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ORIGINAL PAPER

Pedigrees of madness: the study of heredity in nineteenth and early twentieth century psychiatry

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Abstract This article discusses the development of the statistical methods employed by psychiatrists to study heredity as a causative factor of mental diseases. It argues that psychiatric asylums and clinics were the first institutions in which human heredity became the object of systematic research. It also highlights the different concepts of heredity prevalent in the psychiatric community. The first of four parts traces how heredity became a central category of asylum statistics in the first half of the nineteenth century. The second part deals with attempts to introduce new methods of surveying in order to generate more precise data about psychopathological inheritance in the 1860s and 1870s. The third part discusses how, by the end of the nineteenth century, a widespread discontent with the results of asylum statistics led to an increasing interest in the use of family studies. Finally, the fourth part examines the impact of Mendelian theory on psychiatric statistics in the early twentieth century.

Keywords Genealogy · Human genetics · Human heredity · Medical statistics · Psychiatry

Asylums and clinics for the mentally ill were the first institutions to systematically collect data about physical inheritance in man. Laure Cartron (2007) has described how the first psychiatric hospitals in post-revolutionary France began to record information about the possible hereditary dispositions of their patients. Other authors have pointed out how the emergence of a science of human heredity was closely connected with the study and treatment of mental disease. The nineteenth-century discourse about physical and mental degeneration, which was substantially shaped by psychiatrists, intensified the medical debate about the nature of pathological

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inheritance and paved the way for the eugenics movement (Dowbiggin 1991; Huertas and Winston 1992; Carol 1995; Pick 1996).

Psychiatrists, however, provided not only discursive incentives, but also methods and data that allowed for the development of human heredity into an object of research. While recent studies have shed light on nineteenth-century concepts of pathological inheritance (López-Beltrán 1992, 2004, 2007; Waller 2002), little is known about the ways in which medical knowledge about heredity was actually produced. In this paper, I examine the statistical practices that were developed by psychiatrists during the nineteenth and the early twentieth century in order to get a hold on phenomena of heredity. The case of psychiatric statistics demonstrates that the study of human heredity was shaped in institutional structures that enabled the observation and survey of specific populations.

The first part of this article outlines how, in the first half of the nineteenth century, the institutionalisation of care for the mentally ill enabled physicians to collect their patients' clinical records, and how they began to use these records to investigate heredity and its possible role in aetiology. I argue that it was the establishment of heredity as a central category in asylum statistics which decisively elevated its status in the medical discussion. The second part of the article discusses how in the mid-nineteenth century, the growing concern with heredity generated new questions and statistical approaches. The attempts to improve and to standardise statistical information relating to heredity, however, met with serious technical and conceptual problems. Both methods and results remained inconsistent where the notion of heredity was tangled up with unsettled aetiological and nosological questions.

As will be shown in part three, the resulting dissatisfaction with asylum statistics led to an increased interest in the study of individual pedigrees. This turn to genealogy reflected an intensified interest in the problem of hereditary transmission, as well as a general fascination with genealogical methods by the end of the nineteenth century. The fourth part outlines some of the methodological developments that occurred after the emergence of Mendelian theory. Although concepts and methods formed in the nineteenth century continued to exert an influence on psychiatrists' views on heredity long after 1900, Mendelism ultimately led to a fundamental revision of existing statistical and genealogical practices. This process was driven not only by the Mendelian idea of particulate inheritance, but also by changes in disease classification, and new ways of surveying patient data.

1 Heredity as a statistical category

Family studies were an important source of knowledge about "hereditary" diseases in the nineteenth century (Rushton 1994). Their scope, however, was largely restricted to rare and distinctive diseases recorded by family doctors. In an era generally characterised by the drive for large numbers, casuistic observations were much less valued than statistical surveys covering whole populations (Hacking 1982; Porter 1986). No institution, the French psychiatrist Jules Baillarger stated in 1844, was better suited to conduct such surveys than the psychiatric hospital:

> "[T]he study of madness can contribute, more than the study of any other malady, to the improvement of the general history of heredity and to the determination of the laws it follows. The consumptive, the scrofulous, the gouty are dispersed here and there, and only with a substantial amount of effort and time a singular observer would achieve to collect a sufficient number of observations. The lunatics, in contrast, are assembled by hundreds in the asylums […]." (Baillarger 1844, 168).

