4	White	2,949	1,774	1,175
5	Nonwhite	388	148	240
6	Diagnosis schizophrenic, white (line 4)	2,949	1,774	1,175
7	Not designated for follow-up	705	398	307
8	Admission data obtained	669	373	296
9	Absolute loss	36	25	11
10	Designated for follow-up	2,244	1,376	868
11	Followed successfully	1,899	1,118	781
12	Admission data only	252	184	68
13	Absolute loss	93	74	19
14	Admission data obtained	3,167	1,812	1,355
15	White	2,820	1,675	1,145
16	Nonwhite	347	137	210
17	Absolute loss	170	110	60
18	White	129	99	30
19	Nonwhite	41	11	30
20	Followed successfully (line 11)	1,899	1,118	781
21	Survived through standard evaluation interval	1,681	976	705

on a review by staff psychiatrists of the clinical records of all patients in the samples. Criteria used in making a diagnosis of schizophrenia were based on a *combination* of affective, behavioral, and intellectual disturbances of a psychotic intensity. The criteria included as well a history of disintegration of a previously organized personality and the presence either of secondary symptoms (of a hebephrenic, catatonic, or paranoid type) or of regression and deterioration. In essence, the diagnoses followed a conservative application of the criteria in the 1952 edition of the APA *Diagnostic and Statistical Manual—Mental Disorders*(1).

This procedure yielded a total of 3,337 schizophrenic index cases (table 1).[2] It may be noted that the ratios of patients diagnosed as schizophrenic to the total number of patients screened was about the same for both periods. This fact, together with the uniformity of the diagnostic standards, would seem to indicate the clinical similarity of the two samples of schizophrenic index cases.

The plan for this investigation was to collect data on the index cases in two phases. In the first phase, preadmission histories were to be obtained on all index cases from hospital records. Data available from records included demographic variables, family histories, clinical information, marital and reproductive histories, duration of survey admission, and notations of deaths in hospital. Such data were successfully gathered for 3,167 index cases. Neither hospital records nor subsequent follow-up attempts yielded adequate information on the remaining 170 cases (called "absolute loss" in table 1).

The second phase furnished the basis for this paper. It was designed to provide post-admission data and a longitudinal follow-up of the index cases. In order to hold the work load within bounds, with statistical validity, the initial samples of index cases were randomly reduced by approximately one-third. Nonwhite patients were not included among the cases designated for follow-up.

The procedures carried out on the remaining patients included: a) tracing all hospitalizations subsequent to survey admission, whether the later admissions occurred in New York state or in other states; b) locating the residences of discharged patients and of relatives of hospitalized patients; c) contacting the patient or close relatives by means of mailed questionnaires and direct interviews in order to verify the personal, marital, and reproductive information on the index cases and to complete the family histories; and d) searching for possible hospitalizations of the parents, siblings, spouses, or adult children whose histories suggested mental disorder.

In this procedure, a case was regarded as successfully followed if full information was obtained up to the time of death or to the end of the reproductive period (estimated as age 45 for women, age 50 for men) or if the time of last information fell within the period of the present study (1961-65). Serious efforts were made in the field work to reduce nonresponse, and the degree of success may be worth noting. The proportion of patients successfully followed for both periods combined was 85 percent (1,899 of 2,244). For the earlier sample (1934-36) it was 81 percent (1,118 of 1,376), even though when field work commenced the last known address for some cases was 25 years out of date. For the later sample (1954-56) the success rate was 90 percent (781 of 868).

The mean year of last information (final evaluation) for the cases followed was 1956 in the early sample and 1962 in the later sample. The final evaluation point varied, however, for individual cases, especially those from the 1934-36 sample. To establish a standard reference point, life histories were also evaluated as of December 31, 1941, for cases from the early sample that had been followed through that date. Similarly, a standard point was set for cases from the later sample followed through December 31, 1961. A five- to eight-year period from date of admission was thus avail-

[2] The total number of cases was previously reported as 3,354. Seventeen cases have since been omitted because they were nonresidents of New York state at the time of admission.

able for detailed analysis.[3] To preserve a cohort of index cases actually followed throughout the interval, patients with final evaluation prior to the standard reference date were excluded from the analysis. The 218 cases thus excluded had either died before the standard reference date or received final evaluation status because they were past the reproductive age at last information.

