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PSYCHOSES IN CHILDREN OF SCHIZOPHRENIC MOTHERS

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INTRODUCTION

In spite of many years of intensive research, the question of the genetic basis of schizophrenia has not yet reached a final solution. Through extensive investigations of the morbidity risk in children of schizophrenic parents, general agreement has been reached that the risk is about 10 to 15 per cent if one of the parents is schizophrenic; the risk estimate is increased to between 39 and 68 per cent if both parents suffer from the disease (*Elsässer 1952, Kallmann 1953*). However, no consensus has been arrived at regarding an explanation of these empirically established percentages. Geneticists have stated that it could be an irregular dominant heredity or a monomeric recessive heredity with a manifestation rate of 60–70 % or schizophrenia could be genetically heterogeneous. *Slater* has examined a hypothesis which proposes a single partially dominant gene as the genetical basis of schizophrenia and found it compatible with the mentioned empirically derived numbers of morbidity risk (*Slater 1958*).

The investigations of *Schulz (1933)*, *Bleuler (1941)* and *Leonhard (1957)* suggest that there frequently exists uniformity in the manifest picture of disease in the schizophrenic members of the same family. This has led to attempts at a symptomatological partitioning of their concept of schizophrenia into subgroups according to the courses of the illness. As a result of this work, family research (in words of *Bleuler (1960)*) has become an important tool supporting the hypothesis of the psychogenesis of schizophrenia. What was earlier considered proof of heredity determinants now can also be conceived of as a demonstration of the influence of family environment during childhood.

This Institute is conducting a prospective investigation of schizophrenia, studying a group of children whose mothers are schizophrenic (*Schulsinger & Mednick 1963*). In line with this interest this study retrospectively observed outcome in a group of adults whose mothers were schizophrenic.

METHODOLOGY

An examination was made of the records of all females who at the day of the investigation were inpatients in three mental hospitals in Sjaelland (the State Hospital in Nykøbing Sjaelland; the State Hospital in Vordingborg; and the State Hospital in Glostrup with the Nursing Home in Ballerup).

From these patients were selected those who were diagnosed as schizophrenic, in terms of symptomatology and etiology. In this selection we have focused on the description of the classical symptoms of schizophrenia: autism, paranoid and catatonic symptoms, hallucinations and process-like course of the disease. We have not included cases with less than one year's duration of illness. Furthermore, we have in every case attempted to classify the patient in one of the common clinical subgroups: paranoid schizophrenia, hebephrenia (schizophrenia simplex included) and the catatonic forms.

Using the hospital records' total information on the patients' children, (number, order, names, last address, etc.)—and with these informations checked-up and supplemented to the time of investigation from the Population Registers and the general population census—we searched for mention of these children in the National Psychiatric Register in the University Institute for Human Genetics, Copenhagen, which in addition requested information from the police registers and the Central Register for Death of the National Health Service. The records of all the psychiatrically hospitalized children were then reviewed and all information gathered on punched cards.

THE BASIC SAMPLE

Altogether 428 schizophrenic women were found and included in this investigation; 136 (31.8 per cent) had born children.

Figure 1 reports distribution of age for childless women and mothers compared with the normal population of women above 15 years (Statistisk Årbog 1963/64).

It appears from Figure 2 that an age difference exists between mothers and childless regarding the age of manifestation. In more than 30 per cent of the childless women, the illness began between their fifteenth and twentieth year; the comparable figure for the fertile women was 5 per cent. The average age for the childless women is lower than for the mothers (54.8 against 61.3 years). The time between the onset of the psychosis and the first hospitalization is the same for the two groups.

Figure 3 presents the mean duration of last hospitalization for the fertile and childless women. No important differences appear. However, it should be noted that for both groups more than 75 per cent had been hospitalized for more than five years, more than 50 per cent for more than 20 years.

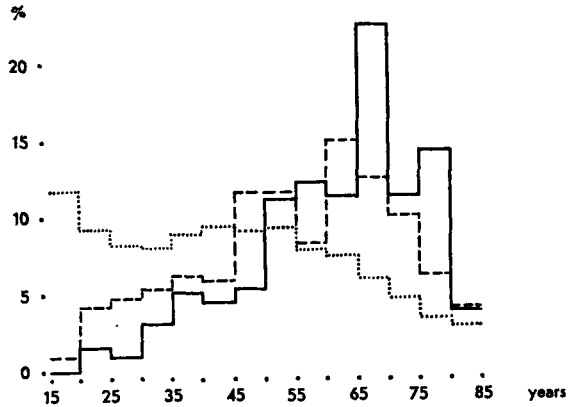


Fig. 1

— mothers

- - - childless

. Danish normal population (women above 15 years) 1963.