Statistical surveys were a part of psychiatric routine ever since asylums began to define themselves as medical institutions in early nineteenth-century France. For Philippe Pinel, the pioneer of French psychiatry, the meticulous recording of the admission and release of patients, of healings and relapses, was primarily a way to assess' the curative efficiency of hospitals (Pinel 1809, p. 404). Jean-Étienne-Dominique Esquirol, his successor at the Parisian Salpêtrière hospital and the teacher of a whole generation of French psychiatrists, developed statistics into a tool of aetiological study. His idea was to create a quantitative survey of the factors that were believed to cause mental diseases (Cartron 2007, p. 166). The pathogenic causes identified by Esquirol (and many psychiatrists after him) were recorded and divided into two major groups: "moral" causes, like professional misfortune, unrequited love or "domestic sorrows" on the one hand; and "physical" causes such as alcoholism, menstrual disorders, stroke, syphilis, intoxication, and—usually at the top of the list—"heredity" on the other (Esquirol 1838, p. 64). Patients were included in this category if interrogations or any other information pointed toward mental diseases in their parents or other relatives.

Obviously, such statistical records were not primarily assembled to discover laws of hereditary transmission. Their objective was aetiological: they were intended to reveal the frequencies of all the possible sources of madness appearing in the patients' life histories –alcoholism, onanism, the blows of fate, or, for that matter, "heredity." Psychiatrists were aware, however, that the quality of their data was contestable. It was difficult enough to determine the causative factors in an individual case of madness; it was even more problematic to establish proof of a hereditary disposition, since information about family history usually had to be taken from relatives or even from the patients themselves. As the striking differences between the findings of various early nineteenth-century surveys testify, psychiatrists had rather different ideas as to what constituted evidence for a "hereditary" disposition. Surveying methods differed accordingly. Esquirol, whose Salpêtrière records displayed a portion of about one-third of "hereditary" cases, hypothesised that the real numbers should be far higher since his proletarian clientele were often completely ignorant about their familial backgrounds (Esquirol 1816, p. 188; Cartron 2007, p. 167). His German colleague Maximilian Jacobi, in contrast, argued that more careful and systematic interrogations would show that familial insanity was in fact much less common than most alienists assumed (Jacobi 1844, pp. 600–601). Not all practitioners could rely on the cooperativeness of the patients' families to the same extent as Jacobi, whose asylum served a bourgeois clientele. Throughout the nineteenth century, statistical surveys were habitually furnished with laments about unsecured information, or about "reticent" and

"dishonest" relatives unwilling to reveal the dark secret histories of their families (Jung 1864, p. 579; Hagen 1876, p. 177).

Without second-hand information, however, it was virtually impossible to compile comprehensive statistical data. Statistically minded psychiatrists could not afford to embrace the position of the Berlin physician Rudolf Leubuscher, who maintained that a certain proof of hereditary insanity required the direct observation of all relevant cases within a family (Leubuscher 1847, p. 85). Nor would they have agreed with Leubuscher's postulate that the disease was hereditary only if development and symptoms were identical in all cases. Up to the late nineteenth century, most psychiatrists took it for granted that the hereditary disposition to mental diseases could manifest itself in different ways. As Jacobi framed it in the 1840s, it seemed evident that mental disorders had a "great tendency to pass from one of their forms into another" in the course of hereditary transmission (Jacobi 1844, p. 602). This idea of hereditary transformation found its most prominent and most radical expression in the degeneration theories formulated by Bénédict Morel and Jacques-Joseph Moreau de Tours in the 1850s. According to Morel's concept, the psychopathological disposition manifested initially in the form of slight mental abnormalities, became aggravated in the course of generations, and led gradually (but not inevitably) to the final extinction of a family (Morel 1860). In the words of Moreau, the hereditary disposition was basically a "lesion of the intellectual organ" which was able to manifest "with different intensity, but in a comparable form."

In this spirit, even "oddities and eccentricities" of relatives could count as a proof that a patient's madness was hereditary (Moreau 1859, pp. 114–115). The degenerationist view was by no means commonly accepted in the second half of the nineteenth century. German alienists tended to dismiss it as a folly of their French colleagues who even attributed significance to hints at parental stuttering or "fluttering eyelids" in their statistical records (Jung 1866, p. 213). But all statistical surveys were more or less based on the practice of counting diverse ancestral disorders as indicators of a hereditary disposition, even though some alienists were aware that what they recorded were not necessarily signs of physical inheritance, but possibly effects of familial tradition and education (Zeller 1844, p. 53; Jung 1864, p. 576).