Table 1 shows a summary of the number of cases drawn, designated for follow-up, successfully followed, and surviving to date of standard evaluation.

It should be noted here that the figures in table 1 represent actual numbers of index cases in the samples, but that henceforth all figures in tables are weighted. (Exceptions occur only in table 3, where the actual numbers in the samples are needed for statistical calculations). The weight for any case was the inverse of its probability of selection. This probability is the initial probability of selection of a consecutive hospital number, reduced to half if a case had two admissions during the three-year period of selection (or reduced to a third for three admissions), and reduced further because not all of the eligible cases were designated for follow-up.

[3] In a previous report, a standard interval of five to seven years was used for a portion of the cases. It has since been possible to extend evaluation throughout the years 1941 and 1961, respectively.

Results

Previous reports on this study dealt with incomplete and unweighted data(4, 5, 7). Unweighted analyses of data up to survey admission for the final total of 2,820 white index cases give figures almost identical to those presented in the earlier report. The weighted data reduce slightly the differences between the two samples but confirm the major trends noted earlier.

Data up to survey admission, either weighted or unweighted, show no apparent differences between the 1,899 cases that

TABLE 2
Marriage and Fertility Data for All Index Cases Followed Beyond Admission, by Sex
(Based on Weighted Samples)

CHARACTERISTIC	AT ONSET		AT 1ST ADMISSION		AT SURVEY ADMISSION		AT FINAL EVALUATION*	
	1934-36	1954-56	1934-36	1954-56	1934-36	1954-56	1934-36	1954-56
Male patients	4,533	4,457	4,533	4,457	4,533	4,457	4,533	4,457
Number of children	1,577	1,806	1,867	2,536	2,046	2,988	2,740	3,671
Children per patient	0.4	0.4	0.4	0.6	0.4	0.7	0.6	0.8
Children per marriage	1.7	1.5	1.9	1.6	1.9	1.6	1.8	1.7
Children per fertile marriage	2.7	2.3	2.6	2.2	2.6	2.2	2.6	2.3
Proportion of patients ever married (percent)	20.0	26.9	21.8	35.9	24.2	40.6	32.7	48.4
Proportion of marriages childless (percent)	34.6	35.1	26.7	26.5	28.7	24.1	29.0	25.4
Proportion of patients with children (percent)	13.0	17.4	16.0	26.4	17.3	30.8	23.2	36.1
Female patients	4,679	4,468	4,679	4,468	4,679	4,468	4,679	4,468
Number of children	3,574	3,429	4,047	4,253	4,380	4,915	5,080	5,420
Children per patient	0.8	0.8	0.9	1.0	0.9	1.1	1.1	1.2
Children per marriage	1.7	1.5	1.7	1.8	1.8	1.8	1.8	1.9
Children per fertile marriage	2.5	2.2	2.6	2.4	2.7	2.5	2.7	2.6
Proportion of patients ever married (percent)	45.6	49.8	50.8	54.1	53.1	60.0	58.8	63.8
Proportion of marriages childless (percent)	33.8	29.4	34.8	27.1	34.2	26.1	31.4	26.1
Proportion of patients with children (percent)	30.2	35.1	33.2	39.4	35.0	44.4	40.3	47.2

* Mean year of final evaluation is 1956 for the 1934-36 group and 1962 for the 1954-56 group.

were followed beyond admission and the 921 cases that were not followed. The cases followed may thus be considered to give an adequate picture of the over-all group up to the time of admission as well as a detailed study of the postadmission period.

