

# Social Class, Marriage, and Fertility in Schizophrenia

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## Abstract

The hypothesis is presented that the etiology of schizophrenia is neurodevelopmental: schizophrenia is a disorder occurring in extremely late maturers, whereas manic-depressive psychosis affects early maturers. This hypothesis is related to recent neurobiological findings and also to the following epidemiological and demographic topics covered by the author in her review of social class, marriage, and fertility in schizophrenia: Kretschmer's observations of body type differences between patients with schizophrenia and manic-depressive psychosis; trends in the incidence of schizophrenia and manic-depressive psychosis in industrialized versus developing economies; changing epidemiology of the subtypes of schizophrenia and of manic-depressive psychosis; sex differences in manic-depressive psychosis and schizophrenia; fertility and childlessness in schizophrenia; selection for marriage in schizophrenia; marriage patterns, inbreeding, and schizophrenia; social class, social mobility, and occupation in schizophrenia; social mobility and social selection; excess of schizophrenia in the lowest strata of society; social class, course, and outcome; and social stress and schizophrenia.

Manic-depressive psychosis was accepted as a well-defined concept from its first description by Kraepelin (1896/1913) in the last century, but this was not the case for schizophrenia. It is clear that schizophrenia and manic-depressive psychosis are found in every culture and society, but it is also clear that there are several "schizophrenias." Different concepts of the disorder predominate in different

countries. For instance, an extremely wide concept of schizophrenia prevailed in the United States before the introduction of *DSM-III* (American Psychiatric Association 1980). Nearly 50 percent (46.6 percent) of first admissions to U.S. psychiatric hospitals in 1969 and 1975 were classified as schizophrenic and less than 10 percent as manic-depressive. In contrast, in England for 1976, the diagnosis of schizophrenia (including paranoia) was applied to only 11.5 percent of first admissions and affective disorder (manic-depressive psychosis + "depressive disorder not elsewhere specified") to 42.5 percent (Saugstad and Ødegård 1983, 1985).

In Norway and Denmark, psychiatrists had early accepted Kraepelinian nosology, but they considered his concept of schizophrenia and manic-depressive psychosis as too narrow, believing that there still remained a considerable number of psychoses that could not easily be classified. Therefore, in 1911 Evensen and Vogt (Saugstad and Ødegård 1983) and Wimmer (1916) introduced an intermediate category of functional psychosis—psychogenic or reactive psychosis. In Norway and Denmark, about 40 percent of first admissions in 1969–75 were classified as intermediate psychoses (mainly as other psychosis, ICD 298; some as paranoia, ICD 297, and unspecified psychosis, ICD 299), and less than 10 percent as schizophrenia.<sup>1</sup>

<sup>1</sup>ICD = International Classification of Diseases (World Health Organization 1967, 1978).

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In addition to the problems with narrow versus wide definitions of schizophrenia, another problem in schizophrenia research is a growing reluctance to apply the diagnosis at all. In Denmark, of first admission patients who received a diagnosis of schizophrenia either in 1972 or in the following 10 years, only 50 percent of the males and 40 percent of the females received the diagnosis on first admission (Munk-Jørgensen 1985); as expected, there was a corresponding increase in diagnoses of borderline states and paranoid and unspecified psychoses (Munk-Jørgensen 1986).

Increasingly, schizophrenia has come to be defined as a disorder with a necessarily unfavorable outcome. In Norway, for example, Langfeldt's (1939) introduction of the concept of "schizophreniform" psychoses, together with the high frequency of social remissions accompanying the introduction of psychotropic drugs in the 1950's, has contributed to the tendency to reserve the diagnosis for only the most unresponsive patients. The category of schizophrenia therefore mainly comprises nonparanoid schizophrenia (simple schizophrenia, ICD 295.0; catatonia, ICD 295.1; and hebephrenia, ICD 295.2) and paranoid schizophrenia (ICD 295.3). Subgroups of schizophrenia that, by definition, have a favorable outcome such as acute (ICD 295.4), latent (pseudoneurotic) (ICD 295.5), and schizoaffective (ICD 295.7) are rarely used. In fact, only 1 percent of Norwegian first admissions in 1977–78 (a total of 6,255) were so classified (Saugstad and Ødegård 1980). Against this background of heterogeneity in the concept of schizophrenia and diagnostic practice, we have seen the development of different classifications using

various operational criteria to define the categories of patients to be included (Saugstad and Ødegård 1985). As long as the etiology of schizophrenia is unknown, however, there is no objective means of identifying one diagnostic system as more valid than another. A comparison between countries using different classificatory systems is not only difficult but of little value.

### **The Etiology of Mental Illness: Manic-Depressive Psychosis and Schizophrenia as Neurodevelopmental Disorders**

It is postulated that very *early* puberty is the necessary factor for the development of manic-depressive psychosis, whereas extremely *late* puberty is the necessary factor for the development of schizophrenia. This hypothesis is based on the following assumptions: the relationships between the onset of puberty and the last major step in brain development, between age at puberty and body build, and between body build and mental illness.

A change in the incidence of manic-depressive psychosis and schizophrenia, respectively, and a concomitant shift in the epidemiology of various subgroups of schizophrenia have occurred in association with a decline in mean pubertal age of approximately 4 years that has taken place over the last 100 years. This confluence of events has been taken as evidence (Saugstad in press *a*, in press *b*).

The *onset of puberty* has usually been considered to coincide with the last major step in brain development—the systematic elimination of redundant neuronal

synapses (about 40 percent) that is believed to increase the efficiency of communication between billions of neurons (Huttenlocher 1984; Ribchester 1986; Rakic 1988). Any maturational irregularity at this stage should significantly affect later brain function. It is suggested that maturational irregularities in the central nervous system are most likely to occur at the extremes of rates of maturation—such as in very early or extremely late puberty. A shortened period of prepubertal growth may be accompanied by higher rates of neuronal elimination. In some very early maturers, however, the process of eliminating redundant synapses might have been cut short. Such a failure of "pruning" might not be verifiable even with refined neuroradiological methods such as computed tomography (CT), positron emission tomography (PET), and magnetic resonance imaging (MRI). In contrast to early maturers, in individuals with an extremely late and prolonged pubertal period, a greater than optimal attenuation of synaptic density could have occurred. This is probably verifiable with the new neuroradiological methods, but only subtle, non-specific structural defects would be expected. Those cells, axons, and synapses that die (due to excessive "pruning") would probably be randomly dispersed among those that survive (Goldman-Rakic et al. 1983; Goldman-Rakic and Rakic 1984; Goldman-Rakic 1988).

There is a relation between *body build and age at puberty*: early maturers tend to have a pyknic (broad, squat, fleshy) body type, while late maturers tend toward a linear, leptosomic (slim) physique. This difference in stature and weight persists throughout life (Marshall and Tanner 1986).

The older psychiatric literature posited a relation between *body build* and *mental illness*. According to Kretschmer (1921/1961), a pyknic body build predominated (90 percent) in classical manic-depressive psychosis, whereas a leptosomic, dysplastic body type characterized schizophrenia (80 percent). In comparison to these psychiatric groups, the great majority of the general population were of mixed body type (athletic-pyknic, athletic-leptosomic, etc.), and only around 20 percent were pure pyknic or leptosomic types. Kretschmer also observed dysplastic features (e.g., acromegaly, eunuchoidism, infantilism, masculine sexual characteristics in females, and feminine sexual characteristics in males) in about 17.5 percent of his schizophrenic subjects as against only 0.4 percent of his manic-depressive subjects. There was also a relation between body build and *subgroup of schizophrenia*. Cases of nonparanoid schizophrenia, dementia simplex, hebephrenia, and catatonia had the most pronounced leptosomic and dysplastic characteristics, whereas paranoid schizophrenic subjects were less leptosomic. This was also the case for the schizophrenic females compared with the males.

Age at puberty is only partly genetically determined. The recent 4-year lowering of mean pubertal age in Western industrialized countries has been accompanied by a 13-cm rise in mean adult height (Marshall and Tanner 1986). These changes have been interpreted as phenotypic responses to improved living conditions. Mean menarcheal age is now below 13 years (SD = 1.02 years) as compared to just below 17 years around 1860. Extremely late-maturing girls (+ 2 SD = about 15 years old) now experience menarche at the same

age as very early maturers 100 years ago ( $-2$  SD = about 15 years old). This significant increase in maturational rate has led to the reduction or even elimination of the leptosomic-dysplastic body build, as well as a marked reduction in such categories as the leptosomic-athletic build, among others. Pyknic-athletic and pyknic body builds are now predominant in the general population. If manic-depressive psychosis and schizophrenia occurred among individuals at each extreme of the maturational rate continuum, as we have hypothesized, we would expect to see a considerable decline in the rate of schizophrenia, particularly in its more malignant forms (i.e., the nonparanoid subtypes most characterized by a leptosomic-dysplastic body type). At the same time, we would expect to see a most striking increase in manic-depressive psychosis and other disorders affecting early-maturing individuals. However, in regions that have not experienced the marked improvement in living conditions that has occurred in industrialized nations, we would expect a persistently high prevalence of schizophrenia and no increase in manic-depressive psychosis.

Puberty occurs about 2 years earlier in females than in males. If the hypothesis is correct, a higher risk of manic-depressive psychosis in females and a higher incidence of schizophrenia in males would be expected. There are social differences in the rate of physical maturation. For instance, the average age of menarche ranges from a few months to 2 years earlier in the upper than in the lowest social classes. Taking this factor into consideration, we would expect the rate of schizophrenia to be highest among individuals of the lowest

socioeconomic status (SES), with the highest risk of manic-depressive psychosis among upper-SES individuals.

### Trends in the Incidence of Manic-Depressive Psychosis and Schizophrenia

Any estimate of changes in the incidence of manic-depressive psychosis and schizophrenia requires the availability of adequate hospital facilities for decades as well as psychiatric case registers with diagnostic information for each first-admission patient. There are few countries or regions from which such accurate information is available.

The National Norwegian Case Register of Serious Mental Disorder comprises all first admissions to psychiatric hospitals and clinics by diagnosis since 1916 (Ødegård 1971; Sjøgaard and Ødegård 1980, 1983, 1987; Saugstad 1986). Between 1926 and 1965, there was a more than 50 percent increase in first admissions classified as manic-depressive psychosis or reactive-depressive psychosis (ICD 298.0). Most patients who received the latter diagnosis were rediagnosed as manic-depressive psychosis on subsequent hospital admissions. The increase occurred almost entirely after 1955, when a growing proportion of hospital admissions were being classified as nonpsychotic. In particular, "neurotic" depressions (ICD 300.4), which accounted for less than 5 percent of admissions in the 1940's, rose to well above 10 percent in the 1960's and to a current level exceeding 20 percent (Saugstad and Ødegård 1980). A great number of these patients were involuntary admissions, confined to psychiatric hospitals because they

were considered psychotic. We therefore seem justified in stating that there has been a significant rise in manic-depressive psychosis over the last 30 years in Norway.

Similar findings have emerged in Denmark, where the Danish National Psychiatric Register covers all admissions to psychiatric hospitals. Various studies are in agreement that manic-depressive psychosis and depressive psychosis (ICD 298.0) are occurring with increasing frequency (Weeke et al. 1975; Nielsen et al. 1979; Schou and Strömngren 1979). They are much more frequent than formerly; the disease expectancy for severe psychotic depression, for instance, was much higher in Samsø in 1979 than it was in 1947. The same increase was found in Aarhus County. Similarly, in Iceland, Helgason (1979) observed a lifetime risk of manic-depressive psychosis of 3.34 percent as compared to 2.42 percent in 1947. In Iceland, as in Norway, there was also a marked increase in depressive psychosis (ICD 298.0) and nonpsychotic depressions (ICD 300.4). Yet another example is the Lundby study in Sweden, which included inpatients, outpatients, and never-treated cases. The probability of suffering from depression increased significantly in both sexes from 1947 to 1972, and the risk was highest among young adults in the 20- to 39-year-old age range (Hag-nell et al. 1982). Similar observations have been made in the United States, where there was a sharp increase in depression (Klerman 1978).

Admission rates for schizophrenia are particularly complete, probably approaching 90 percent in Norway during 1921–40 and around 80 percent in the following 26 years (Ødegård 1971). The rising trend among psychiatrists to diagnose

intermediate functional psychoses (ICD 297, ICD 298, and ICD 299) initially and to postpone a diagnosis of schizophrenia until readmission, together with the narrowing of the concept of schizophrenia to a disorder with a necessarily poor prognosis (mainly nonparanoid and paranoid schizophrenia), complicates any assessment of a recent decline in schizophrenia. Recall, however, Kretschmer's observation that patients with nonparanoid schizophrenia were more pronouncedly leptosomic than patients with paranoid schizophrenia, who in turn were more leptosomic than patients with a more favorable outcome, such as patients with acute and latent schizophrenia. Thus, we should mainly be able to register a decline in countries with a narrow concept of schizophrenia—Norway, Denmark, Scotland, and England, among others. This, in fact, seems to be the case. The lifetime risk of schizophrenia (including paranoid psychosis) decreased slightly in the male sex in the years 1926–65, and the decline has been considerable in recent years. The decrease is probably less marked, however, than the reduction in numbers of cases diagnosed schizophrenic on first admission, which declined from over 60 percent in 1926 to 19 percent in 1965, and to 5.5 percent in 1977–78 (both sexes) in Norway.

In Denmark, which also has a narrow concept of schizophrenia, there has been a remarkable decline in schizophrenic first admissions for both sexes between 1970 and 1984 (Strömngren 1987). In view of the known reluctance to diagnose schizophrenia on first admission (Munk-Jørgensen 1985, 1986), we may question whether there is a true decline in the incidence of schizophrenia. However, the most remarkable change related to diag-

nostic distribution since 1953 is the decrease in the population of resident schizophrenic patients—that is, a decrease in readmissions classified as schizophrenic. The decrease was most pronounced among females, especially those of middle age.

In Scotland, first admission rates for schizophrenia dropped by as much as 40 percent between 1969 and 1978, concomitantly with a slight rise in mania (Eagles and Whalley 1985). The proportion of first admissions classified as schizophrenic (including paranoid psychosis) also decreased slightly in England between 1970 and 1977 (from 13.5 percent to 11.3 percent) (Saugstad and Ødegård 1983, 1985).

In contrast to figures for countries with a narrow concept of schizophrenia, the proportion of schizophrenic first admissions in the United States did not change between 1969 and 1975 (46.6 percent in both years). No information is available concerning the relative distributions of schizophrenic subtypes. The *DSM-III*, with its narrower concept of schizophrenia, was first introduced in 1980, so its influence is not reflected in the above figures.