One might argue that such an ambiguous material was hardly suited to generate scientific insights. Yet the very existence of "heredity" as a statistical category was instrumental for turning it into a scientific object. Carlos López-Beltrán has shown that the noun "heredity" first came into use in French medical discourse by the 1830s (1992, 36). It is hardly coincidental that this "transition from metaphor to thing" took place at a time when "heredity" became a statistical entity. Even though numbers on the frequency of hereditary dispositions were evidently questionable, they provided a starting point for reconsidering established ideas. While the early statistical surveys were largely restricted to the calculation of the total number of "hereditarians," psychiatrists began to make a more sophisticated use of their records in the second half of the nineteenth century. Since asylum records comprised various details about the life history of their patients, they allowed for the establishment of correlations between these categories. It was, for example, possible to calculate if "hereditary" cases were especially common among certain social,

religious, or professional groups, if they tended to break out at an earlier age, and if they were less likely to be cured than non-hereditary ones. Many of the correlative tables appearing in statistical surveys—such as those indicating the proportion of "hereditarians" amongst Catholics or Protestants, or in certain professions—were futile number exercises that contributed very little to knowledge or understanding, published only because the records enabled their calculation. Some results, however, actually affected the discussions about pathological heredity. Statistical studies were instrumental for the refutation of the widespread idea that hereditary cases were incurable or more difficult to cure than non-hereditary cases; certain German studies even suggested that the opposite was true (Statistisches Bureau 1866, XXXV; Jung 1866, p. 230).

The most intensely debated question was that of the relationship between heredity and sex. Jules Baillarger was the first psychiatrist to construct a comprehensive survey listing precisely in which degree of kinship (mother, father, grandmothers and grandfathers, aunts and uncles) was noted any form of "madness" (a notion that was not further specified). In this way, he tabulated how often hereditary dispositions turned up in the maternal and in the paternal lineage. According to Baillarger, the mothers were the more dangerous source of dispositions to mental disease, especially for the female offspring (Baillarger 1844, p. 158). The question of sex-specific hereditary influence was taken up by several statistical studies during the next decades, mostly with results that were in accordance with those of Baillarger—or with the traditional idea that the nervous system was mainly determined by the mother's constitution (Baillarger 1844, pp. 163–164; Jung 1866, pp. 215–218; Tigges 1867, p. 191; Hagen 1876, pp. 215–216).[1] The interest in this topic reflects a central characteristic of nineteenth-century thinking about inheritance. Specific maternal and paternal "influences" were thought to shape the physical constitution of the offspring, not distinct hereditary qualities transmitted via mother or father. When Baillarger referred to "laws" of heredity, he thus referred to laws of procreation, not of hereditary transmission.

While almost all statistical records noted whether mental diseases or abnormalities had occurred in the male or the female relatives, they rarely specified the forms of these disorders. In the second half of the nineteenth century, some asylums began to collect such data systematically. As described by the German alienist Wilhelm Tigges, the aim of this procedure was "to relate certain peculiarities of the ascendants, namely the form of illness, […] to certain peculiarities of the diseased descendants, in order to accumulate material to decide on the question of progressive degeneration as a result of heredity" (Tigges 1867, p. 214). Drawing on data from his asylum in Marsberg/Westphalia, Tigges strongly argued that the "prevailing law" was in fact the identical transmission of an illness from ancestor to descendant. His Silesian colleague Wilhelm Jung was of the same opinion. According to his data, more than half of the "hereditarian" patients suffered from the same mental disorder that had affected their relatives. Moreover, he held that constant inheritance was the norm for certain clinical forms, especially melancholia

[1] For the provenance of these ideas from ancient Greek theories see Lesky (1951).

(Jung 1864, p. 626). These studies indicate that in a period characterised by the popularisation of degeneration theories, there was a growing unease about the underlying concept of heredity. Many psychiatrists were no longer content with charting diverse abnormal phenomena under the category of "heredity." Instead, they became increasingly interested in the constant transmission of particular clinical patterns. This change in perspective was promoted and enabled by the accumulation of statistical data; however, the material to which alienists like Tigges and Jung could refer was anything but comprehensive. In order to follow the question of constant and dynamic heredity further, it was necessary to raise more data on the familial background of asylum patients, and that the data be more precise and more standardised.

2 The problem of statistical standardisation

As with all statistical projects, surveying asylum patients was a matter of standardisation and centralisation. Asylum records provided the material for national "lunatic censuses" which primarily served the monitoring of the quantitative development of the "insane" population. Some of these national surveys also considered aetiological categories, but did so in somewhat different compositions. The Danish survey of 1847 featured "heredity"—inevitably—as one of the top causes of mental disease (15 per cent of all cases), alongside the highly ambiguous category of "love" and the love of liquors (Hübertz 1853). In the English census of 1843, "heredity" headed a list comprising such nebulous categories as "vices" or "sorrows." Despite its omnipresence, "heredity" was by no means an unambiguous category. As a German reviewer observed, the data of the individual English asylums varied so strikingly that the total numbers of the surveys were virtually meaningless (Hagen 1845). Indeed, how was it possible to generate statistically valuable data about aetiological factors if different psychiatric institutions applied different categories? As Baillarger lamented, "[t]he evil lies in the isolation and in the lack of homogeneity between the studies," (Baillarger 1846, p. 632).