Table 2 summarizes marital and reproductive data at a series of reference points in the life histories of the cases followed. The reference points examined here are: onset of the disease (estimated time at which psychotic symptoms were first detectable); first admission to a mental hospital; survey admission in 1934-36 or 1954-56 (which may or may not be the first admission); and final evaluation, as previously defined. The term "married" refers to persons who had ever been married at the given reference point. The number of children is computed on the basis of legitimate live births.

Comparison of results for the two periods at the various reference points in table 2 displays changes in the structure of marriage and fertility patterns. At each point, the 1954-56 cases of each sex showed, in contrast to the 1934-36 sample: a) a greater proportion of married persons; b) a decreased proportion of childless marriages (except for males at onset); c) a corresponding rise in the proportion of all persons, male and female, who had produced at least one child. Total reproductive rates, represented as children per person, were also higher for the 1954-56 cases at all reference points, with the exception of onset.

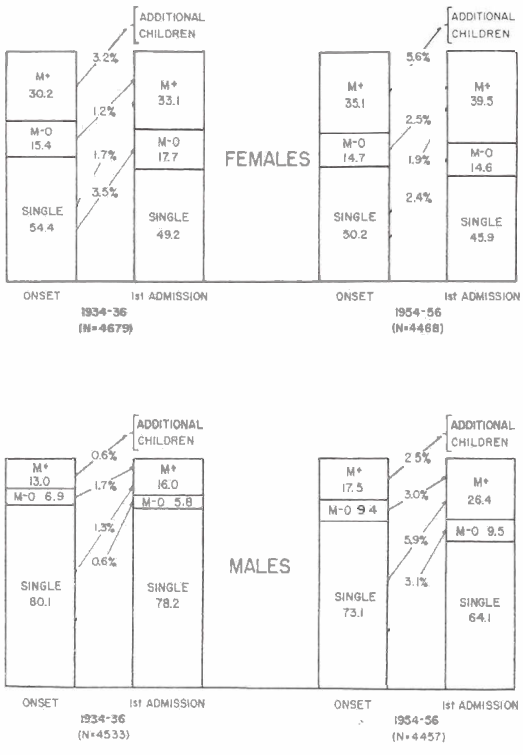
The increment in total reproductive rates, however, did not reflect a rise in mean family size. Indeed, it was accomplished despite slight decreases in the number of children born to fertile married persons as well as to married persons generally. Hence, the additional number of children born to schizophrenic patients in the later survey period was distributed across a larger number of family units.

Regarding the comparison between the two groups at the time of final evaluation, it may be observed that the 1934-36 cases had been followed for an average of 21 years from survey admission to final evaluation, at which time only 8.1 percent were alive and within the reproductive period. The 1954-56 cases were followed only for an average of seven years to final evaluation, at which time 57.3 percent of them were alive and within the reproductive period. Nevertheless, in spite of this handicap, the later cases, male and female, showed at final evaluation fewer persons childless and more children per person.

Characteristics that influence the marital and reproductive trends may be evaluated by comparing the two groups prior to first admission and for equal periods of time following survey admission. Analysis of the changes that took place during the interval between onset and first admission (figure 1) illustrates differences between the two samples prior to hospitalization. Approximately the same proportion of single females in both samples (9.6 percent and 8.6 percent in the earlier and later samples respectively) contracted new marriages between onset and first admission. Although the proportion of new marriages that resulted in childbirth was essentially the same

FIGURE 1

Changes in Marital Status and Fertility Between Onset and First Admission for the Cases Followed in the Two Samples (Each of the percentages designating the amount of change, as shown in the arrows, was computed by using the subclass at onset as a base.)



for the two samples of women, the proportion of women in the 1954-56 sample already married at onset had a considerably higher rate of conception between onset and first admission. Males of the 1954-56 sample, on the other hand, experienced substantially greater gains in both marriage and fertility over the males of the 1934-36 sample.