Age distribution in 5-year-groups for mothers and childless compared with the Danish normal population.

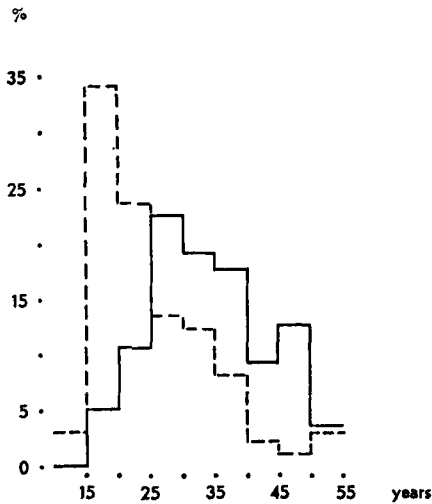


Fig. 2

— mothers

- - - childless

Distribution in 5-year-groups at the age of manifestation of the illness for mothers and childless.

The distribution of women by diagnostic subgroups (Figure 4) shows that the mothers mostly belonged to the paranoid subgroup. This is in accordance with the fact that they have gone through the greatest part of their fertile period before this form of the disease manifested itself. Among the childless

Fig. 3
Duration of last hospitalization for mothers and childless.

	Less than 1 year	1-5 years	5-20 years	More than 20 years
Mothers (in %)	14.8	7.7	26.1	51.4
Childless (in %)	14.7	7.5	20.2	57.5
Total	14.7	7.6	22.1	55.5

Fig. 4
Distribution on diagnostic sub-groups for mothers and childless.

	Paranoid	Hebephrenic	Catatonic	Unknown
Mothers (%)	73.3	19.0	5.6	2.1
Childless (%)	48.6	41.4	8.3	1.7
Total (%)	56.9	33.9	7.4	1.9

the distribution between paranoids and hebephrenics is more equal. The catatonics only account for a small percentage of the groups.

At the time of the investigation seven of the 136 mothers were unmarried; Of the 428 females in the total sample, 158 (37 per cent) were married or had been married. At time of admission 53 per cent of the mothers lived in rural districts, 22 per cent in provincial towns and the rest in Greater Copenhagen.

THE SAMPLE OF CHILDREN

The review of the mothers' records provided us with information concerning a total of 349 children. As reported in Figure 5, 27 (7.7 per cent) had to be excluded. Of the 27, nine have emigrated and seven have not been located through the population registers because their cards have been destroyed, or they have been noted as missing persons. The remaining eleven children have not been located because their identifying information was too scanty. There is doubt concerning the existence of several cases since the only report concerning them comes from a psychotic patient's statements in the admission record. The sample also includes 11 persons who died in adulthood. Three of those are known to have committed suicide. Furthermore, 33 died as children, most of them in infancy.

Figure 6 reports the distribution of sex and age for the remaining 322 children of the sample. The average age for the males was 35.8 years and for the females 37.7 years. The 322 children were born to 132 women. When we correct our reduced sample by *Strömngren's* modification of Weinberg's method (five years groups) (*Strömngren* 1948) we arrive at a "Bezugs-ziffer" for schizophrenia of 201.8.

Fig. 5
The total child sample.

Alive at time of investigation	278	
Died in adulthood	11	
Died as children	33	
Total		322
Emigrated	9	
Not followed	7	
Doubt of existence	11	
Total excluded		27
Total children		349

Fig. 6
The reduced child sample. Distribution on age-groups, sex and alive/dead at time of investigation (1963).

	Sex	Age groups													Total
		0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	
Alive	male	0	4	11	11	11	15	24	16	20	25	11	5	1	154
	female	1	2	4	8	9	9	15	14	31	14	9	4	2	122
	sex unknown	2													2
Dead	male	1	1	0	0	2	1	0	2	1	0	0	0	1	9
	female	4	1	0	0	0	1	0	1	1	0	0	0	0	8
	sex unknown	26			1										27
Total		34	8	15	20	22	26	39	33	53	39	20	9	4	322

At the time of our investigation 32 per cent of our 278 living children resided in rural areas, 23 per cent in provincial towns, and 42 per cent in Greater Copenhagen. Two percent were psychiatric in-patients. Four of the 349 children were adopted; one of these was among those not located.