The prevalence of schizophrenia also has remained high in regions without particular improvement in living conditions or with a subsistence economy. This applies to the Istrian region of Yugoslavia, certain parts of rural Ireland, the Australian Aborigines, the Cree Indians, and the Salteaux of Northern Saskatchewan (Crocetti et al. 1964, 1971; Roy et al. 1970; Warner 1985). Most important, extremely high prevalence rates of schizophrenia and similarly low prevalence rates of manic-depressive psychosis have repeatedly been recorded in the North Swedish iso-

late population on the Finnish border (Böök 1953; Böök et al. 1978; Modrzewska 1980). According to Böök, as late as 1949, the farms in this region were small, providing insufficient subsistence for a family. Poverty was widespread, and death rates were elevated. Similar impoverished conditions prevailed in the neighboring regions of Finland, where the prevalence rates of schizophrenia are also elevated (Vaisanen 1975; Lehtinen and Vaisanen 1981; Warner 1985). The North Swedish isolate was in fact colonized by three Finnish families in the 17th century (Böök 1953). Böök commented on the uniformity in the catatonic clinical picture of the schizophrenic patients in this region.

### Changing Epidemiology of the Subgroups of Schizophrenia

Experienced psychiatrists like Ørnulv Ødegård (1972a) and Erik Strömngren (1982, 1987) agree that the clinical picture of schizophrenia has changed during the last 40–50 years. The most severe forms of schizophrenia are much less common today. One sometimes has the impression that a new type of schizophrenic personality has evolved. We seem to observe an increasing number of acute, latent (pseudoneurotic), pseudopsychopathic, schizoaffective, and borderline psychotic conditions (Ødegård 1972a). The decline in the most severe subgroups such as dementia simplex, hebephrenia, and catatonia has often been attributed to the introduction of drug treatment and the accompanying improvement in hospital care (Saugstad and Ødegård 1980). Alternatively, it may be the result of the marked reduction in

extremely late-maturing individuals in the population. The nonparanoid subtypes have the most extreme leptosomic-dysplastic body build, indicating that they are late maturers. Kretschmer's observation that a certain proportion (17.5 percent) of these patients were dysplastic has received little recent attention, perhaps reflecting a true reduction in such cases during the last 50 years or so. The psychotropic drugs cannot affect the early onset or the insidious character of nonparanoid schizophrenia; they can only interfere with the course of the disease through control of psychotic symptoms leading to hospital discharge.

A decline in nonparanoid schizophrenia has been observed in Norway, where schizophrenia is narrowly defined. Out of a total of 6,255 first admissions in 1977–78, 5.5 percent were classified as schizophrenic. Among the schizophrenic first admission patients, only 2 females and 4 males received a diagnosis of catatonia, and 11 females and 21 males received a diagnosis of dementia simplex and hebephrenia. In the past, diagnoses of nonparanoid schizophrenia predominated among males, but in the 1977–78 period, nonparanoid and paranoid schizophrenia were about equally rare. Among females, diagnoses of nonparanoid and paranoid schizophrenia had formerly been equally distributed, but by 1977–78, paranoid schizophrenia predominated (Saugstad and Ødegård 1980).

The relationship between maturational rate (age at puberty), body build, and schizophrenic subgroup is also suggested by data from Asia and Africa. Asian and African ethnic groups are more mature throughout growth, with more weight relative to height than is found in Caucasian populations,

and they experience puberty at an earlier age (Marshall and Tanner 1986). In Asia and Africa, paranoid schizophrenia is more common than nonparanoid schizophrenia. Moreover, onset is more acute and the course of illness is more benign, with fewer chronic defect states being seen, as compared to the European countries included in the World Health Organization's International Pilot Study of Schizophrenia (Sartorius et al. 1986, 1987).

### Sex Differences in Manic-Depressive Psychosis and Schizophrenia

On average, the age of puberty occurs 2 years earlier in females than in males. Most studies reveal a markedly higher (1.5–2.0 times) lifetime risk of manic-depressive psychosis (excluding clear bipolar cases) in females than in males (Ødegård 1972a; Strömngren 1976; Rawnsley 1982). This heightened risk is in accord with the concept of manic-depressive psychosis as a disorder particularly affecting early maturers. In some studies, the onset of manic-depressive psychosis is also about 10 years earlier in females than in males, with maximum age-specific rates of 30–40 years in females as compared to 40–50 years in males (Lundquist 1945).

Although it is generally stated that there is no sex difference in the incidence of schizophrenia, some evidence exists of a higher incidence in males. In the United States, Babigian (1975) reported a 40 percent higher rate in males, while in Norway (1946–65), Ødegård (1971) found that first admission rates in males were 19–36 percent higher than in females. Similarly, in Denmark, Strömngren (1987) observed higher first admission rates for males. A higher male inci-

dence of schizophrenia has also been observed in the Third World (Sartorius et al. 1986, 1987). Further, maximum age-specific rates are observed about 10 years earlier in males than in females (Noreik and Ødegård 1967; Ødegård 1971). In addition to its earlier occurrence, onset of illness is distinguished by a more insidious nature in males, who also show greater chronic defects and, on the whole, a less favorable course of illness. This is to be expected in view of the male's, on the average, later and more prolonged puberty, possibly reflected in more greatly reduced synaptic density. The female, with her earlier puberty, is "protected" from schizophrenia. Onset is later and more acute, and the course of illness is more favorable (Saugstad and Ødegård 1980, 1987; Watt et al. 1983; Håfner 1987; Strömberg 1987). This is suggested by data from Denmark, where the decrease of resident schizophrenic patients since 1953 is much more pronounced for females. With their older age of onset and relatively good preservation of the personality, which at onset is already mature and fully developed, schizophrenic females are hospitalized for shorter periods and remain out of the hospital longer after discharge (Strömberg 1987). Moreover, a more intensive study of the limited population of Bornholm in 1935 and 1983 revealed a relatively unchanged prevalence of schizophrenia in males as against a considerable decrease in females (Strömberg 1987).

### **Epidemiology of Manic-Depressive Psychosis and Schizophrenia**

One of the most consistent but nevertheless widely debated findings in

schizophrenia research is the higher incidence of the disorder in the lowest SES (3–4 times the expected rate) in most investigations. Attention has focused on whether the low social position at admission is a consequence of the disorder (social selection or "downward drift") or a cause of it (social causation theory) (Kohn 1973; Ødegård 1975a, 1975b).

In view of the social differentials in rate of maturation, we would expect the highest incidence of schizophrenia in the lowest socioeconomic classes and a higher risk of manic-depressive psychosis in the upper classes. Depending upon the size of the maturational differences, which ranges from a mean menarcheal age only a few months earlier in the upper classes to a 2-year difference, we would expect the excess of schizophrenia in the lowest SES groups to vary, as has in fact been observed. Information about differences in rate of maturation (age at puberty) related to SES is available from only a few countries. In Norway, for instance, where the social-class differentials are negligible (Brundtland et al. 1980), Ødegård (1972b) had to use occupations to study variation in admission rates. He found an excess (3–4 times above expectation) in male occupations associated with low training requirements, low income, and low social prestige. Recall that schizophrenia occurs particularly early in males. It is often difficult to distinguish prepsychotic personality changes at adolescence from the onset of psychosis. We would therefore expect to find that in a certain proportion of cases (especially males) low social position resulted from incipient illness. As postulated in the social selection theory, such patients would have "drifted down" from the social class of their

families of origin. Without knowledge of the social differentials, however, we cannot be sure what proportion of the excess of schizophrenia in the lowest social class or in occupations with the lowest training requirements is actually attributable to social selection. Conversely, the highest lifetime risk of manic-depressive psychosis was observed in social class I in Iceland (Helgason 1979) and Finland (Stenbäck and Achte 1966), whereas schizophrenia was 4.5 times more frequent in social class V than in social class I. In Norway, Ødegård (1963, 1975b) followed all high school graduates from the years 1916–29 (a total of 18,000 largely upper middle class families) until 1974 by means of the Norwegian National Case Register. Among females, rates for manic-depressive psychosis were 2.3 times higher than in the general population; among males, 1.7 times higher. Diagnoses of schizophrenia were lower than expected in this population. The graduates represented less than 5 percent of their relevant birth cohorts.

### **Conclusion: Evidence in Support of the Maturational Hypothesis**

There is evidence from several countries for a marked increase in manic-depressive psychosis (including depressive psychosis). This coincides with expectation if early maturation is the necessary factor for the development of manic-depressive psychosis. The rise is, in fact, so striking that alarmed researchers have asked: "Are we entering an age of melancholy?" (Hagnell et al. 1982). The higher lifetime risk of manic-depressive psychosis in females and the excess of manic-depressive psychosis in

the upper classes further suggest that manic-depressive psychosis is a disorder involving early maturation.

Because there are both gender-related and social-class differences in maturational rate, one might examine disorders that are more common in the upper classes and in females, and that have increased in frequency during recent years. A prime example would be eating disorders. These disorders primarily affect upper- and middle-class females, and their incidence has increased markedly (Russell 1983). Anorexia nervosa is characterized by self-induced weight loss and delayed menarche or discontinued menstruation. Bulimia nervosa is also characterized by fear of becoming fat, combined with periodic bouts of overeating, purging, and vomiting. There are also reports of coexisting manic-depressive psychosis in some cases, and lithium has been successful in treating others (e.g., Cantwell et al. 1977; Stein et al. 1982; De Vries 1985). Thus, the eating disorders, like manic-depressive psychosis, could be disorders involving early maturation.

The decline in schizophrenia is most easily discerned in countries with a narrow concept of schizophrenia, mainly encompassing cases with a poor prognosis. The decline therefore primarily involves the nonparanoid and paranoid categories of schizophrenia. No information is available concerning the trend in the subgroups which, by definition, have a favorable outcome, such as acute schizophrenia, latent schizophrenia, and schizoaffective disorder. However, if we consider a country like the United States, where first admission rates for schizophrenia continue to be high, there are indications that these good-prognosis subgroups have probably always been

included. The good-prognosis subtypes are not new; most of them had already been described by French and German psychiatrists in the late 19th or early 20th century (Pichot 1983). They seemed to become increasingly frequent in the United States, however, leading to the description of schizoaffective disorder (Kasanin 1933), latent or pseudoneurotic schizophrenia (Hoch and Polatin 1949), borderline schizophrenia (Knight 1954), and schizophrenia spectrum disorder (Kety et al. 1968). This shift in the epidemiology of schizophrenia, with the more malignant forms of the disorder apparently being superseded by milder forms characterized by an acute onset and favorable outcome, is in agreement with the idea of classic, poor-prognosis schizophrenia as a disorder afflicting late-maturing individuals. The significant decline in the incidence of process schizophrenia mirrors the marked decline in mean pubertal age that has occurred in the industrialized nations. In areas of the world without significant improvement in the standard of living and where the proportion of late maturers, accordingly, is relatively unaffected, the prevalence of schizophrenia remains high. This also supports the notion that extremely late puberty is the necessary factor for the development of schizophrenia in its classic, poor-prognosis form.

The sex differences observed in the epidemiology of the major mental disorders, with females having an early onset and higher lifetime risk of manic-depressive psychosis and males having a higher incidence and earlier, more insidious onset of schizophrenia, probably reflect the maturational-rate differences in the two sexes. A reduction in synaptic density may

occur in slower-maturing males, predisposing them to schizophrenia, whereas a redundancy of neuronal synapses may exist in early-maturing females, making them vulnerable to manic-depressive psychosis. The sex differences in the occurrence of schizophrenia and manic-depressive psychosis may be interpreted as providing further support for the hypothesis of maturational irregularities in the central nervous system as etiological factors in both disorders.

### **The Neurodevelopmental Etiology of Schizophrenia: Implications From Social Class, Marriage, and Fertility**

The necessary factor for the development of schizophrenia in late-maturing individuals is posited to be reduced density of neuronal synapses. This etiological hypothesis implies that abnormal development in the schizophrenic brain is manifested by nonspecific, subtle structural deficits localized to areas and structures fundamental to emotional and cognitive behavior, especially the frontal lobes (Ingvar 1980; Shelton and Weinberger 1986) because of the hierarchical order in development and because the anterior and superior frontal cortical regions are the last to develop (Phelps et al. 1988). This definition of schizophrenia as a neurodevelopmental disorder implies that there may be several "schizophrenias." Depending on the degree of maturational lag and of the resulting cerebral structural deficits, we would expect to encounter a range of schizophrenic disability—from the most malignant (nonparanoid schizophrenia) to the mildest (acute, borderline schizophrenia) forms of the disorder.

The severity of the structural cerebral deficits in nonparanoid

schizophrenia is illustrated by the difficulty in identifying the precise onset of disorder in these cases. It is difficult to distinguish between the insidious onset of psychosis and the prepsychotic personality changes. This has even led researchers to state that much of what formerly was considered an integral part of the pathological process leading to the manifestation of schizophrenia seems to be rooted in the personality of the patient. Spontaneous remissions (self-healing) do occur in schizophrenia, and psychotic symptoms can be reversed by neuroleptics. Even in remission, however, there are residual signs, and the personality usually differs from that before the onset of psychosis.

The present wide concept of schizophrenia comprises the total hierarchy of schizophrenic disorders. Age at onset, course of illness, and long-term outcome differ significantly in the three main subtypes (nonparanoid, paranoid, and good prognosis) of schizophrenia. These differences affect marriage rate, fertility, and social position. An investigation into these demographic factors should therefore treat the three major subtypes separately. Moreover, in view of the later onset and more favorable prognosis in females, the two sexes should also be treated separately in formulating research strategies.

The predominance of different concepts of schizophrenia in different countries is a complicating factor, as is the proliferation of operational criteria that have been developed to define patients included in particular studies (Saugstad and Ødegård 1983, 1985; Gottesman et al. 1987). The Kraepelinian subtypes are useful indications of severity, but the

delimitation of new categories prevents comparison with previous studies. This is particularly important if we want to study trends. The secular changes in the maturational rate and concomitant changes in the epidemiology of the various schizophrenic subgroups suggest that particular attention should be devoted to the study of trends.