In the analysis of the information gathered on patients after the survey admission, the standard evaluation interval previously described is of key importance. This interval provides an equivalent length of time beyond admission for a cohort of cases in each sample. Age-specific comparisons of the two cohorts with respect to the hospitalization history during the standard five- to eight-year interval show a definite decrease in the amount of continuous hospitalization and in the total duration of hospitalization from the earlier to the later period. The difference in duration is in the same direction in all age groups (15-24, 25-34, 35-44, and 45 or over) of both sexes, and calculations based on methods described by Deming(2, p. 62; 3, chap. 14) give consistently high t values. (The t values and methods of calculation will appear in a monograph to be published on this study and may be obtained from the authors upon request.)

Because the procedure was a probability sample, it may be asserted that were the whole procedure repeated with a new sample drawn from the same hospitals for the same periods, screened and followed during the same standard intervals with the same care and definitions that were used in this study, the change in the average number of years of hospitalization per patient between the two periods would be close to the results given in table 3.

The difference between the cohorts is especially marked for the cases that were at the peak of the reproductive period (i.e., ages 25-44) at the time of admission. It is noteworthy that the 1954-56 females, of all ages combined, spent an average of 2.89 years in the hospital, contrasted with 4.68 years for the 1934-36 females. In other words, women of the 1954-56 cohort were institutionalized for about 44 percent of the postadmission interval, while women in the earlier cohort lost 72 percent of the time in this way. Similar findings are noted for the males, with 49 percent and 72 percent (1954-56 and 1934-36 cases, respectively) of the standard interval being absorbed by hospitalization.

In table 3 the age-specific reproductive rates for the standard evaluation interval give evidence of the effects of the changes in patterns of hospitalization. Age group by age group, for both sexes, the number of children born per person during the interval was greater for the later cohort. The only exception occurs in the age group 45 or over. For the interval as a whole (column 3), the birth rates among the 1954-56 females more than doubled in comparison with those among the 1934-36 females; birth rates among the 1954-56 males tripled in comparison with those among the males in the earlier cohort and indeed ran closely parallel to the reproductive rates of females during the interval.

The increase applies not only to the interval as a whole but to fertility data based on years spent outside the hospital (last column of table 3). It is clear, therefore, that the difference in years spent outside the hospital was not the sole source of variation between the two samples with respect to fertility. The data for the child-per-person rate per nonhospitalized year suggest that the cases of 1954-56 made better use of their opportunities. For example, if the 1954-56 females, aged 15-24 at admission, had spent as few years out of the hospital during the standard interval as did the 1934-36 females of the same age, their birth rate for the entire interval would have been $.250 \times 2.75/4.03 = 0.171$ children per woman, which would still have surpassed the rate of 0.099 children per woman observed for the earlier cases.

Similar calculations may be made for the age groups 25-34 and 35-44, as well as for the males. It must accordingly be assumed that other factors in addition to increased opportunity played a role in raising the postadmission fertility of the 1954-56 group, just as other factors must have been responsible for the differences between the samples that occurred prior to admission.

Differential Fertility

Whatever the contributing factors, the

TABLE 3
Age-Specific Rates of Fertility for Both Cohorts Over the Standard Evaluation Interval, by Sex

AGE	NUMBER OF INDEX CASES (WEIGHTED)	NUMBER OF CHILDREN BORN DURING INTERVAL (WEIGHTED)	NUMBER OF CHILDREN BORN PER PERSON DURING INTERVAL	MEAN NUMBER OF YEARS OUT OF HOSPITAL	CHILDREN PER PERSON PER YEAR OUT OF HOSPITAL
Males 1934-36					
All ages	3,963	151	.038	1.77	.021
15-24	1,010	55	.054	2.56	.021
25-34	1,543	71	.046	1.52	.030
35-44	965	17	.018	1.64	.011
45 or over	445	8	.018	1.15	.016
Males 1954-56					
All ages	4,037	510	.126	3.30	.038
15-24	826	183	.222	3.45	.064
25-34	1,412	249	.176	3.62	.049
35-44	1,033	78	.076	3.72	.020
45 or over	766	0	0	1.97	0
Females 1934-36					
All ages	4,042	213	.053	1.82	.029
15-24	845	84	.099	2.75	.036
25-34	1,284	109	.085	2.08	.041
35-44	1,113	9	.008	1.52	.005
45 or over	800	11	.014	0.83	.017
Females 1954-56					
All ages	4,023	480	.119	3.65	.033
15-24	581	145	.250	4.03	.062
25-34	1,100	278	.253	4.00	.063
35-44	1,472	57	.039	3.84	.010
45 or over	870	0	0	2.62	0