Introducing standard statistical forms seemed to be the obvious answer to this problem. In Germany, this was attempted first by the Association of Alienists *(Verein deutscher Irrenärzte)* in the 1840s, but their attempt had a limited impact, despite the simplicity of their proposal (Flemming 1844). A much more ambitious attempt to achieve statistical standardisation was launched during the 1867 International Psychiatric Congress in Paris, where a commission of renowned psychiatrists was assigned the task of developing forms and tables to be used in all European asylums. The resulting scheme centred on a comprehensive table, demanding the exact indication of aetiological factors. It distinguished sixteen "predisposing" and about fifty "determinant" causes, with heredity ranking at the top of the list. This latter category was subdivided into "direct" heredity (patients whose parents or grandparents had been mentally ill), "collateral" (ill siblings), and "mixed" heredity (diseases in various degrees of kinship; Lunier 1869). This categorisation, which was already quite common at that time (Tigges 1867; Jung

1866; Hagen 1876), would have enabled an analysis of the extent to which these different degrees of hereditary burden related to certain forms of disease.

Those who devised the Paris scheme admitted that, in practice, it would not always be possible to determine the causes of a disease with certainty (Lunier 1869). Moreover, even with its unwieldy amount of detail, the list of possible aetiological factors did not constitute a sufficient tool to adequately represent the complexities of individual cases. Some psychiatrists felt that this problem even called into question the usefulness of the statistical approach altogether. Ironically, these doubts were most concisely formulated by two members of the Paris commission: Jules Falret, one of the French pioneers of asylum statistics, argued that if the aetiological assessment of a case was the most insecure part of psychiatric work, there was no reason to believe that a large number of aetiologial observations would help to improve nosological classification (Falret 1864, XXXII f); Wilhelm Griesinger, the doyen of German academic psychiatry, stated that the practice of listing such diverse phenomena as alcoholism, professional background, commercial problems, or heredity "as equivalent categories of causes" could not help in any understanding of the nature of mental disease, since every individual illness was caused by a complex interaction between various pathogenic moments (Griesinger 1867, p. 134). Asylum directors had quite pragmatic reasons to feel uneasy about statistical schemes introducing new sets of categories: whilst there was no guarantee they would ever generate valuable results, they certainly augmented the administrative workload (Hagen 1871, p. 269).

These concerns were taken into account when the German Association of Alienists, discussed the introduction of standardised record sheets, after the collapse of the international project brought about by the Franco-German war of 1870–1871. The initiative evolved in response to the Prussian bureaucracy's plans to reshape medical statistics.[2] The time of national unification, brimming with plans for new central institutions and administrative innovations, provided an ideal setting for highly regulated statistical projects. But the Association also had to consider the objections of its members. When its statistical commission proposed a draft standard form in 1873, it stressed that it had tried to restrict the statistical surveys to questions whose "scientific value was accepted from all sides", and therefore to leave out the "administrative and the aetiological aspects"—"with the exception of heredity," as the authors hastened to add (Nasse 1873/1874, p. 241).

Indeed, the form that was finally accepted did away with the endless listing of "physical" or "moral" causes, and focused on the problem that had been at the centre of most of the recent studies: hereditary disposition. The data sheets recorded cases of mental disease, nervous disease, alcoholism, suicide, "conspicuous (*auffällig*) character", "genius", and criminal offenses observed among the relatives (parents, grandparents, aunts and uncles, or siblings) of the patient. Nosological classification, which was an especially contested problem of psychiatric practice, was kept rather simple. Like the Paris scheme, the Association's forms distinguished seven categories: melancholia, mania, secondary psychic disorder,

[2] Anon. (1873); for the following discussions about new statistical schemes also see Schmiedebach (1986, pp. 79–85).

paralytic psychic disorder, epilepsy, imbecility, idiotism, and delirium potatorum.[3] The success of the new forms remained limited, however. The Prussian lunatic census partly followed the Association's scheme, but the low number of "hereditary" cases recorded suggests that many alienists were not at all interested in fishing out the respective data (State of Prussia 1890, pp. 40–43).

National statistics, thus, presented a fragmentary picture of numbers without scientific value. Serious studies focusing on the problem of heredity were instead the result of long-term initiatives by individual psychiatrists. The makers of a survey issued by the county asylum in Erlangen (Bavaria), for example, stressed the pains they had taken to study family histories and to arrive at their own conclusions without having to rely on the potentially or purposefully misleading statements of their patient's relatives (Hagen 1876, p. 177). Especially interested in the question of constant and transformative heredity, they sought to obtain precise nosological descriptions of the relatives' illnesses. In spite of these additional efforts, however, the share of "unassured" cases was still so significant that the established figures looked rather fragmentary (Hagen 1876, p. 207). The ambitious Erlangen study clearly demonstrated that a reform of surveying techniques alone could not resolve the inherent limitations of asylum statistics. As long as there was no comprehensive access to the medical records of patients' relatives living outside of the asylums, the data about "heredity" were, at best, sketchy. During the last two decades of the nineteenth century, psychiatrists increasingly lost faith in the statistical approach and began to set their hopes in the "accurate study of individual family trees" (Rohde 1895, IX).