The present review of social class, marriage, and fertility in schizophrenia has therefore been undertaken to test the hypothesis that trends in the schizophrenic population show increasing conformity with trends in the general population. This is particularly true for marriage rate and fertility—variables that are affected by age at onset of disease. Although age at onset influences the patient's social position, the epidemiology of schizophrenia also reflects social differences in the rate of physical maturation. A persistent excess of schizophrenia in the lowest socioeconomic classes is therefore to be expected in countries with marked social class differences. Among the greatest problems in this review is the insufficient information about the selection of patients in a particular study or about the conditions in the area where the investigation took place. There is too often a lack of adequately matched control populations.

### **Fertility and Childlessness in Schizophrenia**

Little is known about the relation between age at puberty and later reproductive fitness, but Wyshak (1983) emphasizes that the proportion of unsuccessful pregnancies is at a minimum at the menarcheal age of  $13 \pm 1$  year. There is no evidence of a primary fecundity impairment in schizophrenia.

However, Kretschmer (1921/1961) observed dysplastic features in about 17.5 percent of his schizophrenic subjects, and similar observations were made by Bleuler (1954). Some of these individuals with physical anomalies could be extremely late maturers, perhaps never reaching puberty. Childlessness in a certain proportion of schizophrenic patients is therefore to be expected. This is extremely difficult to verify because of the low marriage rate in schizophrenia, particularly among the nonparanoid subtypes with their early and insidious onset.

Let us first consider the conditions in the North Swedish isolate population on the Finnish border with its high prevalence of schizophrenia (a particular type of catatonia). In Modrzewska's (1980) investigation, she included all children (in and out of wedlock) of schizophrenic parents born and resident in the community during 1829–1960. Among the total 214 schizophrenic subjects in a population of 6,000, only 23 percent (28 of 122) of the male schizophrenic subjects were married and had children. There was a decline in the proportion of reproducing schizophrenic females from 73 percent in 1949 (Böök 1953) to the present rate of 47.8 percent (44 of 93 schizophrenic females). Whereas the previous high proportion of reproducing schizophrenic females had been attributed to a prevailing shortage of young females in the isolate population, the decline was explained by the secular trend of a decreasing marriage rate in Sweden, by increasing awareness of the risk of marrying into families with several schizophrenic members, and by the earlier hospitalization of the patients from younger cohorts.

Another investigation (Larsson and Nyman 1973), in a mental hos-



pital with a catchment area consisting of two rural counties in southeastern Sweden, covers a 1881–1900 birth cohort followed until 1973. Among the total of 153 schizophrenic males, as many as 85.4 percent of those with a subtype diagnosis of nonparanoid schizophrenia (hebephrenia and catatonia) were unmarried and childless, while 54.6 percent of the paranoid schizophrenic subgroup were unmarried and 60.6 percent, childless. Mean age at onset of schizophrenia differed by about 15 years: 26.6 years in the nonparanoid subtype versus 42.0 years in the paranoid subtype.

A German study (Haverkamp et al. 1982; Hilger et al. 1983; Propping et al. 1983) examined two cohorts of schizophrenic patients (16–55 years old) admitted to a regional psychiatric hospital during 1949–50 ( $n = 183$ ) and 1965–67 ( $n = 228$ ). The cohorts were then followed for more than 13 years after admission. In the total series, the proportion of childless female patients was just over 40 percent—only slightly higher than the rate in the control series that had been matched for all demographic variables (including born and resident in the region) except marriage rate. The proportion of childless schizophrenic males rose from 48 percent in the 1949–50 cohort to 71 percent in the 1965–67 cohort, as compared with 26 percent and 32 percent, respectively, in the male control series. The proportion of childless marriages among the schizophrenic patients was then compared with a second control series that had been matched for marriage rate as well. The childless marriages ranged from 9 percent to 25 percent in the two schizophrenic cohorts and from 17 percent to 27 percent in the controls. This was taken to indicate that the patients practiced birth

control and postponement of the first child in a manner similar to the general population.

Another relevant investigation is the Erlenmeyer-Kimling et al. study of two New York State hospital cohorts admitted in 1934–36 (1,118 patients) and 1954–56 (781 patients). Diagnoses of schizophrenia were the chart diagnoses of the day. The proportion of childless, married schizophrenic males increased from 26.7 percent on admission in 1934–36 to 29 percent at the final evaluation in 1956, while it declined from 26.5 percent on admission in 1954–56 to 25.4 percent in 1962. In the schizophrenic females, there was a decline in proportion of childless marriages in both periods of observation (from 34.8 percent to 31.4 percent in the first period, and from 27.1 percent to 26.1 percent in the second period) (Goldfarb and Erlenmeyer-Kimling 1962; Erlenmeyer-Kimling et al. 1969; Erlenmeyer-Kimling 1978).

In England, Slater et al. (1971) studied 1,086 schizophrenic females and 1,003 schizophrenic males admitted to the Bethlem and Maudsley hospitals in 1952–66. Marital fertility was 73 percent that of the general population. In Switzerland, Garrone (1962) observed three times more childless marriages than expected from the general population, and in Germany, Kallmann (1938) also observed a higher proportion of childless marriages than expected among admissions to a Berlin hospital in 1893–1902. Kallmann commented, as had Essen-Möller (1935) before him in connection with a study of admissions to a Munich hospital in 1904–27, that marital fertility was particularly reduced ( $< 50$  percent of the expected rate) in marriages of catatonic and hebephrenic patients, whereas the paranoid patients had

a marital fertility rate more or less comparable to the general population. To put it another way, the proportion of childless marriages could well be particularly increased in these nonparanoid subtypes, in agreement with the speculation that the nonparanoid schizophrenic subtypes are extremely late maturers, some of them perhaps never reaching puberty (e.g., ability to conceive). As a result of the proportion of schizophrenic subtypes sampled, the proportion of childless marriages could vary considerably. The number of schizophrenic patients studied is often small, however, and division of the sample into subgroups is therefore precluded for statistical reasons.

In recent decades, with the widespread practice of birth control and, particularly, the postponement of the first child, the proportion of childless marriages in the population is increasing (Hoem 1988). At the same time, there is a significant increase in children born out of wedlock. In 1986 in Norway, about 30 percent of the births were to unmarried mothers, and in Denmark and Sweden, about 50 percent. In Norway, age-specific fertility rates are now published for married and nonmarried women separately. Births to unmarried mothers increased from below 6 percent in 1970, reaching 12.4 percent in 1976–80, and 20 percent in 1980–85.

*Illegitimacy*, as a “compensation” for the low probability of marriage in schizophrenia, is of particular interest. However, in view of the previous preponderance of nonparanoid schizophrenic patients, with their early and insidious onset, illegitimacy equal to or even below the general population seems most likely in early investigations. Thus, more recent studies may well observe high rates, but not

approaching the present rates in the general population of Scandinavia.

In fact, illegitimate births appeared to be lower than expected on the basis of general population trends in the two investigations from Germany. Kallmann (1938), in his study of 1,087 schizophrenic patients admitted before age 40 to a Berlin hospital during 1893–1902 and followed up until 1931, observed a low rate. Similarly, Essen-Möller (1935), in his sample of schizophrenic patients admitted to a Munich hospital during 1904–27 and followed up until the early 1930's, found a decline in the illegitimate birth rate that coincided with a decrease in the general population birth rate. After hospital discharge, the illegitimacy rate in the schizophrenic patients fell to half its previous level. In Norway, Ødegård (1960), using information in the National Case Register, analyzed births to single patients first admitted during the years 1936–55; he found that the frequency of illegitimate births to schizophrenic patients appeared to be *lower* than that for the general population (1936–45 general population = 6.78 percent, schizophrenia = 3.9 percent and 4.3 percent in the two sexes; 1946–55, general population = 4.25 percent, schizophrenia = 3.6 percent and 4.0 percent in the two sexes). Böök (1953), in his study of the North Swedish isolate (1902–49), observed a lower illegitimacy rate in schizophrenic females than in controls. Erlenmeyer-Kimling (1978) similarly observed fewer illegitimate births in her schizophrenic females admitted to New York State hospitals (1934–36) than expected from the rate in the general population.

A rise in illegitimate births was observed by Stevens (1970) in her study of schizophrenic patients

(ages 16–49) admitted to Springfield Hospital in London (1955–63). The 622 schizophrenic females of British origin had a total of 46 illegitimate births (7.4 percent) as against 1.7 percent in the general population. Moreover, among the schizophrenic patients, there was a relation between illegitimate birth and lower social position and, in addition, several patients could give no details about father's occupation, etc. Stevens suggests that "it may well be that many of the patients having illegitimate children were themselves illegitimate or from broken homes" (p. 27).

McNeil and Kaij (1974) also observed a rise in illegitimate births in their study of female admissions to Malmö Hospital (1958–60) born after 1912. More than 16 percent of the offspring of schizophrenic females were illegitimate as compared with about 10 percent in the general population. It is generally stated that the *marital fertility* of schizophrenic patients is below normal (Erlenmeyer-Kimling 1978). Most studies cover fertility before first hospitalization (prepsychotic fertility) or perhaps a few years thereafter, but they rarely cover the total reproductive period (15–49 years). Studies of schizophrenic fertility in populations practicing birth control to a very limited degree, such as in the North Swedish isolate on the Finnish border, are exceptional. In Modrzewska's (1980) investigation covering all children born (in and out of wedlock) to schizophrenic parents resident in the community during 1829–1960, the total sample of 214 schizophrenic patients had 553 children. Both parents were schizophrenic in 7 families, and in 72 families one parent was schizophrenic. Their fertility was compared with that of 100 families of the same age (a total of

624 children). The mean number of children per marriage was 7.2 and 7.0, respectively, for schizophrenic mothers and fathers, as compared with a mean of 5.6 children when both parents were affected and 6.2 children when both parents were unaffected residents in this region with an exceptionally high prevalence of schizophrenia. The limited practice of birth control was related to the influence of a religious movement—Laestadianism—in this part of Sweden.

Marital fertility was not reduced in Larsson and Nyman's (1973) investigation from southeastern Sweden which followed the total 1881–1900 birth cohorts until 1966. Only 43 of 153 schizophrenic male admissions to a mental hospital serving two rural counties had children (total  $n = 131$ ; mean = 3.0) as compared with a mean of 3.1 and 3.0 children, respectively, for the fertile siblings of nonparanoid (hebephrenic or catatonic) or paranoid probands. The fertile siblings of the remaining probands (mixed, schizoaffective, etc.) had a mean of 2.8 children. Larsson and Nyman limited their study to males to minimize false-positive diagnoses (e.g., involuntional melancholia) classified as schizophrenia in females. Their results represent the completed fertility of the male schizophrenic patients as well as of their unaffected, but fertile siblings. The "net fitness" of all male schizophrenic patients was only 0.9 children per patient.

The recent investigation from Germany (Hilger et al. 1983; Propping et al. 1983) of marital fertility in schizophrenic patients also covers the total reproductive period and includes adequately matched controls from the same region. Marital fertility was not reduced in this series. Male and female admissions

from 1949–50 had a mean number of children of 2.17 and 1.86, respectively, as compared to 1.80 and 1.52, respectively, in the controls; male and female admissions from 1965–67 had 1.65 and 1.60 children, respectively, as compared to 1.71 and 1.75, respectively, in the controls. Marital fertility was examined in both prepsychotic (before first admission) and postpsychotic (after discharge) periods. In males, prepsychotic and postpsychotic fertility rates differed little—1.07 and 0.98, respectively, for the 1949–50 cohort as compared to 0.94 and 0.71, respectively, for the 1965–67 cohort. There was even a slight increase in male marital fertility after the 13-year followup (0.12) in the 1949–50 cohort. In the females, however, prepsychotic fertility was considerably higher than postpsychotic fertility, in agreement with previous investigations by Essen-Möller (1935) and Bland and Orn (1978), among others (prepsychotic fertility: 1.49 and 1.40 children, respectively, for 1949–50 and 1965–67 admissions; postpsychotic fertility: 0.34 and 0.20 children, respectively, for 1949–50 and 1965–67 admissions). The trend was similar among the controls, except for male controls for 1965–67. The observed sex differences in postpsychotic marital fertility suggest that childbearing age (15–49 years) could be relevant, and the high mean age on admission of married schizophrenic females (39.4 and 41.4, respectively, in the two periods) supports that interpretation. There is no similar limit for males. On the other hand, the proportion of ever-married schizophrenic males rose by 17.4 percent in the 13-year followup (from 33.3 percent to 50.7 percent), whereas the proportion of ever-married schizophrenic females increased only slightly (5.2 percent to 67 per-

cent). It is definitely less problematic for a schizophrenic female to marry than for a schizophrenic male.

Although marital fertility was not reduced in the three investigations reviewed above, it is usually found to be reduced in studies using census information (e.g., Ødegård 1960). The National Norwegian Case Register contains information about number of children born to patients before the first hospitalization. Ødegård (1960) studied marital fertility in a total of 34,333 admissions (1936–55), including 9,227 ever-married women with 19,717 children and 7,412 ever-married males with 15,468 children. He used information in different censuses to calculate expected number of children. Marital fertility was 92.7 percent and 91.5 percent, respectively, for married male and female schizophrenic patients, compared with 84.8 percent and 81.7 percent, respectively, for married male and female patients with manic-depressive psychosis. Most important, there was a rising trend in marital fertility in schizophrenia—from 80.9 percent (1936–45) to 104.4 percent (1946–55) in males, and from 89.7 percent to 93.3 percent in females. This possibly shows that schizophrenic patients have maintained their level of fertility and not followed the decreasing trend in the general population. Similar observations were also made by Hilger et al. (1983) in Germany. Ødegård's (1960) followup study of 242 married patients discharged from Gaustad Hospital revealed that postpsychotic fertility was not below normal during the 8 years of followup, but there was an increased number of divorces (> 15 percent). In his later investigation (1956–75) including only married

women (about 21,204 with 41,199 children), Ødegård (1980) observed a moderate increase in prepsychotic marital fertility of the psychiatric patients (from 72.4 percent of the expected rate for 1936–45 to 85.4 percent [corrected] for 1966–75).

The mean number of children was higher in manic-depressive psychosis (2.0) than in schizophrenia (1.8), as compared with a mean of 1.94 children for all diagnoses. This is contrary to expectation in view of the social differentials in fertility and excess of schizophrenic diagnoses in the occupations with the lowest levels of training, income, and social prestige (lowest SES). These class differentials in fertility would have been expected to raise fertility in schizophrenia and lower it in manic-depressive psychosis. It is also surprising given the different attitudes toward pregnancy in the two disorders. Patients with manic-depressive psychosis are often very much concerned about their condition, and requests for sterilization are not rare. Although the prepsychotic state in schizophrenia frequently constitutes a considerable barrier against matrimony, it does not necessarily inhibit having children once the marriage is established (Ødegård 1960).