marriage and fertility patterns of schizophrenic patients admitted in the mid-1950s had undergone significant changes in comparison with those of affected persons admitted in earlier years. More marriages were being contracted and more children were being born.

For an evaluation of differential fertility, it would have been desirable to use, as a yardstick, data on cohorts of the general white population of the state of New York. The only available fertility statistics for New York state, however, are census tables on children ever born for 1940 and 1960. These tables neither pertain to the precise years under study nor fill the need for cohort data followed across the standard evaluation intervals.

Cohort fertility data covering the years of the present study have been compiled and published by Whelpton and Campbell for birth cohorts of United States women(19).[4] Unpublished data, in the format of the tables referred to, but limited to cohorts of native white women in the United States, were made available for the comparative purposes of this study by Dr. Campbell, who is chief of the Natality Statistics

[4] The table is extended to the cohort of 1950 in table 19 in section 1, volume 1, of *Vital Statistics of the United States*(18).

Branch, National Center for Health Statistics.

It should be mentioned that a comparison of fertility statistics for New York state and United States women at the census points of 1940 and 1960 reveals lower reproductive rates for the former in all age groups, although the shapes of the age-specific curves are the same. Had data on cohorts of New York state women been available, therefore, relative fertility ratios (as described below) would probably have been higher than those calculated on the basis of the United States cohorts.

Table 4 presents data on the reproductive performance of schizophrenic women and of the cohorts of white women in the United States, at the beginning and at the end of the standard evaluation interval. Fertility of the schizophrenic women refers to the number of children ever born per woman at survey admission (1934-36 or 1954-56) and at the end of the years 1941 and 1961, by age of the women at survey admission. For cohorts in the general population, similar reproductive measures are shown for the years 1935 and 1955, corresponding to the midpoints of survey admission periods, and again for the same groups of women as of the end of 1941 and 1961.

Data pertaining to the survey admission years show that schizophrenic women in both periods had lower reproductive rates than women of the same age groups in the general population. The differential between the schizophrenic and general population cohorts was, however, substantially less in the later than in the earlier period, as may be seen by comparing the relative fertility ratios in column 4 of table 4. The increases in relative fertility hold for every age group, and the consistency of the pattern outweighs the fact that, for any one age group by itself, the gain might be considered small in rela-

TABLE 4
Age-Specific Rates of Fertility for Both Cohorts of Schizophrenic Women at Admission and at Time of Standard Evaluation: Comparison with Cohorts of Native White U. S. Women*