3 The turn to genealogy

Psychiatrists had been using comprehensive family histories throughout the nineteenth century. While published works relied heavily on statistical tables, the study of "deep" pedigrees constituted a form of tacit knowledge that informed psychiatric thinking about heredity. The prominent psychiatrist Richard Krafft-Ebing stated that his ideas about the hereditary relations between the nervous diseases rested "on the exhaustive study of the pedigrees of many hundreds of sick persons" (Krafft-Ebing 1869, p. 443f). The alienist Heinrich Damerow, in presenting his asylum's statistics, noted that deeper insights into the manifestation and transformation of the hereditary disposition could only be derived from the study of extensive pedigrees (Damerow 1865, p. 235). The use of pedigrees as a visual tool, however, was rather uncommon in the psychiatric literature before the 1880s. Family trees were especially suited to substantiate the concept of progressive degeneration. In 1869, the French psychiatrist Gabriel Doutrebente published a selection of twenty-five genealogical observations in order "to demonstrate *de visu* the mode of hereditary transmission in a succession of generations, of which the most remote serves as our point of departure" (Doutrebente 1869, p. 209). Like the

[3] Anon. (1874). The Paris scheme (Lunier 1869) distinguished *folie simple, folie épileptique, folie paralytique, démence senile, démence organique, idiotie*, and *cretinsime.*

handbook of his compatriot Jules Déjérine (1886), Doutrebente presented (mostly rather fragmentary) pedigrees which all suggested that incurable mental diseases originated from minor nervous disorders in preceding generations. Paul Julius Möbius, a German champion of degeneration theory, pointed out that asylum records were generally unsuited to register these "embryonic" neurasthenic conditions foreshadowing outright mental illness (Möbius 1884, p. 228).

The concept of progressive pathological heredity was thus closely associated with genealogical practices. Nevertheless, the "genealogical turn" that took hold in the German medical community, around 1900, was mainly promoted by medical scientists who were opposed to degeneration theory. The proponents of this view, the pathologist Friedrich Martius and the psychiatrist Robert Sommer, regarded family research as a remedy against the "pandemic fear of degeneration" (Martius 1901, p. 818), or against the "pessimistic world-view of the doctrine of décadence" (Sommer 1901, p. 67). It was, Sommer added, necessary only to collect more representative samples of pedigrees, samples not biased (as were the examples presented by degeneration theorists) towards cases showing a striking accumulation of anomalies. A similar critique was also directed against customary statistical practices. Because asylum records only captured patients with diseased relatives, but never considered the ancestry of healthy people, they necessarily created a distorted picture of the "hereditary burden" (Grassmann 1895, p. 976). Remarkably, this critique of selection bias was first translated into a research project by one of the most influential European degeneration theorists, the Swiss psychiatrist August Forel. His assistant Jenny Koller (1895) published the first study comparing patient records (from Forel's Burghölzli asylum) with the family histories of "mentally normal" people. In fact, the survey detected quite a high frequency of mentally abnormal ancestors for the "healthy" group. The hereditary disposition to mental diseases was therefore not restricted to certain unfortunate families, but was a problem that could occur elsewhere in the population.

The Swiss study attempted to transcend the restrictions of asylum statistics by extending it to the outside population. Another response to the methodological crisis was to focus on families in which two or more members had been under "competent, exact observation" (Sioli 1885, p. 118). By the turn to the twentieth century, however, many German physicians and psychiatrists were convinced that it was necessary "to go deep rather than wide" (Strohmayer 1908, p. 483), i.e. to reconstruct family histories covering as many generations as possible. Partisans of this position usually argued that while statistics provided comprehensive but imprecise data, genealogical case studies disclosed aetiological details. While asylum records were dismissed as "fossil" and "bureaucratic", family research was supposed to offer a vivid picture of people "in flesh and blood" (ibid.).

Ottokar Lorenz's "Handbook of Scientific Genealogy" (Lorenz 1898) caused a decisive increase in medical practitioners' enthusiasm for genealogy. Lorenz, a conservative historian, maintained that genealogy had to be realigned according to recent biological knowledge. Drawing on Weismann's germ-plasm theory, he argued that the only correct representation of genealogical relations was the "ancestor chart," a pedigree showing the complete ascending ancestry of an individual. Although many physicians adopted this model, the appeal of Lorenz's

book was due less to the rather general methodological advice it contained, but primarily to its central message that genealogy was not just an auxiliary method, but a key science linking the humanities and the biological sciences (Gausemeier 2008). For physicians and psychiatrists, many of whom were amateur genealogists, that the construction of medical pedigrees was not simply a way of gathering facts about a certain hereditary disease, but part of a scientific endeavour that would generate a new understanding of human nature, society, and history.