RESULTS

In only 30 cases (with 26 mothers), in which the child was hospitalized for psychiatric disease, did we consider the information sufficient. In 21 other cases we obtained some information from non-hospital sources about mental deviancy. As can be seen in Figure 7, fifteen of the 30 hospitalized children were girls. The average age at first admission was 23.6 years. There were a total of seven clearly established cases of schizophrenia and 14 cases of schizophreniform psychosis. Of those 14, five were cases of paranoid psychosis, some of them with hallucinations and ideas of influence, in which the psychotic condition remitted before discharge. Five others suffered from atypi-

cal psychoses with schizophreniform symptoms and changes of mood. In three of these cases the patients were considered as oligophrenic. One patient had had a paranoid reaction of less than 24 hours duration. A diagnosis of pseudodebilitas*) was established in three cases. Of the remaining two psychoses in the sample one was diagnosed as depression with suicidal attempt in a patient with encephalopathia atrophicans and probably multiple sclerosis; one case was diagnosed as manic-depressive.

The present method of search did not permit determination of the number of cases with neurosis, character deviations, or mental retardation. The figures in Fig. 7 are minimal. One patient has been psychiatrically hospitalized for a depressive neurosis and observation for legal abortion. Four patients were admitted because of character deviations and three have been admitted in institutions for the mentally defective without disclosing symptoms suspect for psychosis. An intellectual defect appeared in 11 of the hospitalized patients as a main or subsidiary diagnosis. Using the above mentioned Bezugsziffer of 201.8, the seven well established cases of schizophrenia represent a morbidity risk of 3.5 per cent. If we include all 21 schizophreniform cases we obtain a morbidity risk of 10.4 per cent.

Fig. 7

The incidence of psychiatric illness in the reduced child sample.

Diagnosis	Total	Hospitalized:			Average age at 1. hospitalization (years)		
		male	female	total			
Schizophrenia	7	3	4	7	25		
Psychogenic paranoid psychosis ..	5	14	8	5	13	44	
Atypical psychosis	2						14
Atypical psychosis in mentally deficient	3						
Paranoid reaction	1						
Pseudodebilitas obs. pro	3						
Other psychoses	2	0	2	2	30		
Neuroses	13	0	1	1	31		
Character deviations	9	3	1	4	18		
Mentally deficient	6	1	2	3	6		
Total	51	15	15	30	23.6		

Figure 8 is a representation of similarities and differences between the course of the disease in the mother and the child for the seven well-established cases of schizophrenia. Similarity of age of manifestation and age at first hospitalization was defined as a difference of less than five years. The average

*) This term is here used for a condition in normally gifted patients acting as mentally deficient (and in this sample showing schizophrenic symptomatology).

age of first manifestation of psychosis in the mothers was 37.6 years and for the children, 23.6 years. The corresponding figures for the age at first admission were 39.4 and 24.9 years. Further, we have indicated accordance of mother and child with regard to diagnostic subgroup and course of illness using *Bleuler's* systematization of course of illness (*Bleuler* 1941). Finally we have given the child's age at the time of the mother's first hospitalization as an indication of the duration of the child's contact with the (pre)psychotic mother (in average: 13.1 years).

Fig. 8

Agreement of mother and child in the nuclear-group of the 7 schizophrenics (see text).

Nr.	Child: sex	Agreement of mother and child regarding:				Age of child at mothers 1. hospitalization
		Age of manifestation	Age at 1. hospitalization	Diagnostic subgroup	Course	
1	female	+	-	+	-	13
2	male	-	-	+	-	8
3	female	-	+	+	-	17
4	female	+	+	-	-	8
5	male	-	-	+	+	26
6	female	-	-	-	-	18
7	male	-	-	-	-	2

With respect to the schizophreniform psychoses, Figure 9 presents data on accordance between mother and child for age of manifestation of illness and age at first admission. The average age at the manifestation of psychosis is, for the mothers 36.6 years and, for the children, 27.0 years. The average age of the mothers at first admission is about 1 year greater; the children were apparently admitted at the time of the very first manifestation of psychosis since typically this was an acute disturbance. The average age of the children at time of their mothers' first hospitalization was 10.2 years.

Of the 20 mothers of the 21 psychotic children, 14 have been classified as paranoid schizophrenics and the rest as hebephrenics. The average duration of their last hospitalization was 19.2 years.

At the time of this investigation all of the psychotic children were living. Four of them were hospitalized, two with well-established schizophrenia and two in the pseudodebile group. Of the 21 children, ten lived in rural districts and provincial towns.

DISCUSSION

The basic sample conforms with earlier utilized hospital samples (*Schulz* 1933) with regard to age of manifestation of both the entire sample and the diagnostic subgroups.