Erlenmeyer-Kimling (1978), in her study of two cohorts of schizophrenic patients admitted to New York State hospitals in 1934–36 and 1954–56, also recorded marital fertility among schizophrenic patients to be below expectation from census information (U.S. Vital Statistics).

The mean number of children was also reduced in 901 female schizophrenic patients (1.54) investigated by Shmaonova et al. (1976) in Moscow as compared with census data (2.0). Shmaonova et al. also compared marital fertility in

schizophrenia with that in manic-depressive psychosis. They observed that as many as 83 percent of the reproducing patients with manic-depressive psychosis had delivered their children before age 30, as compared to only 61 percent of schizophrenic patients, who delivered 36.2 percent of their children between ages 30 and 39.

Similarly, Vogel (1979) observed in Germany that 708 schizophrenic admissions (1968–75) had a higher age at marriage and that their age-specific fertility was maximal at a later age (30–39 years) than in the general population. On the basis of census information used to calculate expected marital fertility, age-specific cumulative marital fertility in schizophrenia was 65.39 percent of expectation. Vogel also investigated the relation between school achievement and fertility. The highest age-specific cumulative fertility was found in patients with ordinary schooling. It then declined in both directions, particularly if the patient had less than ordinary schooling or had failed a grade in elementary school.

Jones (1973) also investigated the relation between IQ and fertility in schizophrenia. He studied three samples—one series of consecutive admissions to a State hospital, a selected inpatient sample from the same hospital, and male schizophrenic patients from a Veterans Administration (VA) hospital. The patients were born after 1920, admitted before 1971, and the diagnosis of schizophrenia was made before the age of 45 years (114 males and 107 females). Mean IQs ranged from 76.3 to 86.3, and mean number of children from 0.55 to 1.52, according to the proportion of ever-married patients in the different groups (30–66 percent). There was a significant tendency for schizophrenic males with normal or

higher IQs to be more often married and to have more children than low-IQ males, who tended to remain single. The relation between low IQ and reduced fertility was mainly related to the failure to marry. The data for the schizophrenic females were less clear, since greater male initiative is usually needed for marriage. Although there is no evidence that IQ deteriorates in schizophrenia (except in an acute phase of the disorder), according to Jones (1973), low IQ is detrimental in schizophrenia. Patients with low IQs tend to have earlier onset, be hospitalized longer, and improve less (Jones and Offord 1975).

Vogel (1979) also confirmed the role of early onset of psychiatric disturbances in reducing fertility. He divided his series of 708 schizophrenic patients into those with certain, questionable, or no known psychiatric disturbance before age 15. The age-specific fertility rates were markedly reduced in both the certain and the questionable categories. Patients of the nonparanoid subtype (simple schizophrenia and hebephrenia) had a particularly decreased fertility rate.

A considerably lower rate of marital fertility in nonparanoid schizophrenia was also observed by early investigators such as Nissen (1932), Essen-Möller (1935), and Kallmann (1938), who found marital fertility in nonparanoid schizophrenia was only half that in paranoid schizophrenia. Few recent investigations have analyzed fertility separately in the nonparanoid subtype. Propping et al. (1983) found that fertility was higher in the paranoid subtype (77 males and 165 females) but did not calculate fertility separately in the 16 males and 21 females in the nonparanoid category because the sample size was too small.

Shmaonova et al. (1976) simply excluded the nonparanoid forms of schizophrenia (e.g., the hebephrenic, catatonic, and simplex categories) with the following comment: "Since patients with the malignant forms of schizophrenia virtually never marry and have no children, they are not considered in this table or later in the paper" (p. 245). No information about the number excluded was given. However, dividing their 901 schizophrenic females according to course type—continuous (indolent and paranoid types) versus episodic (episodic and recurrent types)—resulted in significantly different total infertility rates. With a marriage rate of approximately 35 percent, infertility was 55.3 percent in the continuous group and 39.4 percent in the episodic group, revealing a considerably higher proportion of childless marriages in the former group. Age at marriage also affected infertility: 18.8 percent in marriages contracted before age 24, 24 percent after age 24, and 56.8 percent after age 30. The only exception was in the subgroup of recurrent schizophrenia, whose rates of infertility were lower overall: 8.1 percent, 15.2 percent, and 37.5 percent, respectively. The mean marriage rate of 35 percent in the 901 females with schizophrenia, as compared with 94.4 percent married in the 203 females with manic-depressive psychosis, is surprisingly low in view of these investigators' exclusion of the most severe forms of schizophrenia. In older investigations, the marriage rate in schizophrenic females was not only higher than that in male patients, but around 50 percent of the expected rate. For instance, Ødegård (1960) found a rate 49.2 percent of that in the general population for schizophrenic females in the 1936–45 cohort, which rose to

56.6 percent in the 1946–55 cohort. More recently, Erlenmeyer-Kimling (1978) reported an increase in the marriage rate from 78 percent of expected for her 1934–36 American cohort to 82 percent in her 1954–56 cohort; for males, the corresponding rates were 38 percent and 47 percent, respectively. Stevens (1969), in her British investigation of 811 schizophrenic females, found a marriage rate 73 percent of the expected rate among admissions from 1955–63. Shmaonova et al. (1976) considered the proportion of married schizophrenic females as a most important measure of their social adaptation. However, with the present decreasing trend in the proportion of married couples in some countries, a comparison of marriage rate per 100 schizophrenic patients with the expected rate, while hinting at their degree of conformity with the general population, may leave open the question of whether family formation is more frequent.

In the United States and the Soviet Union, which (before *DSM-III*) had similarly broad concepts of schizophrenia, the selection of schizophrenic cases must have differed, with an excess of cases with later, more acute onset in the U.S. studies and of cases with earlier onset and poorer prognosis in the U.S.S.R. studies. The marriage rate of 94.4 percent in the cases with manic-depressive psychosis suggests that they are probably not too different from the general Moscow population in this regard. In Norway, the proportion of ever-married females in the population was over 82 percent among those above age 50 in 1982.

### Summary and Conclusions

In accord with the idea that patients with nonparanoid schizophrenia

(catatonia, hebephrenia, and simple schizophrenia) constitute the most extreme subgroup of late maturers in the population, and that some of them (particularly males) perhaps never reach puberty (ability to conceive), the highest rate of *childlessness* has been reported in nonparanoid schizophrenic males. Values range from only 14.6 percent of the hebephrenic and catatonic cases in Larsson and Nyman's (1973) study reproducing (born 1881–1900 and followed until 1966) to about 23 percent reproducing among the 122 predominantly catatonic males in Modrzewska's (1980) study of all schizophrenic patients born and resident during 1829–1960. The early studies from Norway (Nissen 1932) and Germany (Essen-Möller 1935; Kallmann 1938) all agree that marital fertility in catatonic and hebephrenic cases is considerably below that in other subtypes, but they provide no information about the proportion of childless marriages as such. Total fertility (married plus unmarried cases) in Essen-Möller's sample, however, was only 40 percent of that in the general population.

In the more recent investigations from Germany (Hilger et al. 1983), the United States (Erlenmeyer-Kimling 1978), and the United Kingdom (Stevens 1969; Slater et al. 1971), the proportion of childless marriages does not differ markedly from that of the general population, perhaps reflecting a significant reduction in cases with the most severe forms of schizophrenia. In a few studies that provide information concerning the various schizophrenic subtypes, the proportion of nonparanoid cases is particularly low (e.g., Propping et al. 1983).

Information on *illegitimate births* is admittedly incomplete, particularly for males. The low proportion of

illegitimate births to schizophrenic patients observed in studies from Germany, Sweden, Norway, and the United States (Erlenmeyer-Kimling's [1978] 1934–56 cases but not her 1954–56 cases) illustrates the failure of the schizophrenic patients to compensate for their low probability of marriage. In contrast, in Ødegård's (1960) study of children born to single patients admitted between 1936 and 1955, the proportion of illegitimate births to mentally defective psychotic females was 23.5 percent and 16.4 percent in the two decades (1936–45 and 1946–55, respectively), as compared to 4.3 percent and 4.0 percent, respectively, in schizophrenic females, and 6.78 percent and 4.25 percent, respectively, in the general population. The higher proportion of illegitimate births in Stevens' (1970) study (7.4 percent vs. 1.7 percent expected) of 622 schizophrenic females who lived mostly outside the hospital is probably related to the overrepresentation of good-prognosis patients (acute schizophrenia, latent schizophrenia, schizoaffective disorder, and borderline schizophrenia) and to an extreme social selection of cases.

The low rate of total reproduction (fertility  $\times$  marriage rate) in schizophrenic patients is mainly a consequence of their low marriage rate, which at one time was between 30 and 40 percent in males, and around 50 percent in females, of the marriage rate in the general population. Information on nuptiality (prepsychotic), because it is usually ascertained at hospital admission, is relatively unaffected by drug treatment. The increasing proportion of acute, latent, schizoaffective, and borderline subtypes, all characterized by a later age at onset, may have contributed to a rise in nuptiality, which has been

observed in a number of countries. The proportion of married schizophrenic females (broadly diagnosed) even exceeded 80 percent of expectation from the general population in Erlenmeyer-Kimling's (1978) study of New York State hospital admissions (1954–56).

Because of the recent increase in cohabitation in Western Europe and, especially, in Scandinavia—in Denmark and Sweden, half the annual births are outside wedlock—a comparison of the marriage rate in schizophrenic patients with that in the general population is of less interest than earlier comparisons in previous series of schizophrenic patients from the same region or hospital.

The level of reproduction in schizophrenia as compared with that of the general population is better measured by comparing age-specific fertility rates (+ cumulative) for all reproducing schizophrenic females with rates for all reproducing females in the general population (married + nonmarried), with an additional note concerning the proportion of non-reproducing females in both populations.

We know from various recent investigations (Ødegård 1980; Hilger et al. 1983) that schizophrenic patients have followed the trend in the general population—that is, widespread use of birth control and general reproduction below replacement—but at a slower pace. The inclusion of births to unmarried females eliminates the possibility of investigating the particular postponement of the first child among married couples (a gradual reduction of births before the sixth month of marriage), but represents more completely the overall trend in reproduction.

Censuses never cover male ferti-

ity or fertility of divorced or widowed persons of either sex. Ødegård (1980) estimated the expected fertility in male schizophrenic admissions from 1936–55 on the basis of their age distribution, the mean difference in age between spouses, the female marital fertility rate, etc. He judged this method as too inaccurate to calculate male fertility in the next two decades and limited his investigation to married women only.

The observation that marital fertility in schizophrenia is within "normal limits" when adequately matched controls are used (Larsson and Nyman 1973; Modrzewska 1980; Propping et al. 1983), but well below expectation when census information is used, suggests that marital fertility in schizophrenia has special determinants. Vogel (1979) and Shmaonova et al. (1976) found that maximal age-specific fertility rates in schizophrenia occurred considerably later than in the general population (30–39 years). The schizophrenic population also has a social distribution characterized by an excess in the lowest social classes. Social differences in fertility should therefore be considered in calculations of expected fertility in schizophrenia. It is apparent that no such adjustment has been made in any investigation. Ødegård (1980) expressed great surprise when he found a higher mean number of children in marriages of patients with manic-depressive psychosis than in marriages of patients with schizophrenia (2.0 vs. 1.8). He had expected the social-class differentials in fertility to raise fertility in schizophrenia and lower it in manic-depressive psychosis. Marital fertility in manic-depressive psychosis is also usually found to be below expectation when census information is used. However, in

an Icelandic study that included a control series adequately matched to the psychiatric sample on such variables as social class, Helgason (1979) observed a higher fertility rate in patients with manic-depressive psychosis than in controls.

Ødegård (1960) was the first to examine directly the possibility of a relatively increased rate of reproduction in schizophrenia. He observed slightly increased rates of marital fertility in admissions from 1946–55 compared with admissions from 1936–45 (104.4 vs. 80.9 in males; 93.3 vs. 89.7 in females). The rate of reproduction increased in both sexes, but the marriage rate increased only in females. These rates were ascertained at the time of first hospital admission, so they do not reflect any influence of drug treatment.

The effect of divorce on the rate of reproduction of patients following hospital discharge is a new and increasingly important limiting factor in attempts to assess post-psychotic fertility. The incidence of divorce is significantly elevated among schizophrenic patients (Jorda-Moscardo and Munk-Jørgensen 1986), and Bleuler (1972) estimated a divorce rate of around 50 percent in his series of schizophrenic patients. Another limiting factor could be the trend to postpone the first pregnancy in the general population. In Norway, the average age at marriage has increased in both sexes as has the mean age of delivering mothers. The general population is now following the same trend seen in schizophrenia, with the maximum age-specific fertility rates being seen in higher age groups.

Unwanted pregnancies are an important source of psychiatric morbidity both for psychiatric patients and their children (Burr et

al. 1979). For the patients, the responsibility for a family is frequently an obstacle on the road toward social rehabilitation. For the children, the "broken home" situation, with one parent episodically away in the hospital and the other frequently absent (divorced), poses an increased risk to their own mental health. Ødegård (1960, 1980) considered this social/psychiatric problem of such importance that he estimated the number of Norwegian newborns each year at risk of having a parent who was a former hospitalized psychiatric patient (1,800 per 50,000 births) as well as the rising number of discharged patients in the population.

Another question about reproduction in schizophrenia is whether there is an increase in fetal and perinatal deaths or an increased perinatal morbidity. In studies covering offspring born to parents from 1829 to 1960 (e.g., Modrzewska 1980), the incidence of stillbirths and of infant mortality (including perinatal mortality) was significantly elevated in schizophrenic patients in comparison with local controls. However, in more recent studies (e.g., McNeil and Kaij 1973a, 1973b), no statistically significant differences were observed. The selection of schizophrenic patients differed significantly in the earlier studies, which included mostly patients of the nonparanoid subtype, and, of course, the standard of obstetric care has also changed.

Progressing from being considered primarily a problem of eugenics, fertility in schizophrenia has become an important social problem. Perhaps partly as a result of improvements in the treatment of schizophrenia and the trend toward outpatient care, schizophrenic patients now conform

much more closely to the general population in their reproductive behavior. Accordingly, the mental health of their offspring deserves increased attention.