It was Robert Sommer, professor of psychiatry at the University of Gießen, who most actively promoted this vision of genealogy as a hybrid science. In 1908 and 1912, Sommer organised two conferences on "family research, the study of heredity and regeneration" that brought together psychiatrists and physicians, public health officers, lawyers, natural and social scientists, hobby genealogists, and activists of the eugenics movement (Sommer 1912). The bringing together of the latter two groups prompted a new initiative: the German Society for Racial Hygiene and the "German Central Office for the History of Persons and Families", an association founded by amateur genealogists, reached an agreement to jointly build up a collection of genealogical material of "eugenic interest" (Breymann 1909, pp. 106–107). The project was based on the belief that once there was a large treasury of well-documented pedigrees, compiled with the help of hundreds of hobby genealogists, new knowledge about human heredity would arise more or less inevitably (Breymann 1912). Medical professionals like Sommer campaigned rather for central data collections based on material gathered in asylums and clinics according to standardised methods (Sommer 1913, pp. 394–395; Römer 1912).

In the years prior to World War I, many of the German medical practitioners who were also amateurs of genealogy submitted schemes for constructing and representing pedigrees, and proposals for the institutionalisation of genealogical data collection. In contrast, they produced very few studies showing how genealogical methods could actually be applied to medical problems. Sommer published an epic history of his wife's ancestry, which he associated with extraordinary mathematical and artistic talent (Sommer 1907, p. 202ff). He also contributed to the boom of celebrity genealogy with a book on Goethe's ancestry (Sommer 1908). Lorenz exemplified the "biological" application of the ancestor chart by following the mandibular prognathism running in the Habsburg dynasty, the so-called "Habsburg lip" (Lorenz 1898, pp. 402–408).

But Habsburgers or Goethes rarely turned up in medical practices or hospitals. The fascination with historical genealogy only aggravated the problem that had troubled psychiatrists for decades: the lack of reliable clinical data about past generations. One of the few examples of a situation in which the tracing of a pedigree could actually be useful for medical purposes came from Sweden, where detailed genealogical records were available even for peasant populations, reaching back to the eighteenth century. The neurologist Herman Lundborg had spent fifteen years reconstructing the history of a peasant dynasty comprising seven generations and more than 2,000 individuals (Lundborg 1913). Lundborg's primary interest was myoclonic epilepsy, a rare nervous disease. His pedigrees provided quite convincing evidence that it was inherited as a Mendelian recessive trait. But Lundborg devoted much more attention to the other anomalies recorded in the family registers. The

fifty extensive pedigrees printed in a separate volume were replete with references to violence, insanity, criminality, and, above all, alcoholism. The basic message was therefore no different to the one communicated by earlier degeneration theorists: some families were simply hotbeds of all sorts of biological evils. Even though twentieth-century eugenicists were still convinced of the general truth of this wisdom, they nevertheless sought for a more analytical approach to human heredity (Gausemeier, Müller-Wille and Ramsden 2013). This was obviously more than could be achieved through the labour-intensive compilation of ramified pedigrees.

4 Mendelian statistics

While followers of the cult of the pedigree were still wondering how to resolve the practical difficulties of medical family research, one physician persistently tried to convince them that medical family research led to a dead end. For Wilhelm Weinberg, today better known for his seminal contributions to population genetics (Früh 1996), the kind of family research Sommer and others envisaged had not only occasional flaws, but was a fundamentally misguided approach which inhibited the scientific development of the study of human heredity. The search for exemplary families providing long-ranging medical records would inevitably result in a selection of striking, but unusual cases. Moreover, since families were likely to live under similar social and hygienic conditions, family studies were unsuited to distinguish between nature and nurture (Weinberg 1903 & 1908/09). Human heredity, thus, could only be studied through the statistical analysis of sufficiently broad random samples.

If Weinberg was irritated by the inability to recognise these obvious methodological shortcomings, he was even more troubled by the genealogical thinking that inspired the pedigree craze. He was perhaps the first medical scientist who fully realised the implications of Mendelian theory for the study of human heredity. Analysing heredity was not about following lineages, but about constructing generations. Although he had produced one of the first examples of what a statistical proof of Mendelian inheritance might look like—for the disposition to twin births—Weinberg was cautious with respect to the practicability of Mendelian statistics. Because it required the complete registration of a well-defined trait in a large population, he concluded that a conclusive proof of Mendelian inheritance in man was "a matter for the future" (Weinberg 1908/09, 460).