	AT SURVEY ADMISSION					AT TIME OF STANDARD EVALUATION			
AGE	SCHIZOPHRENIC	U. S.	RELATIVE FERTILITY RATIO, SCHIZOPHRENIC TO U. S.	STANDARD ERROR OF RATIO	AGE	SCHIZOPHRENIC	U. S.	RELATIVE FERTILITY RATIO, SCHIZOPHRENIC TO U. S.	STANDARD ERROR OF RATIO
				A. Earlier sample					
15-19	0	0.040			22-26	0.090	0.723	.12	.08
20-24	0.183	0.454	.40	.12	27-31	0.286	1.300	.22	.05
25-29	0.526	1.149	.46	.09	32-36	0.660	1.790	.37	.07
30-34	0.572	1.795	.32	.07	37-41	0.596	2.193	.27	.06
35-39	1.487	2.306	.65	.08	42-46	1.502	2.503	.60	.07
40-44	1.428	2.690	.53	.10	47-51	1.428	2.730	.52	.10
15-34	0.383	0.811	.47	.06	22-41	0.474	1.461	.32	.04
15-44	0.754	1.298	.58	.05	22-51	0.816	1.789	.46	.04
				B. Later sample					
15-19	0.086	0.075	1.15	.85	22-26	0.457	1.407	.33	.13
20-24	0.402	0.789	.51	.31	27-31	0.562	2.323	.24	.11
25-29	1.004	1.642	.61	.13	32-36	1.345	2.637	.51	.10
30-34	0.757	2.126	.36	.08	37-41	0.934	2.668	.35	.07
35-39	1.712	2.278	.75	.10	42-46	1.741	2.494	.70	.10
40-44	1.394	2.224	.63	.10	47-51	1.446	2.264	.64	.10
15-34	0.663	1.212	.55	.08	22-41	0.914	2.282	.40	.06
15-44	1.090	1.563	.70	.06	22-51	1.242	2.315	.54	.05

*Unpublished data for the U. S. were kindly supplied for use in this study by Dr. Arthur A. Campbell, now with the Public Health Service, Washington.

tion to the standard errors. (The calculation of the standard errors of the ratios will appear in a monograph in preparation and may be obtained from the authors upon request.)

Not surprisingly, reproductive rates for schizophrenic women of both cohorts failed to keep pace with those for the general population during the years following survey admission. Schizophrenic women of the later cohort aged 15-44 averaged only 20 percent as many births within the years 1955-1961 as the general population (i.e., the relative fertility ratio was 0.20 for the interval). The earlier cohort did even more poorly in relation to the general population of its time, with only 13 percent as many births within the interval 1935-1941. By the end of the standard evaluation intervals, therefore, the relative fertility ratios for all age groups in both schizophrenic cohorts were lower than at the time of admission.

Since the later group maintained higher relative ratios over the evaluation interval, it may seem paradoxical that the differences between the ratios for the two cohorts at the end of the intervals (column 9, table 4) were not wider than at the beginning (column 4). The explanation hinges upon the fertility trends taking place in the general population during the two periods under study. Reproductive rates for the later cohort of U. S. women rose sharply over the interval in contrast to those of the earlier U. S. cohort. So did the reproductive rates of the later cohort of schizophrenic women compared with those of the earlier group.

Considered proportionately, the increase in the interval fertility from the earlier to the later cohort was greater for the schizophrenic women than for the U. S. women (table 5). In absolute magnitude, however, it was smaller for the schizophrenic women, so that the concurrent gain in relative fertility is masked in the values obtained for the end of the standard evaluation interval. The observation remains, however, that the relative fertility rates for schizophrenic women of the later cohort surpassed those of the earlier cohort, age group by age group, at survey admission, throughout the standard evaluation intervals, and at the end of the postadmission years.

Discussion

New trends are appearing in the marriage and reproductive patterns of schizophrenic patients. The increase in marriage rate is substantial, as is the rise in the overall reproductive rate and in the number of schizophrenic individuals attaining parenthood. Most important, the contrast between the reproductive rates of schizophrenic women and women in the general population is less prominent for the 1954-56 sample than for the 1934-36 group or than for samples studied previously(6, 10, 12, 15, 16). Although the relative gain in fertility observed for the 1954-56 index cases is not large, it is consistent, as shown in the age-specific data of table 4, and represents a real decline in the selective disadvantage that had earlier been associated with schizophrenia.