### Selection for Marriage in Schizophrenia

Psychiatric morbidity, as measured by first admission rates, is higher in unmarried than in married persons, and the excess morbidity among the unmarried is also consistently higher in males than in females. A comparison of first admission rates for functional psychoses in Norway (a total of 28,511 admissions for 1956–65) revealed a single/married ratio on the order of 3.4 for male patients and 2.2 for female patients. Selection for marriage mediated by a "normal personality" has been considered a most likely explanation. The greater male differential has been related to a greater presence of prepsychotic personality traits in single males (Ødegård 1971). That prepsychotic marriage handicap is involved is illustrated by the significantly greater single/married ratio for schizophrenia than for manic-depressive psychosis (in schizophrenia, 7.7 and 4.5 for males and females, respectively; in manic-depressive psychosis, 1.5 and 1.3 for males and females, respectively).

More specifically, there has been a significant rise in the single/married schizophrenia ratio since 1931–45, when it was 4.3 and 3.7, respectively, in males and females, while the ratio has not changed in manic-depressive psychosis for either sex. This increased morbidity of the unmarried schizophrenic patient is surprising in view of the fact that marriage rates in the general population in the 1950's and 1960's were

considerably higher than in the 1930's, when unemployment was high and the economic situation difficult. However, the extreme narrowing of the concept of schizophrenia, which became almost synonymous with the nonparanoid and paranoid subtypes following the introduction of psychotropic drugs and the subsequently higher frequency of social remissions, has probably contributed to the increased morbidity associated with being single; unmarried patients predominate among the nonparanoid subtype. The most likely explanation for the increased discrepancy in morbidity (7.7 to 4.5) between the two sexes is probably the earlier decline in these severe cases among females, attributable to their earlier physical maturation (age at puberty).

The distribution by age of single and married cases differs significantly. Age-adjusted rates (indirect standardization) therefore give an incomplete picture. A comparison of the age-specific rates, however, showed increased rates of morbidity for the unmarried in all age groups, but with a striking maximum below 30 years of age.

If the selection for marriage in schizophrenia is mostly affected by early, insidious onset of illness, and such cases have a lower frequency nowadays, a higher marriage rate is to be expected in more recent investigations. In fact, marriage rates for schizophrenic males in the various studies were as follows: 23 percent in the North Swedish isolate (Modrzewska 1980); 40 percent in Swedish birth cohorts from 1881–1900 (but only 14.6 percent in the nonparanoid subtype) (Larsson and Nyman 1973); above 40 percent in Norway (Ødegård 1953, 1971); and above 50 percent in German admissions from 1949–50 and 1965–67

(Propping et al. 1983). There was a peculiar increase in postpsychotic marriages on the order of 17 percent in schizophrenic males in the last investigation.

This "second selection" for marriage in schizophrenia has been studied in more detail by Folnegovic-Smalc (1979) in a series of 402 hospitalized schizophrenic patients from Croatia. Using information in the local psychiatric case register, Folnegovic-Smalc later widened the investigation to include a representative sample of nonhospitalized persons with schizophrenia in the population. The proportion of single, married, divorced, and widowed did not differ between the hospitalized and nonhospitalized cases. The hospitalized group was therefore considered representative of schizophrenia in the defined areas and was followed up with special attention to change in marital status. The proportion of divorced schizophrenic patients was eight times that expected from the general population. Unlike divorced persons in the general population, divorced schizophrenic patients rarely remarried.

Age at onset of illness and subtype of schizophrenia appeared to be important determinants of prepsychotic marital status. Similarly, the later clinical picture and course of illness also appeared to influence marital status. Patients with a favorable course generally tended to marry at the same age as those in the general population. These (postpsychotic) marriages further widened the gap between single and married schizophrenic patients, since the negative characteristics (e.g., lower status employment and poorer socioeconomic conditions) associated with a diagnosis of schizophrenia were less common in

married patients. Among married patients, those with a poorer clinical course and lower socioeconomic position had a higher divorce rate. The chance of a schizophrenic patient remaining married was directly related to his or her clinical picture and course of illness. This was also confirmed by the more benign clinical picture in widowed schizophrenic patients of advanced age despite a long-term history of schizophrenia. As a consequence of the two selective processes—prepsychotic and postpsychotic—for marriage and the mechanisms underlying intact marriages in schizophrenia, single and divorced patients had a far worse prognosis than their married counterparts.

The high risk of marital disruption in schizophrenia was investigated by Slater et al. (1971) in 1952–66 admissions to a London hospital. They showed that married schizophrenic patients spent an extremely small part of their reproductive years (defined as ages 20–44) in the married state (only 42 percent of the general population rate for schizophrenic males and 60 percent for schizophrenic females).

In their comparative census study of Danish schizophrenic patients hospitalized during 1977 and 1982, Jorda-Moscardo and Munk-Jørgensen (1986) noted that an increase in divorced schizophrenic females had occurred concomitantly with a decline in married schizophrenic females. The proportion of divorced females rose from 15.7 percent in 1977 to 19.2 percent in 1982 (as against an expected rate of 7.2 percent), while the proportion of married schizophrenic females fell from 20.2 percent to 17.2 percent over the same time period. The schizophrenic males showed no similar changes. The authors focused on the rise in divorced

schizophrenic patients. However, although the Yugoslav investigation found a similar distribution by marital status in hospitalized and nonhospitalized schizophrenic patients, given the efficacy of modern treatments with patients spending a greater part of their lives outside the hospital, one would expect an increasing proportion of the married schizophrenic patients, especially female patients, to spend more time outside the hospital. As suggested by Strömngren (1987), a likely explanation for the change might be a lower proportion of married schizophrenic females in the hospital due to their better prognosis.

Since the first observation of excess morbidity in unmarried schizophrenic patients, the question of marriage as a "protective factor" has been debated. To date, however, there is no evidence that such a factor exists (e.g., Ødegård 1953, 1971, 1972*b*; Gittelman-Klein and Klein 1968; Turner 1970). Eaton (1975), in his study of marital status and schizophrenia, considered the morbidity of the widowed to be crucially important. He calculated what he called a "ratio of selection" (never married/widowed) from age-adjusted admission rates in five different studies. The morbidity rates for the never married were substantially higher than the rates for the widowed (both sexes) in all studies. He therefore concluded that there was clear evidence of selection for schizophrenia among the never married rather than protection by marriage.

### Marriage Pattern, Inbreeding, and Schizophrenia

The low rate of reproduction in schizophrenia does not explain the



maintenance of the disease in the population. While the role of genetics is convincingly demonstrated in families with several affected relatives, the extremely high discordance rate (about 50 percent) in monozygotic twins (Gottesman et al. 1987) indicates the insufficiency of genetics alone as an explanation for the disorder.

An alternative approach to this investigative conundrum is offered by the Norwegian 1891 census, which includes information on consanguineous relations (inbreeding) between spouses and statistics on admissions to psychiatric hospitals dating back to the middle of the last century. This unique census formed the basis for an investigation by Saugstad (1986) and Saugstad and Ødegård (1978, 1987) of whether there was an association between two variables—inbreeding and schizophrenia in the population.

Only sparsely populated rural communities were included in the study, and the proportion of continuous residents exceeded 80 percent. Of the total 326,083 marriages with both spouses alive in 1891, 240,368 marriages were recorded in these communities, where consanguinity (cousin marriages) averaged 8.3 percent (range 4–31 percent) as compared with less than 2.5 percent of the remaining marriages. First admissions to psychiatric hospitals by diagnosis were available for the years 1921–40, with a total of 11,108 admissions. Age-adjusted admission rates were computed for each of the 416 municipalities, and separate admission rates were also computed for the nonmigrant population, as well as for each of the 18 counties in Norway. For that era, “functional psychoses” were the only diagnoses. When the diagnostic changes on readmission were included, more than 80 percent of

the first admissions for those years were classified as schizophrenic. There were similarities between the pattern of inbreeding and admission rates in the rural communities, but we were unable to demonstrate any significant correlation.

Admissions to psychiatric hospitals do not equal total psychiatric morbidity, and the diagnoses extracted from official sources are usually not reliable or useful for such estimates. The National Norwegian Case Register is, however, a very special institution—due, in large part, to the initiative and work of one person, Ørnulv Ødegård. His interest in diagnosis resulted in the introduction in 1935 of a new Norwegian system for classification (very similar to the later ICD-8) that was applied to all admissions. Ødegård personally checked and coded all diagnoses, and he was particularly interested in diagnostic changes on readmission. For a period covering admissions over nearly 70 years, the National Case Register was a one-man register. Through the years, Professor Ødegård’s narrow concept of schizophrenia remained constant (Saugstad 1986). Nationwide hospital facilities were well established between 1921 and 1940, and the accuracy of information has been considered satisfactory.

The information in the 1891 census has also been fairly complete. Wives were asked directly about genetic relatedness to their husbands, and a satisfactory answer was obtained from 97 percent.

The proportion of first cousin matings among parents of psychiatric inpatients admitted in 1926–55 (a total of 22,000 first admissions) was also investigated. This was possible because the index card of first admissions includes the following question: “Are the parents of

the patient related [other than by marriage] to each other?” This question was answered by more than 75 percent. A control study of a representative sample did not reveal any additional cases. Only a 0.9 percent rate of first cousin marriages was observed in the parental generation as compared to an expected level around 2 percent. The inbreeding level was therefore well below expectation and more in accordance with the patient’s own generation. It was therefore concluded that there is probably less psychiatric morbidity, as measured by admission to psychiatric hospitals, among offspring of first cousin marriages than in the general population of Norway.

This conclusion is in agreement with Helgason’s (1979) findings in Iceland. He recorded all first cousin marriages in 1916–64 ( $n = 378$ ). Only the rates for mental retardation and organic syndromes were higher among children of first cousins than in the controls. In the Norwegian series, schizophrenia and paranoid psychosis were less frequent than expected from the control series (Saugstad and Ødegård 1987).

If lower psychiatric morbidity in offspring of consanguineous parentage is accepted, Saugstad and Ødegård asked, “how was selection against mental disorder possible in marriages between close relatives in the last century in Norway?” It required good knowledge of the other family, which was exactly the case in the sparsely populated rural communities. When they investigated the preindustrial (1600–1850) marriage pattern in Norway, Saugstad and Ødegård (1977, 1978) found that the heirs to independent farms married within the local community in more than 98 percent of cases, and there was a predomi-

nance of marriages contracted between partners living in geographical proximity.

The marriage pattern of previous generations contributes significantly to the genetic structure of the present population. The functioning of the rural communities as marriage isolates and the particular marriage pattern based on extreme geographical proximity of residence of spouses must necessarily have resulted in a varying degree of consanguineous relationship between spouses. The resident population was probably considerably more closely related than estimated from the inbreeding coefficient. We would expect their descendants to be more or less closely related and to possess a similar genetic structure.

Inbreeding as the main factor responsible for the extremely high prevalence of schizophrenia in the North Swedish isolate population is unlikely in view of the fact that the prevalence of schizophrenia in neighboring regions of Finland is similarly high (Vaisanen 1975; Lehtinen and Vaisanen 1981) and the conditions are similarly poor. The Swedish isolate was populated by three Finnish families in the 17th century, and its prevalence for schizophrenia should better have been compared with neighboring Finland than with the mean for Sweden.

Kendell (1987) has stated that manic-depressive psychosis and schizophrenia appear to breed true, and Gottesman et al. (1987) have emphasized the specificity of a family history of schizophrenia in conferring an increased risk for schizophrenia, but not for manic-depressive psychosis or delusional disorder. This is in accordance with the present hypothesis of schizophrenia and manic-depressive

psychosis as neurodevelopmental disorders occurring at opposite ends of the continuum of physical maturation rate (age at puberty) with "normality" in between. They differ in the fact that several diseases (genetic and nongenetic) may present as "schizophrenia," whereas there is no phenocopy of manic-depressive psychosis. The lack of difference in clinical picture between so-called heritable and nonheritable cases of schizophrenia (familial vs. sporadic cases) (Ødegård 1972a; Jablensky 1986; Saugstad 1986; Saugstad and Ødegård 1987) underscores the insufficiency of a single genetic factor for the development of schizophrenia.

The suggestion that manic-depressive psychosis might be "caused" by a single gene on chromosome 11 (Egeland et al. 1987) or in other cases by an allele on the X chromosome (Baron et al. 1987) is not contrary to the view that manic-depressive psychosis is a neurodevelopmental disorder affecting very early maturers. The allele is not destiny, because less than 70 percent of those who inherit the allele develop the disorder. It would be of great interest to know what other particular characteristics were inherited by those family members who inherited the allele for manic-depressive psychosis. In the future, we will probably see reports such as Sherrington et al.'s (1988) suggesting a susceptibility locus for schizophrenia on chromosome 5, as well as evidence against linkage of schizophrenia to markers on this particular chromosome (Kennedy et al. 1988). The strong evidence against linkage in Kennedy et al.'s investigation is interesting since they studied families in the North Swedish isolate (Böök 1953), all of whom could be

traced back to the three Finnish families settling in the region in the early 17th century. Further, they comment on the particularly severe schizophrenia symptomatology with poor response to neuroleptic medication.

The neurodevelopmental hypothesis eliminates the problem related to the low reproductive rate in schizophrenia that is posed in a single major gene hypothesis. There are enough people in the population at each end of the maturational rate continuum to maintain a lifetime risk of about 1 percent for schizophrenia and manic-depressive psychosis, respectively.

### **Social Class, Social Mobility, and Occupation in Schizophrenia**

A varying excess of schizophrenia in the lowest social strata of society is to be expected for several reasons:

1. The etiology of schizophrenia as a neurodevelopmental disorder affecting extremely late-maturing individuals and the existence of social differentials in maturational rate imply that the greatest number of schizophrenic cases will be found in the lowest social categories. The extent of overrepresentation of schizophrenic cases will vary in relation to the extent of the social class differentials, which range, for example, from negligible ones in Scandinavia (Brundtland et al. 1980) to increasing differentials in the United Kingdom (Whitehead 1987).

2. The multiplicity of adverse factors prevailing in the lowest social categories—for example, higher prenatal, perinatal, and postnatal morbidity (Saugstad 1985; Saugstad and Ødegård 1987)—as well as the higher later morbidity will probably

lead to an increase in forms of schizophrenia with a more severe course of illness as a result of greater involvement of the central nervous system.