Weinberg's methodological suggestions were eagerly taken up by Ernst Rüdin, a psychiatrist by then mainly known as a protagonist of the racial hygiene movement (Rüdin 1911). With assistance from Weinberg, Rüdin developed a method for testing the hypothesis that certain mental disorders were transmitted as recessive Mendelian traits. The choice of the object of his first study was equally important: Rüdin focused on *Dementia praecox* (schizophrenia) according to the definition of Emil Kraepelin, then his senior at the University of Munich. Kraepelin's nosological system, developed in the 1890s, had set new standards for the classification of patients (Kraepelin 1909; Engstrom 2003). According to Rüdin, *Dementia praecox* was a perfect object for the study of heredity because it was predominantly caused

by endogenous factors and characterised by specific symptoms (Rüdin 1916, pp. 22–25). The latter claim was debatable at the time, to say the least. While Kraepelin claimed that the etiology of *Dementia praecox* was unmistakably specific, many psychiatrists maintained that the boundaries between the symptoms of schizophrenia and related clinical phenomena were fluid (Roelcke 2000). Rüdin's project, thus, was not only a matter of Mendelian statistics, but also concerned a key question of nosological classification (Cottebrune 2009).

Rüdin was not the first psychiatrist to suggest the recessive inheritance of *Dementia praecox*. But while earlier studies were based on a compilation of genealogical observations (Jolly 1913), Rüdin and his assistants surveyed all patients accessible in Bavarian clinics—c. 750 altogether—and examined their siblings and parents. In this way, Rüdin was able to compile a comprehensive Mendelian "F_1" generation, comprised of c. 5,000 siblings. This enabled him to test the hypothesis that the disease was caused by a recessive trait. If this hypothesis was correct, Rüdin reasoned, then the number of *Dementia praecox* cases in the filial generation should amount to 25 per cent in cases where both parents were healthy, or to 50 per cent for the combined offspring of couples with one healthy and one afflicted parent (Rüdin 1916, pp. 1–27). The calculations were in fact far more complex. Rüdin had learned from Weinberg that the mere counting of a patient population, no matter how comprehensive, was never a sufficient basis for a correct Mendelian calculation. In the case of an allegedly recessive hereditary disease, the collation of family records of families with at least one affected member had to produce misleading ratios because matings between two heterozygous carriers of a trait were quite likely to produce no visibly afflicted offspring at all. In such a sample, thus, trait-carriers would necessarily be over-represented. It was therefore necessary, as Weinberg argued, to subtract a certain share of the trait-carriers in order to obtain realistic figures (Weinberg 1912, pp. 166–168).

This approach marked the fundamental difference between Weinberg's understanding of Mendelian statistics and the prevailing concept of medical genealogy. While the latter was aimed at reading the order of heredity out of a visual arrangement of anomalies in a family tree, Weinberg was aware that Mendelian genetics was essentially about calculating with the *unseen*. This difference is most strikingly illustrated by looking at another contemporary large-scale project dealing with psychopathological heredity: that pursued by scientists linked with the pivotal institution of the American eugenics movement, the Eugenics Record Office (ERO). With its large collection of pedigrees compiled in families displaying mental illness, special "talents" or certain physical traits, the ERO represented exactly the kind of genealogical database German eugenicists were anticipating (Allen 1986; Wilson 2008). Studies published by the ERO were usually centred on small samples of pedigrees that went back three generations. This was also true for the studies of the psychiatrist Aaron J. Rosanoff, which compiled an impressive array of family trees detailing various forms of mental diseases and aberrant behaviour (Cannon and Rosanoff 1911; Rosanoff and Orr 1911). By drawing together all cases in which insane children descended from "normal" parents, Rosanoff determined a ratio of exactly 25 per cent "abnormal" individuals in the filial generation—for him, a sufficient proof that mental diseases were based on a Mendelian recessive trait. For

Weinberg, Rosanoff's reckoning proved nothing at all—it was just another demonstration of a superficial understanding of heredity based on pedigrees selected for the accumulation of evils (Weinberg 1913, p. 304).[4]

Rüdin's study marked not only a break with the form of genealogical empiricism exemplified by Rosanoff's studies. It also dealt a serious blow to the simplistic ideas about Mendelian inheritance prevailing among eugenicists. After the application of Weinberg's correction methods, the final figures were far below the expected classical Mendelian ratios (less than 5 instead of 25 per cent). *Dementia praecox*, therefore, was definitely not a case of monogenic recessive inheritance. This did not cause Rüdin to give up his basic belief that *Dementia praecox* and other mental diseases could be explained in relatively simple Mendelian terms. Rather speculatively, he suggested instead that the results could be explained by assuming that recessive alleles of two separate genes had to come together to produce schizophrenia (Rüdin 1916, pp. 52–57).