It is evident that the observed trends derive from several sources, although the quantitative contributions of each cannot be separat-

TABLE 5
Comparison of Reproductive Performance During the Standard Evaluation Intervals Between the Two Schizophrenic and the Two U. S. Cohorts of Women, Aged 15-44

COHORT	REPRODUCTIVE RATES OVER THE INTERVAL	ABSOLUTE DIFFERENCE BETWEEN COHORTS	PROPORTIONATE INCREASE BETWEEN COHORTS (PERCENT)
U. S. cohort			
1935	0.491		
		0.261	63
1955	0.752		
Schizophrenic			
1934-36	0.062		
		0.090	146
1954-56	0.152		

ed. A dominant factor, as initially hypothesized, is the altered hospitalization pattern resulting from a combination of medical and sociological advances. The additional years of community life made available to mental patients through constriction of hospital residence constitute added years of opportunity for marriage and reproductivity—and, as has been shown, the schizophrenic patients of the 1954-56 cohort enjoyed a significantly larger block of "opportunity" during the postadmission period. As we have also shown, however, patients in the 1954-56 cohort had higher birth rates per year of "opportunity" (i.e., per nonhospitalized year during the standard evaluation interval). The over-all gain in fertility is not entirely explained, therefore, by the abbreviation of hospital stay and the concomitant lengthening of opportunity.

Two main factors are probably responsible for the greater utilization of opportunity in the later period; both relate to improvements in conditions confronting the patient upon release from the hospital. The first is the extension into the community of drug therapies, psychiatric care, and other services; the same developments that have changed the hospitalization pattern also help, for limited periods of time, to sustain the discharged patient at home.

The second factor is the prevailing social climate. Recent years have seen a broadening in the understanding of mental illness, a relaxation of barriers against the former patient, and a general increase in permissiveness toward refractory behavior in marginally adjusted individuals. Consideration has been given to a third possibility: namely, that the phenothiazines may have a biological effect upon the fertility of treated women(17). Since the male index cases showed larger reproductive gains than the females, it is unlikely that drug side effects contributed significantly to the trend reported here. The hypothesis, nevertheless, remains of interest for further investigation.

It should be mentioned that fertility differences between the 1934-36 and the 1954-56 groups of index cases cannot be attributed to differences in the composition of the two samples with respect to social characteristics such as religion, occupation, or education—all of which are known to be important factors in differential fertility. Indeed, changes in the composition of the samples were such that lower fertility rates per opportunity year might have been expected for the later group. In counterbalance, of course, the schizophrenic patients of the 1950s were probably influenced by the same factors that shaped the general population trend toward higher marriage and birth rates during that period.

It may be assumed that schizophrenic individuals have been as potentially responsive to vogues in family style as their healthier peers. The main point is that they are now perhaps better equipped to follow the popular model. The 1954-56 sample of patients followed in this investigation was only at the threshold of a new era in psychiatric care and social responsibility, so that greater changes in reproductive patterns might be forecast for subsequent groups of patients.

Implicit in the fertility gains relative to the general population is a small but important shift in the structure of the population gene pool. The increases in reproductive fitness are, of course, not expected to lead to an abrupt rise in the incidence of schizophrenia within a few generations. Without certainty regarding the genetic and current population parameters of the disease (e.g., number of loci involved, allelic frequencies, mutation rates, other aspects of fitness), it is not even possible to estimate the number of generations required for an appreciable rise in incidence. What can be foreseen with accuracy is the gradual accumulation of alleles that would have previously been eliminated through counterselection, the gradual dispersion of such alleles throughout larger segments of the population, and an eventual increase in the proportion of persons who are affected.

Long-range consequences for the population may be viewed in at least two ways. One suggests that the mutational load to be carried as a result of relaxation of selection against a large number of physical and mental conditions can only be dysgenic(13, 14). Accordingly, the accelerated replacement of genes associated with schizophrenia could be considered as contributing a significant share to the genetic deterioration of the species.

A more optimistic outlook is based on a promise of future advances that may be capable of circumventing entirely the unwanted phenotypic effects of the various disorders—schizophrenia among others—or, even better, of realizing genotypic "cures" through corrections of flaws in the genetic code. It would be hoped also that such steps might be accomplished at moderate costs to society and at little inconvenience to the individuals involved.