3. A rising number of cases of schizophrenia in the lowest social classes is also to be expected as a result of social selection. The markedly greater morbidity seen in unmarried as compared to married schizophrenic patients—the respective admission rates for unmarried males and females were 7.7 and 4.5 times those for their married counterparts in Norway in 1956–65 (Ødegård 1971)—illustrates the significant prepsychotic personality handicap in schizophrenia. Social selection, meaning upward social mobility, is apt to be rare, although probably more frequent today than previously, due to the marked reduction in the most severe forms of schizophrenia. Failure to achieve the expected social level or simply downward drift in social position is probably the rule, thereby increasing the proportion of schizophrenic cases in the lowest social classes.

**An Index of Selection.** In contrast to the case in schizophrenia, in manic-depressive psychosis, the unmarried patient shows little excess morbidity as compared with the ever-married patient (1.5 and 1.3 times higher admission rates, respectively, in male and female first admissions in 1931–65 in Norway (Ødegård 1971). Thus, there does not appear to be a special prepsychotic personality handicap in manic-depressive psychosis that interferes with social mobility. This conclusion is supported by the significant excess of manic-depressive psychosis in the upper classes (Stenbäck and Achte 1966; Ødegård 1975b; Helgason 1979).

In an investigation of all 1916–29

high school graduates in Norway (a total of 18,000) followed until 1973, Ødegård (1975b) found that manic-depressive psychosis was 2.3 and 1.7 times more frequent in males and females, respectively, than in the general population, whereas schizophrenia was underrepresented in this population. The high school graduates were an upper class educational group from predominantly urban settings. In view of the hypothesized etiology of manic-depressive psychosis as a neurodevelopmental disorder affecting early maturers, this finding is expected and also suggests that there is no particular personality handicap in manic-depressive psychosis.

The ratio of schizophrenia over manic-depressive psychosis was 1.8 and 1.1, respectively, in males and females, as compared to 3.5 and 2.4, respectively, in the general population. We can use admission rates for schizophrenia over admission rates for manic-depressive psychosis as an *index of selection*. This has already been done.

The social differentials are minimal in Norway. The Central Bureau of Statistics has not been able to devise a social classification that differentiates with regard to mortality rates. Mortality and morbidity rates differ significantly, however, by occupation, and occupation reflects a number of factors linked to social status. Occupation has also been used as an index of social status. Ødegård (1956, 1975a) examined 13 occupations of 34,457 male first admissions (ages 20–69) in 1926–50 (excluding general paresis and alcoholic psychosis). The highest admission rates (including the highest rates for schizophrenia) were found in occupations with the lowest social prestige, training requirements, and income (farm

laborers, sailors, etc.). The lowest admission rates (including the lowest rates for schizophrenia) were found in technicians, merchant naval officers, owners, managers, etc. The index of selection was minimal in these occupational categories—2.2 and 2.0, respectively, in owners/managers and professional staff versus 6.4 and 6.9, respectively, in sailors and farm laborers. This illustrates the relation between schizophrenia and low social status. The role of selection (failure to rise) in schizophrenia can be seen in the time trend in rates of admission. Admission rates increased in declining occupations (i.e., with a decreasing population) such as farm laborers, with their excess of schizophrenia, and decreased in expanding occupations such as technicians.

The study of internal migration (about 15,000 first admissions in Norway in 1958–63; Astrup and Ødegård 1970) illustrates the selective effect of migration on admission rates, particularly for schizophrenia. The population of Norway is comparatively stable, since about 54 percent were residents in their community of birth in 1960 and an additional 20 percent had not moved out of their county of birth. The admission rates for the migrants (whether of rural or urban origin) were below those for the nonmigrant population except in a few relatively uncommon routes of migration (e.g., from cities to rural communities). The rates for schizophrenia were invariably low in the migrants, with one exception. In the Oslo area, admission rates for schizophrenia were higher in the migrant than in the city-born population. Astrup and Ødegård (1970) considered this selective migration to Oslo analogous to the Norwegian overseas

migration in the last century, which was described by Ødegård in his *Emigration and Insanity*; the selection there had been attributed to pre-psychotic personality traits or initial symptoms in an insidious psychosis.

### Social Mobility and Social Selection

Until recently, for a person to desire to move upward and out of the working class was regarded as "treason" in many European countries. Today, the social classes are not made up only of people who were born in them (self-recruitment). A varying proportion has been recruited from other social classes, either as a result of people climbing up or drifting down in status. High social mobility or marked social selection is in many ways desirable as a means of increasing social and economic efficiency in our increasingly complicated societies.

In the United States, the idea of upward mobility and the conviction that opportunities exist are considered fundamental to the ideal of an "open" society. Upward mobility is a socially accepted goal, whereas a fall in status (drifting down) is not considered a desirable outcome.

In the United Kingdom, the social structure is less flexible, as can be seen in the high degree of self-recruitment in the upper social strata. Glass (1954) reported that in 1949 nearly 50 percent of men in social category I (professional and high administrative) had fathers of the same status; the maintenance of parental status was even more evident in category V (skilled manual and routine grades of nonmanual), where over 50 percent of fathers and sons had the same status.

There were indications of a decline in self-recruitment for generations born in 1920–29, as compared with 1900–09, with considerably more upward and downward movements in social status between generations occurring for the later-born group. For the 1920–29 cohort, over 70 percent of men whose fathers were in category VII (unskilled manual) had advanced to higher social categories; and over 50 percent of men whose fathers were in category VI (semiskilled manual) had likewise improved their social status. On the other hand, there was a fall to lower social categories in more than 60 percent of the men born in social categories I and II (professional/managerial and executive).

Social mobility was significantly greater than expected in the lowest social categories in Aberdeen (200,000 inhabitants in 1962), Scotland, when Birch et al. (1970) investigated the prevalence particularly of mild mental subnormality (IQ 60–75) in the 8,274 children born in the city in 1952, 1953, and 1954, respectively. The Department of Education in Aberdeen, Scotland, administers standard achievement tests at ages 7, 9, and 11, and about 98 percent of the children had taken the tests at age 7. The prevalence of psychometrically ascertained IQs between 60 and 75 rose from around 3 per 1,000 in social class I to over 30 per 1,000 when the father was semi-skilled (social class IV) and around 60 per 1,000 when the father was unskilled (social class V). In Scotland, with its homogeneous and stable population, there was, contrary to expectation, no stable "underclass." Both parents had been born and reared in the "underclass" in only 23 percent of the families; in the remaining families, either the father (41 percent)

or the mother (36 percent) had drifted down.

Internal migration is frequently synonymous with upward social mobility. The lower 1958–63 admission rates in the migrant population in Norway compared with rates in the residents in community of birth (Astrup and Ødegård 1970) suggest a favorable effect of social mobility on psychiatric morbidity. This has also been verified.

In his study of the psychiatric morbidity of male high school graduates, Ødegård (1975b) categorized the graduates according to whether their occupational level was higher than (36 percent), the same as (45 percent), or lower (19 percent) than their father's. Morbidity rates were 87 percent of expectation when the son's occupation was higher than the father's; equal to expectation when the son's occupation was similar to the father's; and 15 percent above expectation when the son's occupation was lower than the father's (the remaining graduates were not gainfully employed and had morbidity rates more than 50 percent above expectation). A similar pattern was observed in female graduates except that the category "not gainfully employed" had morbidity below expectation (married). The risk of higher morbidity when remaining in the same occupation as the father was operant regardless of social level, but it increased with decreasing social level.

### Excess of Schizophrenia in the Lowest Strata of Society

The higher risk of schizophrenia among the lower classes is one of the most consistent findings in psychiatric epidemiology. Eaton (1980), in his review of 17 studies conducted throughout the world,

found that as many as 15 observed the same inverse relation between class and schizophrenia that was first observed by Faris and Dunham in their investigation of Chicago in 1939: a concentric pattern, with the highest admission rates for schizophrenia in the central slum areas of the city with the lowest SES and then diminishing rates as one moved out of the city toward the high-status suburbs. Class differentials are sharper in the cities, and increase with the size of the city. This pattern has been accepted as characteristic of the big cities. The central parts of the big cities may gradually deteriorate as the population decreases through a selective outward migration. Those who remain represent a negative selection, and in addition, deviants (mostly unmarried) move in from the surrounding rural areas or small towns. As poverty increases, we find an excess of parapsychiatric events associated with mental illness (with a particular rise in schizophrenia) (Ødegård 1975a).

The best known exception to this pattern is the Hagerstown, MD, study by Clausen and Kohn (1959). They found no relation between either occupation or the social status of the area and admission rates for schizophrenia. There are several confounding factors that could have come into play—for example, an overrepresentation of married versus unmarried schizophrenic patients, differing proportions of males and females in different occupations, and a lack of adequate and stable hospital facilities and diagnostic criteria in the period investigated. In 1949, Hagerstown got a new private hospital. Therefore, the first 5 years are not informative data sources because they might include individuals who required care previously but did not

receive it until the hospital became available. In fact, annual admissions in the county rose from 14 (1940–48) to 25 (1949–52); diagnostic practice also changed because fewer cases of schizophrenia were diagnosed in the new hospital; and social distribution probably also differed in the private versus the public hospital. Concomitantly, there was a decline in admissions to the public hospital, which may have affected diagnostic distribution since commitment procedures differed in the facilities. There is no information on diagnostic criteria or on diagnostic changes on readmissions (whether they were included). Between 55 and 60 percent of first admissions were classified as schizophrenic, indicating a broad concept of the disorder, but the number of admissions was small (62, which fell to 59 when 3 ambiguous cases were excluded), and there is no information on the trend. Information is also absent on the proportion of single/married, females/males, or occupational distribution. Patients in the lowest social status seem to be lacking, and one may ask whether they have migrated.

Hagerstown, MD, gives the impression of a small, stable, well-integrated community with a homogeneous white population of 36,000 and a predominance of married people with their extended families in the neighborhood. The social, occupational, and residential differences are probably minor. In this context, we would not expect a great excess of schizophrenia in the lowest strata. The observed lack of relation between either occupation or the social status of an area and admission rates for schizophrenia in Hagerstown tells little when we consider the above-mentioned insufficiencies in the data. Moreover, Clausen and Kohn (1959) did not design their study to look at

this relationship but, rather, to compare the social experiences of schizophrenic patients with those of normal persons from similar backgrounds and to test hypotheses on the role of social isolation and of parent-child interaction in the development of schizophrenia. Against this background, it is somewhat surprising that the authors simply accepted the relationship between low social status and schizophrenia as overwhelming but less surprising that they insist on the decisive importance of psychological factors (social causes) for the development of schizophrenia (Kohn 1973, 1976).

### Social Causes of Schizophrenia

Kohn (1976) suggests that the relation between class and schizophrenia exists because conditions of life experienced by people of lower social class position foster conceptions of social reality so limited and rigid as to impair their ability to deal resourcefully with the problematic and stressful situations that they encounter. In conjunction with genetic vulnerability, this impairment in dealing with stress could be disabling.

The idea that a lower class environment should foster particular conceptions of reality is difficult to comprehend unless we assume that lower class people live and die in the social isolate in which they were born, unable to cope with their own individual problems. As we know from the United Kingdom (Glass 1954), this is not so. More than 70 percent of those born in the lowest category rose to higher social levels. Social mobility is considerably greater today. In the United States, Long and Vaillant (1984) followed 456 male inner-city dwellers

(ages 12–16, mean IQ 94) in Boston, MA, until they were 47 years old. They wanted to test the hypothesis that extreme poverty and a chaotic family life produce a self-perpetuating “underclass.” This was not the case.

The Boston men were assigned to the following four categories when they were children: chronic dependent, multiproblem, nondependent/nonproblem, and finally class V nondependent/nonproblem). Although the intergroup differences were very clear when the men were children, by age 47 men from chronic dependent and multiproblem families were almost indistinguishable from those without such initial disadvantages (including income, employment, global mental health as assessed by Luborsky’s Health-Sickness Rating Scale [Luborsky 1962], etc.). Upward social mobility was somewhat rarer in the first three categories, but the correlation of childhood social class with adult social class was just 0.13. Only 19 percent of adults in class V had belonged to multiproblem families. Moreover, the upward mobility took place despite the fact that the group had been selected for low IQ, and therefore escape through access to higher education was in general denied.

Indeed, the chaos, unemployment, and extreme poverty characteristic of the early lives of these most disadvantaged subjects had not affected the capacity of the majority of them to obtain jobs, hold them, and be promoted. There were, in fact, equal ratings for social class and psychological well-being among the four groups, which suggested unexpected resilience. As the authors state:

If the sense of marginality, hopelessness, powerlessness, or lack

of self-respect that the literature claims is transmitted from one generation to the next had been directly or obliquely expressed by the majority of the disadvantaged groups, such a sense would have been reflected negatively in the 100-point HSRS [Health Sickness Rating Scale]. This was not the case. [Long and Vaillant 1984, p. 344]

The problem of disadvantage was, however, not eliminated by the escape of the majority, as the men from these families died sooner, were more often delinquent, and had worse health. Over half of the class V adults suffered two or more of the following: alcoholism, antisocial personality, IQ below 80, disabling physical illness, schizophrenia, and other mental illness. Nevertheless, the study refuted the hypothesis that the chances of escape from lower class origins are minimal, as escape was the norm rather than the exception. Long and Vaillant (1984) discussed factors that might have made their sample a particularly favored “underclass.” They were white males who moved from childhood to midlife between 1940 and 1975. In 1940, following a decade of universal economic depression, chronically dependent families could have been less alienated and socially deviant than similar families in times of economic prosperity. The group entered the work force at a time when employment levels were high and economic wealth was increasing. It is unlikely that the economically favorable situation after World War II should have unequally favored the most disadvantaged in American society. Long and Vaillant (1984) see a danger that their hopeful findings could be taken to suggest that extreme poverty ultimately presents no problems to the next generation.

They conclude that if deprived family backgrounds do not necessarily permanently disable the majority of urban children, then attempts to intervene and to provide enhanced economic opportunities become a less hopeless and a more urgent task.

Long and Vaillant’s (1984) report describing the lack of a stable “underclass” and the high proportion of psychologically disadvantaged adults who had remained in or drifted down to class V was reminiscent of the experience of Birch et al. (1970) in Aberdeen, Scotland, where in as many as 77 percent of the families of children with mild mental subnormality (MMS = IQ 60–75), at least one of the parents had drifted down from higher social levels. Because of the customary tendency to attribute MMS to an adverse familial and sociocultural environment, this was specially investigated. They found that familial inadequacies or sociocultural deprivations as such did not lower IQ and that there was no subculture inducing MMS. They were, however, struck by the fact that 25 percent of the children with MMS had evidence of brain damage (expected rate < 10 percent) such as cerebral palsy, etc. In the remaining children with MMS, the following factors were overrepresented: poor maternal health, short maternal stature, parity 5 or more, malnutrition, and such pregnancy and birth complications as pre-eclampsia, antepartum hemorrhage, breech delivery, and low birth weight.