Fig. 9
Agreement of mother and child in the 14 schizophreniform psychoses.

Nr.	Mothers diagnosis	Childrens diagnosis	sex	Agreement of mother and child regarding:		Age of child at mothers 1. hospitalization	Child: total number of hospitalizations
				age of manifestation	age at 1. hospitalization		
8	schiz. paran.	psychogen. paran. psychosis, typus neuroticus	female	-	-	17	1
9	- hebephren.	psychogen. paran. psychosis in carcere	male	+	+	6	1
10	- paran.	psychogen. paran. psychosis	female	-	-	10	1
11	- paran.	psychogen. paran. psychosis	female	-	?	?	0
12	- paran.	psychosis paran. climacter.	female	+	+	17	2
13	- hebephren.	psychosis atypica, psychoinfantilismus	male	-	-	3	3
14	- hebephren.	psychosis paran. in puerperium, const. sensitiva	female	-	-	13	7
15	- paran.	psychosis schizophreniformis, debilitas	male	-	-	8	4
16	- paran.	psychosis paran., oligophrenia	male	+	+	11	3
17	= nr. 14	transient mental confusion, inferioritas intellectualis	female	-	-	15	3
18	- hebephren.	paranoid reaction	male	-	-	7	1
19	- paran.	imbecile, pseudodebile?	male	-	-	5	1
20	- paran.	pseudodebile?	male	-	-	7	1
21	- paran.	debilitas, pseudodebile?	male	-	-	14	4

However, it is remarkable in this sample that catatonic cases only account for 7 per cent of a chronic hospital population. In available Scandinavian census studies percentages between 35.6 (*Hallgren & Sjögren* 1959) and 87.8 (*Böök* 1953) have been found. Fifty-four per cent was found in *Strömghren's* census sample (*Strömghren* 1938). The present figures seem to emphasize the subjectiveness of the subclassifications in schizophrenia. However, the distribution of the single subgroups may really have changed in the course of time or have been influenced by the introduction of the psychopharmacological treatment.

Of the women in this sample 63 per cent were unmarried as compared with 18.3 per cent of the normal population of women more than 15 year (1963). This corresponds to earlier investigators' estimation of the frequency of marriage among schizophrenics to be about half of the frequency in the normal population (*Essen-Möller* 1935). *Ødegaard* (1946) found that the ratio single/married schizophrenic women in all age groups was 3 : 1. In New York the same ratio before the last World War was 1 to 1 (*Goldfarb & Erlenmeyer-Kimling* 1962).

The average fertility of Danish females for the years 1911–1950 was between 85–90 live-born children per 1000 females (*Bræstrup* 1964). Since the largest part of the sample of mothers was fertile during those years, the fertility in our sample (between 20 and 25) confirms the earlier established finding that schizophrenics have less fertility than the normal population.

The number of children per proband was 0.8 in this sample; this figure is comparable with the results of *Goldfarb* and *Erlenmeyer-Kimling* (1962) and *Essen-Möller* (1935). In this sample it can also be seen that fertility decreased rapidly after onset of psychosis, as only nine per cent of the children were born after the onset of the mothers' illness.

The basic sample is selected and does not represent a random sample of schizophrenics. In this sample we include mostly long-term hospitalized females, half of whom come from rural districts. The sample therefore is characterized by a heavy genetic loading, i. e., a sample where the gene-carried predisposition to schizophrenia has shown a great penetrance, and where one expects a great morbidity risk for the children.

We found, however, in the reduced and corrected sample only a risk of 3.5 per cent for well-established schizophrenia and a risk of 6.9 per cent for schizophreniform psychosis. This is lower, but not to a significantly degree, than the lowest hitherto published risk figure (*Hoffmann* 1921).

Several conditions have to be taken into consideration in order to understand these results. First we have to consider if the search for cases was effective enough. Barely 8 per cent of the children were excluded. Of these one-third emigrated; the actual existence of another third is doubtful. It is also possible that the three suicides might hide schizophrenia. It must, how-

ever, be considered as granted that almost all the hospitalized cases of psychosis have been located. The low risk figures, however, could in the future be changed by ambulatory or not yet hospitalized cases.