Optimism regarding the long-range future, however, must be tempered with caution about the immediate future. The problem is to pass from the current stage of knowledge to the more advanced one promised in the course of developing technology without being deflected along the way. Currently, the costs of genetic disorders continue to be heavy, both at the individual and at the broader social levels. For schizophrenia, treatment—although obviously of greater benefit than previously—still represents a stopgap measure. Recurring periods of confusion, general behavioral disability, and severe emotional distress remain the prospect of most patients.

One of the more immediate effects of the increase in rates of reproduction among schizophrenic patients may be to inflate the burden on community resources as well as to add to the human costs. The birth of a child may act to aggravate the illness in the schizophrenic parent. The result may be a return to the hospital or at least renewed need for extensive outpatient support. The cost to the community, however, involves not only the patient's problems but often those of the entire family unit, which may require financial aid, social services, and psychiatric consultations.

Full costs are barely recognized. It has long been known, for example, that the risk of schizophrenia for the offspring of affected parents is high(10, 11), and recent data(9) indicate that the risk is not lessened merely by removing the children from the parental influence at an early age. Aside from schizophrenia, moreover, a number of lesser behavioral deviations and inadequacies, sociopathic tendencies, etc., appear to be more common among the children of schizophrenic parents than among children of nonschizophrenic parents. Whether these are, strictly speaking, the effects of genes that show variable expressivity or of a polygenic loading that falls short of a threshold sufficient for overt manifestation of schizophrenia, whether they are actually unrecognized cases of schizophrenia, or whether they are chiefly the reflections of early environmental chaos upon genotypically sound individuals is not yet clear. The salient point is that a substantial proportion of the children do not display satisfactory mental health as adults.

In the short run, therefore, a continued increase in the reproductive rates of schizophrenic patients may be reflected in a spiral of social costs of various kinds. How much of an increase in behavioral pathology can be absorbed without damaging the general well-being of a population remains questionable. Theoretically, at least, it is possible that a drift away from behavioral stability could take place over several generations. The course of behavioral evolution is toward change, and changes in social institutions are not undesirable in themselves. Nevertheless, it is difficult to imagine circumstances in which the symptoms of schizophrenia or its associated conditions could be advantageous in directing the course of social progress.

The course of social progress over the immediate future is precisely what must be ensured if human populations intend to strive toward the longer range goals of safeguarding the genetic heritage. Along with the best efforts to improve treatment and life prospects for the individual patient, therefore, go other inescapable responsibilities. These are to make available to patients and their families, first, genetic counseling and, secondly, programs of child guidance, with the hope of slowing down the rate of increase of mental illness until such time as the condition can be prevented from phenotypic expression.

Summary and Conclusions

Marital and reproductive rates of two samples of schizophrenic patients, admitted to New York state hospitals in 1934-36 and in 1954-56, were compared for the purpose of assessing changes related to the introduction of modern treatment and community care methods. Patients of both sexes

and of all age groups in the 1954-56 period showed increases in marital rates (i.e., number of family units formed), in fertile marriages, and in over-all reproductive rates, compared to 1934-36 patients. The increases evident at admission continued to hold at the end of a five- to eight-year standard evaluation interval following admission.

The relative fertility ratios of schizophrenic women, compared to women in the general population, were higher for the 1954-56 group both at admission and at the end of the standard evaluation interval. The absolute and relative fertility gains shown by the 1954-56 group were attributed partly to the reduction in duration of hospitalization, with a corresponding increase in opportunity for marriage and reproductivity, and partly to greater utilization of opportunity during out-of-hospital time. Possible reasons for the greater utilization of opportunity are considered.

The reproductive trends are discussed in the context of their long- and short-range implications for population genetics, behavioral evolution, and community problems. The need in the immediate future for responsible genetic counseling, family guidance, and child care is emphasized.

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