The suggestion that emotional disturbances “cause” MMS (the problem of pseudosubnormality) was not supported. Psychiatric abnormalities were associated with central nervous system involvement and with severe mental retardation, suggesting a common cause of both

the behavioral disturbances and the mental subnormality. The study therefore suggests that adverse prenatal, perinatal, and postnatal factors affect brain development, probably by interfering with the second regressive event in the central nervous system at 1–2 years of age. That the rate of physical maturation is involved can be seen in Goldstein's (1971) investigation of 13,000 British 7-year-olds born in 1958. He observed an average difference of 3.3 cm at age 7 between children from social classes I–II and class V. A difference in stature on the order of 13 cm was found in children growing up in the most adverse circumstances (social class V, short maternal stature, poor maternal health, smoking in pregnancy, four or more children, and low birth weight) as compared with those in the most favorable conditions. These adverse circumstances are almost identical to the ones reported from Aberdeen. The slower rate of growth and maturation characterizing social class V in Aberdeen, Scotland, as well as the individuals studied by Long and Vaillant (1984) in Boston, MA, suggest that these groups contained a high proportion of late maturers (late puberty) with a high risk of schizophrenia. Through improvement in the standard of living, with the reduction or elimination of factors inhibiting children's growth (elimination of social differentials in rate of maturation), together with improvement in medical care, we should be able to reduce significantly the excess of MMS in the lowest social class as well as the most severe and chronic forms of schizophrenia. An effect of the overall improved economic situation in Chicago, IL, for example, was Levy and Rowitz's (1970) inability to demonstrate the concentric pat-

tern of first-admission rates for schizophrenia described by Faris and Dunham in 1939. During the intervening years between the two studies, the character of the inner city had changed, including the social class V poverty as well.

Kohn's suggestion that social class V is conducive to schizophrenia is unlikely since it is neither homogeneous nor self-recruiting; the majority have mostly drifted down, thereby contributing to an even greater excess of severe schizophrenia than that due to the adverse living conditions in the lowest strata of society.

### Social Drift and Social Selection in Schizophrenia

In *Search for the Causes of Schizophrenia*, Häfner (1987) rightly asks why the enormous research effort that has been focused for several decades on the epidemiology of schizophrenia has not yet led to the insight that the explanatory power of the "breeder" hypothesis is very limited. Häfner cites Ødegård's (1956, 1963, 1971, 1975a) longitudinal studies of occupational and social mobility in Norway, which very clearly demonstrated the superiority of the "selection" hypothesis to the "breeder" hypothesis in explaining the sociocultural distribution of schizophrenia. These studies comprised more than 38,000 first admissions in Norway during 1926–65 who were followed from 5 to 50 years, and they provided information on occupation, marital status, number of children, place of birth, place of residence, initial diagnosis, and diagnostic changes on readmission. Häfner attributed the failure of most psychiatric epidemiologists to accept Ødegård's findings to the immunizing power

of a research paradigm favored by the Zeitgeist against "nonconforming" results. This may be so.

The construct of socioeconomic class or stratum is admittedly too imprecise to test hypotheses about the contribution of social factors or to explain selection processes. No one hypothesis, be it social drift and selection or vulnerability to social stress, can explain all the findings, and most likely, the causal chain is long, complex, and variable (Ødegård 1975a). Ødegård also commented on certain confounding factors that limit studies that examine admission rates in relation to occupational status (e.g., legal inheritance and the law of primogeniture) and the influence of local admission rates in geographically delimited areas on occupational rates (e.g., fishermen invariably reside in areas with particularly low admission rates). Despite such problems, the selection hypothesis has now been fairly generally accepted.

In the last two decades or so, interest has focused on the size of the discrepancy in social and occupational status between the father and his schizophrenic son. American (Hollingshead and Redlich 1958; Dunham et al. 1966; Turner 1970) and Canadian researchers (Bland and Orn 1981) maintain that the fathers themselves are overrepresented in the lowest SES categories. In contrast, European researchers (e.g., Goldberg and Morris [1963] in England; Wiersma et al. [1983] in Holland; Pieschl and Hirschberg [1984] in Germany) maintain that the fathers of schizophrenic patients are distributed according to expectation in the general population. Their interest has focused on the failure of schizophrenic sons to achieve socially expected levels

before the onset of illness and their downward social drift after onset (Silverton and Mednick 1984). Differences in social mobility and socioeconomic structure, as well as other confounding factors, may explain discrepancies in the results of studies conducted in North America and Europe.

The concept of schizophrenia differs throughout the studies, as does the way in which the patients were ascertained. Some samples are limited to first admissions, whereas others consist mainly of chronic cases. Different methods of social class categorization are also used. Attention has not been paid to such factors as maternal occupation, divorce (in case the father's occupation seems less relevant as social background), and exclusion of subjects because of illegitimacy. The main problem, however, is the small number of schizophrenic subjects in each study, which may explain the lack of data analyses by sex, by marital status, by schizophrenic subgroup, etc.

Wiersma et al. (1983) selected 230 first admissions during 1978–79 (ages 15–44, inpatients and outpatients), and a secondary screening yielded 100 cases with recent onset of functional (non-manic-depressive) psychoses. There were 17 refusals, and only 34 patients classified as schizophrenic after a 2-year followup. Despite the strategy of categorizing housewives according to their husbands' occupations, social class information was only available for 59 percent ( $n = 20$ ), reflecting the exclusion of students and those who had never worked. The marked excess within the three lowest social classes of the remaining 20 schizophrenic subjects cannot be taken to demonstrate a similar relation between schizophrenia and social background. Nor

does the comparison of the 34 fathers' social class distribution with that of the subsample of 20 schizophrenic sons reflect the extent to which the fathers' status exceeds that of their 34 sons. The use of a Dutch general sample as controls, particularly with regard to educational distribution, may not have been appropriate in the university town (Groningen) where the investigation took place. In fact, the mean level of education of the fathers of all patients in the total sample, as well as that of the 34 fathers of the schizophrenic patients, was not only above the expected level in their generation, but corresponded to the higher level expected in their sons. Moreover, the mean educational level of the total sample of psychotic patients and of the schizophrenic subsample was strikingly above expectation (2.8 and 2.9, respectively, vs. expected 2.2).

Pieschl and Hirschberg's (1984) German investigation included only inpatients (127 schizophrenic patients, ages 20–40, admitted in 1977), but they note that 29 schizophrenic cases were treated as outpatients in the same year. Information on occupation was available for only 104 of the 127 schizophrenic inpatients. As in the study of Wiersma et al. (1983), housewives were placed in their husbands' occupational categories and students were excluded. The father's occupation was known in only 89 families, probably related to the immigrants (20.5 percent) included in the study.

Bland and Orn's (1981) study of 43 schizophrenic patients (22 males and 21 females) followed for 14 years also included immigrants ( $n = 10$ ; males only?). How this influenced social background in the sample is unknown. The authors

state that the fathers had a mean SES index below the mean for the Alberta, Canada, town in which the study took place.

Let us now turn to the main discrepancy between North American and European studies: whether the social background of schizophrenic patients differs from the general population or not. We may start with Goldberg and Morrison's (1963) classic study, in which they found that the "fathers appeared to represent a typical occupational sample of the population at the time of their sons' admission" (p. 786). Their sample of 672 male first admissions in 1956 (ages 20–34) was drawn by the Registrar General for England and Wales; only 509 (75 percent) of the 672 birth entries were found ("a large proportion of the patients whose entry could not be found had foreign names and were probably born abroad," p. 786). However, Goldberg and Morrison (1963) do not discuss 509 schizophrenic patients, but 351 schizophrenic sons (52 percent) and their fathers. The authors state that the results for men aged 20–24 are difficult to interpret, for their fathers "do not resemble the general population as closely as the fathers of patients aged 25–34" (p. 787). It seems unlikely that foreign-born patients could have accounted for all the first 25 percent excluded (163 of 672 schizophrenic patients). Perhaps, some of these excluded schizophrenic cases came from broken homes or were born out of wedlock. The exclusion of schizophrenic patients aged 20–24 years ( $n = 156?$ ) is unfortunate. Their inclusion would probably have resulted in a less favorable social background, not altogether in conformity with the general population.

To compare the findings of stud-



ies conducted in different places, we need at least to agree on the basis for classification, but no such agreement exists for categorizations of social class. The Europeans base their classifications solely on occupational level, whereas the Americans use weighted scores for area of residence, education, and occupation. To some extent, this could explain the significant overrepresentation of fathers of schizophrenic patients in the lowest social categories in the United States (e.g., Hollingshead and Redlich 1958). The general trend to higher education means that absolute differences in level of education are to be expected between fathers and sons, as illustrated in Wiersma et al. (1983). The increasing social mobility (upward) also underscores an expected overrepresentation of the father in the lower social classes, probably indicated by their area of residence in comparison with their sons.

In fact, by using occupation only, Dunham et al. (1966) obtained a significant reduction in the discrepancy of social class distribution of fathers of schizophrenic patients ( $n = 62?$ ) and the general population. These investigators were dissatisfied with the measurement of social class. They imagined that the mentally ill would be at a disadvantage, particularly in regard to education. To measure this disadvantage, they constructed a discrepancy index score consisting of the difference between level of education and social class as measured by occupation (using six categories of each). A zero discrepancy score meant that occupation equaled educational level, whereas a negative score indicated that occupation was lower than expected from educational achievement. Excluding students, Dunham et al. found that the dis-

crepancy score for 110 schizophrenic patients was particularly low in comparison with that for nonschizophrenic psychotics. Unfortunately, the absolute levels of education are not shown. Thus, in contrast to the case in Groningen, The Netherlands, we do not know to what extent the schizophrenic sons were able to achieve a higher educational level than their fathers, whose mean discrepancy index was positive and more or less in accord with expectation.

We must also remember that the concept of schizophrenia was not at all comparable in the United States and Europe in the 1950's and 1960's, when an extremely wide concept prevailed in the United States and a narrow one in Europe. The striking excess of schizophrenia observed in deteriorating inner city areas (Faris and Dunham 1939) in the United States probably also included patients suffering from psychoses that would have been classified differently in Europe and similarly in Hollingshead and Redlich's (1958) American investigations. At the same time, the narrow concept of schizophrenia prevailing in Europe and the reluctance to apply the diagnosis initially make it necessary to follow patients for at least 5 years to obtain a more reliable picture of the prevalence of schizophrenia. Diagnostic changes on readmission increase with number of readmissions (Ødegård 1972b, 1975a), and the tendency is to shift from other functional psychoses to schizophrenia (Saugstad and Ødegård 1980, 1987; Saugstad 1986).

On the other hand, we know that many of Hollingshead and Redlich's (1958) patients in class V came from class V families, whereas in Goldberg and Morrison's (1963) English sample, schizophrenic sons were

born in class V in 26 percent (90/351) of cases—as compared with 45 percent in the American series. The two systems of defining social class are not exactly comparable, but social class V comprises unskilled workers in both countries and accounts for approximately 10–12 percent of the population. We know from the study in Aberdeen, Scotland, carried out by Birch et al. (1970) that in more than 60 percent of the cases, fathers of mentally subnormal children in class V were themselves born and reared there (both parents in 23 percent of cases).

The striking excess of schizophrenic patients in social class V among Hollingshead and Redlich's (1958) 872 patients mainly reflects their selection of chronic cases (both sexes, all ages) who had been hospitalized from 10 to 15 years. Continuous care from first admission was rare in the class I and II patients (about 15 percent) but occurred in more than half of the class V patients.

The greater downward drift observed in the European studies as compared to the American studies may reflect the more favorable social class distribution of the fathers. One exception is the study of Cooper (1961), who only observed a slight tendency toward downward drift. This could be related to his allocation of students to their father's social class (other investigators excluded students). It might also reflect the extremely short followup period, which could have meant that most of the patients had not yet entered the work force and had the chance of drifting down. As many as 76 of his 128 schizophrenic cases in classes I, II, and III were in the same occupation when discharged; 32 had a

different employment; and only 20 had no gainful employment.

### Social Class, Course, and Outcome of Illness

Most investigators, whether in the United States or Europe, are in agreement that there is a relation between the schizophrenic patient's social class position and outcome. The lower the social class, the greater is the chance of long-term hospitalization, of relapses, and of a more chronic course of illness. This is in accord with the neurodevelopmental hypothesis of schizophrenia, since we would expect an excess of the more severe forms (the non-paranoid subtypes, for instance) to be found in the lower social categories. The disadvantaged individuals in these social categories, with an excess of bachelorhood, broken homes, and unemployment, are likely to run a higher risk of becoming chronic inpatients as well as of chronic defects. Ødegård (1975a), who used the Norwegian National Case Register to follow first admissions for several decades, found that the clinical picture (subgroup of schizophrenia) decisively influenced course and outcome, but that occupation or social class did not. We must remember that the class differentials in medical care in Norway are minimal because of the general health insurance; all patients are treated in the same hospitals. In none of the other European or American investigations is there a division by subgroup of schizophrenia that could explain their findings.

In addition to the overrepresentation of the most severe forms of schizophrenia among lowest social classes, we may add the important social differentials in intellectual capacity as measured by IQ (Birch

et al. 1970). A higher IQ has a "protective" effect on course and outcome, whereas a low IQ has a detrimental effect (Jones 1973; Jones and Offord 1975). Although most studies excluded cases of "severe mental subnormality" from their samples, the degree to which cases of mild mental subnormality are represented is unknown.

Another topic of interest is the trend toward readmissions. Pieschl and Hirschberg (1984) were concerned by their failure to detect any reduction in the proportion of readmitted schizophrenic patients within their series from 1977 as compared to Cooper's (1961) series, which covered admissions in Bristol, England, in the early 1950's. Of their 127 schizophrenic cases, as many as 56 percent were readmitted, whereas only 32.3 percent of Cooper's cases were readmitted. Pieschl and Hirschberg's first admission patients were discharged after less than 2 months in more than two-thirds of cases (maximum length of stay = 6.5 months). Drugs may admittedly have diminished flagrant psychotic symptoms in this brief period. However, with such short stays, which are also typical in other countries, the illness may not have been adequately treated, resulting in greater proneness to early relapse.