Earlier Danish investigations of the general population showed that about 15 per cent of schizophrenics are never hospitalized (*Fremming* 1947). However, these studies used a rather narrow concept of schizophrenia. In addition it is also evident that early hospitalization of the mothers can affect the morbidity risk in their children – compare the reduced fertility after the onset of the disease. However, do other conditions in our basic sample act in the same direction? *Kallmann* (1953) found that the risk for schizophrenia in children of paranoid mothers was considerably lower than for children of hebephrenic and catatonic mothers: 11 per cent against 21 per cent. This is in agreement with earlier German investigations of schizophrenics (mainly paranoid) where the lowest risk figures were found: *Hoffmann* (1921) : 7.0, *Gengnagel* (1933) : 8.3. In our sample about three-fourths of the mothers belong to the paranoid subgroup.

Leonhard (1957) has, however, as opposed to *Bleuler* (1941) found a greater hereditary taint of schizophrenia among atypical periodically progressing schizophrenics compared to the typical chronic cases which characterize the bulk of our sample. *Leonhard's* results are contradicted by *Welner & Strömngren's* (1958) investigations of schizophreniform psychosis and by *Lewis' (1957)* investigations of parents with typical and atypical schizophrenias.

Figures 8 and 9 suggest that the hereditary component of schizophrenia may be conceived of as a certain predisposition or readiness for reaction. Of the seven well-established schizophrenias in the children only one could be said to have exactly the same course as the mother's disease, and only two have the same age of manifestation. This is in accordance with *Schulz* (1940) who found a low correlation between parents and children with regard to age of manifestation. On the other hand, four of our cases are classified in the same diagnostic subgroup as their mother.

Among the remaining fourteen psychoses regarded as schizophreniform it is a notable finding that eight of the ten mothers of the eleven children who reacted with episodic paranoid psychosis, are themselves classified as paranoid.

This is a surprising high agreement in view of the quotations in the literature which generally cannot establish relation between hereditary taints and type of schizophrenia (survey: *Jackson* 1960). The finding requires further investigation before it can be considered either to be caused by a certain (genetic) predisposition or to be the result of a learning procedure.

It should be noted that in many cases reasonable precipitating crises preceded the psychotic breakdown (marital conflicts, work conflicts, etc.).

The duration of a single psychotic reaction ranged from 24 hours to 2 to 3 months. The number of admissions increased when the child also showed signs of character or intellectual deviation. The sample was not studied with regard to family or social variables. However, the time spent together with the pathological mother tended to be of longer duration in the group with well-established schizophrenia than in the group with schizophreniform psychosis. The children's average age at separation from the mother (as a rule when she was hospitalized for the first time because of her psychosis) was 13.1 years for the former groups as compared to 10.2 years in the latter group. Corresponding results have recently been published regarding fifty chronic and remittent schizophrenics observed for a long period of time (*Nameche, Waring & Richs, 1964*).

This information could be interpreted as suggesting that the amount of the time a child is with a psychotic or prepsychotic mother is important in determining the power of penetration of the schizophreniform reaction pattern. It also could be an expression of the fact that long-term anxiety-provoking environmental conditions could be of importance for the learning of this pattern (*Mednick 1962*). Some literature has shown a tendency for genetic sex-link in schizophrenia. It has appeared that daughters of schizophrenic mothers are more clinically deviant than are sons (*Mednick & Schulsinger 1965*). This was not confirmed by this sample; the distribution of sex for the twenty-one schizophreniform psychoses was 11 boys and 10 girls.

It appears from Figure 6 that the child mortality in the sample (dead before one year of age) is about 9.3 per cent. Between 1910 and 1950 infant mortality in Denmark averaged 7 per cent and ranged between 4 and 9 per cent. This difference is not statistically significant. *Essen-Møller (1935)* also fails to report of excessive mortality in children of schizophrenics.

SUMMARY

The author followed 349 children born by 136 hospitalized schizophrenic mothers (all the mothers in a sample of 428 long-term hospitalized schizophrenic women). The basic sample does not differ from earlier published samples with regard to age of manifestation, course and fertility rate. Classification in subgroups shows an unusually small number of catatonic cases. When the size of the sample of children of these schizophrenic mothers is reduced by those who could not be followed, and corrected according to *Strömberg's* modification of Weinberg's method, a "Bezugs-ziffer" for schizophrenia of 201.8 results. Seven well-established cases of schizophrenia and fourteen schizophreniform psychoses were found in this sample. This results in risk figures of 3.5 and 6.9 per cent respectively. These results are discussed. In comparing the mothers' and the children's psychoses only minor

conformity has been found with regard to age of manifestation and course, but a certain general disposition to a paranoid schizophreniform reaction pattern appears. The course of the psychosis, chronic or remittant, might perhaps be related to the duration of contact with the psychotic mother.

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