Rüdin's work also marked a departure from the psychiatric concept of hereditary diathesis (Olby 1993). Rosanoff in fact followed a Mendelised version of this traditional concept by assuming that all psychopathological anomalies noted in his pedigrees were caused by a single hereditary factor. Rüdin did not categorically rule out the existence of such "polymorphic" heredity, but he argued that only the separate examination of clearly defined clinical phenomena would enable the detection of possible genetic relations between them (Rüdin 1916, pp. 139–141). For many psychiatrists at this time, however, the idea of hereditary transformation as discussed in the first section of this paper, was still a certainty. Robert Sommer, for example, claimed that the primary aim of genealogical and statistical surveys was to provide insights into the "familial relations of the mental diseases and their distribution in the whole country" (Sommer 1913, p. 394). He was also convinced that the mental disorders that became manifest in families mirrored their "normal" mental qualities. This holistic idea of psychopathology was hardly compatible with the particulate concept of heredity championed by Rüdin. From this point of view, however, it made perfect sense to use ramified genealogies in search of "the family type in its various manifestations" (Sommer 1907, p. 108; cf. Römer 1912, p. 308).

Contrary to the likes of Sommer, whose proposals for medico-genealogical research were confined to vague ideas about centralised pedigree collections, Rüdin was able to translate his approach into a research program. Kraepelin's nosological classifications and Weinberg's statistical methods provided him with a blueprint for how to collect, organise and analyse data. Once he had established a well-rehearsed survey system operating with standardised data sheets, it became possible to collect all kinds of information on patient populations. In his work for the *Dementia praecox* study, he had already enjoyed the support of the state and of local authorities, which provided files from registry offices, churches, hospitals, police offices, and courts (Rüdin 1916, p. 25). When Rüdin became head of the "Department of Genealogy and Demography" in Emil Kraepelin's German Research Institute for Psychiatry in Munich in 1917, he was able to compile registries containing data on thousands of

[4] For a detailed comparative analysis of Rüdin's and Rosanoff's approaches, see Cottebrune (2009).

mentally ill people and their relatives, material extensive enough to allow for follow-up studies on diverse problems of human heredity (Weber 1993, pp. 159–174).

All of these studies indicated, however, that it was rarely possible to reduce pathological phenomena to monogenic causes. By the mid-1920s Rüdin therefore reconceptualised his approach under the name of *empirische Erbprognose* ("empirical genetic prognosis"). The aim was now to establish probability measures indicating the risk for affected families to produce mentally ill offspring (Mazumdar 1996). But this methodological shift did not imply a modification or softening of Rüdin's eugenic convictions. For Rüdin, the patients observed in his studies were primarily carriers of hereditary traits threatening the genetic health of the nation. His studies accurately accounted for the influence of non-genetic factors, but they merely treated them as parameters obscuring the effects of pathogenic genes. Whereas in nineteenth-century psychiatric statistics, heredity featured as a major cause of mental disease, Rüdin now turned it into the only factor that counted. Although he knew well enough that there was yet no clear-cut evidence of Mendelian inheritance for any of the major mental and nervous diseases (Rüdin 1934, 134), Rüdin eventually became one of the most ardent advocates of the Nazi regime's sterilisation law which defined these diseases as monogenic hereditary defects (Weiss 2010, 121–183).

5 Conclusions

As Ian Hacking has shown, vital statistics require, above all, stable populations and stable categories (Hacking 1982). Just as population statistics emerged in contexts where people were controllable and relatively immobile, the statistical study of heredity developed in an institutional setting that allowed for the observation, interrogation, and classification of large numbers of patients—the psychiatric asylum. The study of heredity, however, had to go beyond the institutional borders. Obtaining sufficient information about the patient's relatives was the pivotal problem of psychiatric statistics. Although this problem made all figures concerning the inheritance of madness rather uncertain, the existence of these crude data were nevertheless essential for the construction of heredity as a scientific discipline. It was precisely the obvious deficiency of available data, which forced psychiatrists to think about methodological improvements and about the question of what was hereditary and what was not.

As shown in this article, the notions of pathological heredity differed widely among nineteenth-century psychiatrists. It ranged from a diathesis concept according to which the most diverse anomalies were hereditarily related, to ideas of a constant inheritance of defined clinical phenomena. Both notions were inextricably linked to different nosological concepts. Without a classificatory system defining certain sets of symptoms as discrete pathological entities, it was impossible to conceive of mental diseases as discrete genetic entities. This is one reason why it was not easy to introduce the principles of Mendelian genetics, especially its central concept of the unit character, into the field of psychiatry. The establishment of the Mendelian approach not only consisted in applying a new way of analysing hereditary transmission. It also involved new regimes for the

classification and observation of patients, the collection of information about their personal and familial backgrounds, and the processing of the data thus compiled.

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