Other authors have expressed concern about the failure of attempts to rehabilitate schizophrenic patients. With the passage of time, a gradual increase is seen in the proportion of schizophrenic patients who drift down to less demanding jobs (Turner 1970) or who in fact have no jobs at all. That is to say, an increasing number of schizophrenic patients lack a "job role" to serve as a protective buffer against social and personal stress from other sources (Ødegård

1975a). Social class V—the category of unskilled laborers—actually comprises a large number of people without regular employment who do incidental jobs that do not lead to anything like a "job role."

In Norway, an increase in the proportion of schizophrenic patients discharged from the hospital as "not cured" did not occur until the introduction in 1960 of an improved disability pension system that included psychotic invalids. Also contributing to the trend toward brief hospitalizations was undoubtedly the fear of creating chronic patients through long-term institutionalization, as well as the striking reduction in hospital beds in recent decades (from over 10,000 beds to less than 5,000). However, the policy of rapid discharge may actually be creating an increased number of cases of schizophrenia, whether they are lodged in hospitals or in the community. This is illustrated by data from The Netherlands.

During the 2 years following the completion of their study, Wiersma et al. (1983) learned of four young males who had become psychotic within the year covered by their investigation. The young men had histories of chronic psychosis and disability. They had received social benefits without any prior psychiatric evaluation, "probably because it is common nowadays for youngsters not to find employment or to opt out of society for emotional, social or political reasons" (p. 148). Despite good educations, they had never achieved any meaningful occupational status. Social outcome in the larger sample studied by Wiersma et al. was strikingly unfavorable, as shown in the 3-year followup of 23 schizophrenic patients. A good social outcome was found in only four cases, and a fairly good outcome was found in

an additional four; the remaining schizophrenic patients all had unfavorable outcomes. To permit their results to be compared with others, Wiersma et al. used specific scaling methods to measure outcome disability. The numbers are small, and their methods should be applied to other, larger series.

In the 1930's with high unemployment and inadequate resources to provide social services to the patient and his family, a great number of largely recovered patients could not be discharged from the hospital. The introduction of the somatic therapies (electroconvulsive therapy, insulin coma), during this period, directly or indirectly, had a greater total impact than the drug treatment introduced in the 1950's. The early somatic therapies opened up existing therapeutic possibilities and, most important, the proportion of patients active in occupational therapy increased significantly. Today, the system of social assistance facilitates the discharge of "uncured" and "unemployable" schizophrenic patients. The ease of obtaining social benefits because of the high unemployment rate can lead (ironically) to a total lack of psychiatric treatment for true schizophrenic patients.

Wiersma et al. (1983) found a particularly low incidence rate of schizophrenia despite screening both inpatient and outpatient facilities in their area. In addition to the importance of their short period of study (as illustrated by the four psychotic males described above), the short followup of their total sample of patients with functional psychosis could partly explain the low incidence of schizophrenia. A number of the functional psychoses may well be classified as schizophrenia on readmission. However,

to cover untreated as well as treated cases, it is evidently necessary to search other places than hospitals, clinics, and outpatient services for the mentally ill. Strömngren (1987) discusses the complications that arise when schizophrenia-like psychoses coexist with drug abuse. It can be very difficult to ascertain which condition is primary—the psychosis or the drug abuse.

Admission to a psychiatric hospital never equaled psychiatric morbidity. But in previous decades, the chance for a person with schizophrenia to be hospitalized during his lifetime was high (80–90 percent). Ødegård, as long ago as 1952, devised methods of calculating, on the basis of hospital statistics and case histories (information on duration of illness before admission), the number of schizophrenic cases "not yet admitted" under the assumption that all surviving cases of schizophrenia would eventually be admitted. These calculations are no longer possible despite the significant decrease in the mortality of schizophrenia, from 4–5 times the general population rate to less than twice the expected rate. A true picture of the social distribution of schizophrenia is therefore difficult.

### **Social Class, Social Stress, and Schizophrenia**

In the article, "Age at Onset of Schizophrenia in Relation to Socioeconomic Factors," Noreik and Ødegård (1967) took as their point of departure T. Braatøy's (1934) thesis, in which Braatøy had advanced the hypothesis that the decidedly earlier age at onset of schizophrenia in males than in females was related to social stress. Adjustment to adult life, especially

working life, could create serious problems even under favorable circumstances, and young men constitute the majority in such out-cast groups as migrants, delinquents, alcoholics, and drug addicts. The age and sex distribution of Braatøy's schizophrenic population corresponded closely to that of men in these categories, and so he concluded that these phenomena could be connected through some common form of social stress—most likely, the mechanism of social isolation. Braatøy's thesis was based on first admissions to Norwegian hospitals in 1926–29, years characterized by nearly permanent socioeconomic crisis and considerable unemployment. Since the Norwegian National Case Register had been established in 1936, and information was available on first admissions by diagnosis back to 1916, Ødegård thought it would be worthwhile to investigate the trend in age at onset of first symptoms of schizophrenia, particularly if there was a relation between lowered age at onset and social stress (socioeconomic crisis). He included the years 1926–60, a total of 38,414 first admissions, with information on the age at onset of the first symptoms in 94.3 percent. He distributed the remaining cases proportionally over all ages below the age on admission.

Age at onset of first symptoms in schizophrenia rarely can be dated precisely, particularly in non-paranoid forms of schizophrenia. Age at onset has been included in Norwegian hospital statistics since 1908, and by 1926 we may assume that the hospital psychiatrists were familiar with the concept and its registration. There is likely to have been a systematic error in designating too high an age of onset because of incomplete knowledge of

the initial symptoms. Possibly this systematic error may have decreased with time, because the case histories became more accurate and complete, which presumably would have resulted in a slight decreasing trend in age at onset. However, between 1926 and 1960, there was an increasing trend in the mean age at onset (males from 28.2 to 30.9, females from 32.3 to 35.7). This apparent increase was due to a corresponding increase in the age of the general population (in particular, a decrease in the 20- to 24-year-old age group, but also in ages 25–29)—a change in age distribution sufficiently great to influence the onset data. Following an age adjustment, it was found that in the years 1931–35, a period with constant unemployment, the median age at onset of schizophrenia was 28.3 years for males and 32.2 years for females. In comparison, in the years 1951–55, a period without unemployment and with “welfare state” benefits, the median age at onset was 26.9 years for males and 32.7 years for females, respectively. As the diagnostic concept of schizophrenia had gradually narrowed between 1931–35 and 1951–55, and an increasing proportion of first admissions were classified as intermediate functional psychoses (reactive psychosis, ICD 298), this category of admissions was added to schizophrenia, but the picture was unchanged.

It was concluded that unemployment and economic crisis are not closely associated with the social stress that is relevant to the precipitation of schizophrenia. Furthermore, there appears to be considerable resistance against any type of stress that weighs upon the entire population or social group to which the individual belongs (a fact later illustrated by the lack of

increase in admission rates for functional psychosis, particularly schizophrenia, during World War II).

In the absence of any apparent influence of the macroenvironment on the onset of schizophrenia, it was suggested that we should concentrate on the microenvironment of the patient’s nearest social milieu: the family. This has in fact happened in England, where research has focused on the impact of life stresses of a personal nature, such as stressful life events and familial stress (Brown and Birley 1968; Birley and Brown 1970).

The least likely mental illness for ascribing onset (or relapse) to life events is schizophrenia. In the delimitation of the reactive or psychogenic psychoses from schizophrenia, particular care was taken to restrict this new category (ICD 298) to those functional psychoses that “are largely or entirely attributable to a recent life experience” (World Health Organization 1978, p. 32). The mental disorders most intimately associated with life events are the multiple types of depressive reactions (ICD 300.4, 301.1, 308.1, 308.4, 309, 311, 312, and 313). They are defined as “precipitated by distressing experience, situation specific and closely related in time and content to bereavement, frustration, exceptional physical or mental stress, etc.” (World Health Organization 1978, pp. 36, 46).

The interesting question, however, is what initiated this change in the direction of psychiatric research in the United Kingdom? Could it have been an article entitled “Post-Hospital Adjustment of Chronic Mental Patients” by Brown et al. (1959)? They showed that successful outcome in schizophrenia was

associated not only with the patient’s clinical status or severity of impairment on discharge, but with the setting to which the patient was sent. Discharged patients who were placed in lodgings or with siblings did better than those who returned to live with parents or wives. This impact of posthospital residence on outcome was significant even after allowing for the fact that sicker patients are probably more likely to be released to parents than to lodgings.

An obvious implication of this impact of life stress on outcome (relapse) was that schizophrenic patients should perhaps not be subjected to the responsibility and privilege of a family life—a situation which, after all, is apt to be a rarity in schizophrenia in view of the high proportion of single and divorced patients and the further rise in divorces after the onset of illness. However, Brown and Birley (1968) obviously wanted to gain more insight into this phenomenon. They succeeded in identifying at least one independent life event preceding the onset of symptoms in 46 percent of cases, but they had had to exclude more than 60 percent of their schizophrenic cases because onset could not be defined. This reduces their 46 percent to less than 20 percent of the sample, as compared to 14 percent in controls.

Some more recent studies have replicated Brown and Birley’s (1968) findings, whereas others have failed to do so (Al Khani et al. 1986; Chung et al. 1986). The adverse effect on schizophrenic patients of “familial stress,” defined as high levels of “expressed emotion,” has been studied by other British psychiatrists (e.g., Leff and Vaughn 1981; Wing 1982).

American researchers (Link et al. 1986) have looked into the adverse

effect of "noisy working conditions" on schizophrenia. Social instability, as measured by the number of changes of residence in the observational period (1962–72), was investigated by Silverton and Mednick (1984) in their study of 207 offspring (20–30 years old) of schizophrenic mothers. As many as 8 of the 14 schizophrenic offspring had changed residence several times, whereas none of the 14 non-schizophrenic offspring had done so.

These various findings are all nonspecific (there is no specific life event associated with the onset or relapse of schizophrenia), and they are also seen in nonschizophrenic individuals. They do illustrate, however, various aspects of the main characteristics of schizophrenic patients—the marked sensitivity to their social (including emotional) environment attributable to their neurodevelopmental disorder. They are vulnerable to overstimulation (high expressed emotion, noisy occupations) but are also sensitive to understimulation (social isolation). They are dependent on their social environment because of their inability to select the most suitable social situation; they simply "migrate" (social, residential instability), usually in a downward social direction.

This striking dependence on the social situation is also characteristic of another group of individuals—the mentally subnormal, for whom a structured milieu and occupational activity geared to their capacity are crucial to functioning. This similarity may to a great extent explain the detrimental effect of low IQ in schizophrenia, as well as underscoring the direction of the therapeutic activities needed to secure optimal functioning and prevent relapses in schizophrenia.

### **Social Class, Prevention, and Schizophrenia**

The significant reduction in the proportion of the most severe cases of schizophrenia (nonparanoid subtypes) during the last 40–50 years, along with the shift to earlier physical maturation (age at puberty), makes it reasonable to question whether a further decrease is possible. The present marked social differentials in growth and maturation in most countries suggest that it is. Improved standards of living, making the inhibition of growth and maturation equally rare in all strata of society, would reduce further the frequency of these types of schizophrenia.

### **Summary and Conclusions**

The hypothesis is presented that the etiology of schizophrenia is neither simply genetic nor environmental, but neurodevelopmental. This hypothesis is based on recent advances in neurodevelopmental biology, which have called attention to the neuronal pruning that occurs in the central nervous system at puberty (elimination of about 40 percent of the neuronal synapses). Schizophrenia is hypothesized to be a disorder particularly affecting extremely late-maturing individuals, in whom greater than optimal neuronal pruning has resulted in excessively reduced synaptic density. In contrast, manic-depressive psychosis is considered a disorder affecting very early maturers (early puberty), in which prematurely abridged neuronal pruning leads to a redundancy of neuronal synapses. This etiological hypothesis is indirectly supported by the characteristic differences in body build in early- and late-maturing

individuals—differences that recall the marked discrepancy in body build observed by Kretschmer (1921/1961) in the two major psychoses. Age at puberty is only partly genetically determined. The alarming rise in the incidence of manic-depressive psychosis, particularly depressions, and the decline in admissions for schizophrenia (especially in countries with a narrow concept of the disorder) have coincided with a decline in mean pubertal age on the order of 4 years in Western Europe and the United States, providing further suggestive support for the neurodevelopmental hypothesis.

There is no relation between age at puberty and either fertility or the proportion of unsuccessful pregnancies. The fertility of schizophrenic women may not be reduced in societies where the practice of birth control is very limited. The present general reproduction below replacement levels in most Western industrialized countries precludes an assessment of "true" fertility. In view of the reduction in the proportion of forms of schizophrenia with early and insidious onset, one would imagine that a decrease in the prepsychotic marriage handicap in schizophrenia should have occurred, as evidenced by a higher marriage rate. This is difficult to verify, however, due to the increase in cohabitation and postponement of marriage in many countries, where a considerable proportion of all births are now out of wedlock (40–50 percent in Scandinavia).

The lowest social classes have a lower rate of physical maturation, with puberty occurring from some months to 2 years later than in higher strata of society. Low social class is also associated with a multiplicity of adverse factors related to childbirth—prenatal, perinatal, and

postnatal events. In view of these facts, a marked excess of schizophrenia is to be expected in this population and has, in fact, been one of the most replicated findings in schizophrenia research. The exceptions are partly related to true minor social differentials (rural areas) and partly due to differences in selection of schizophrenic subjects (different diagnostic criteria for inclusion and exclusion, acute vs. chronic cases, first admissions vs. readmissions), but they also reflect varying durations of followup and differences in the suitability of the controls.

Several of the contrasting findings in Europe and the United States are probably mainly related to differences in selection procedures and social drift, both before and after the onset of schizophrenia, is accepted as a major factor contributing to the excess of schizophrenia found in the lowest social categories.

The significant dependence of schizophrenic patients on the characteristics of their social environment stems from their extreme vulnerability to overstimulation (e.g., high levels of expressed emotions, noisy working conditions) and similar sensitivity to understimulation (e.g., social isolation), and it may reflect their hypothesized neurodevelopmental disorder. The inability of the schizophrenic patient to select the most suitable social situation should be considered in therapeutic activities designed to promote optimal functioning. The small number of schizophrenic patients in most investigations and the lack of analyses by schizophrenic subgroup, by sex, or by marital status underscore the importance of establishing new cumulative psychiatric case registers—particularly if we want to

study the effects of the present trend for earlier puberty on the distribution of schizophrenic subgroups. A further decline in the more severe cases may accompany improvements in the standard of living which reduce the social differentials in rate of physical maturation (age at puberty).

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