Inheritance of Congenital Pyloric Stenosis

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In a previous paper (Carter, 1961) reference was made to the pathology and clinical features of congenital pyloric stenosis. This is the commonest condition requiring abdominal surgery in infancy. In this series the mean age of treatment was 7 weeks, and no case was treated after 18 weeks. The conventional term 'congenital' is applied to the condition though its presence at birth has never been reported. The earliest report of the condition is in a child dying of an unrelated illness at 3 days (Laurence, 1963). The frequency of pyloric stenosis has been found to be about 3 per thousand total births in Newcastle (Davison, 1946), Birmingham (MacMahon, Record, and McKeown, 1951), and Edinburgh (Smith, 1960). In the recent survey in the South-East Hospital Regional Board area of England (J. A. F. Roberts and P. E. Polani, 1968, personal communication), a frequency of approximately 2 per thousand live-births was found, including a small proportion of patients treated medically. The figure of 3 per thousand live-births has been taken for comparison with the findings in this family survey. This is, however, probably a somewhat high figure for comparison with the relatives born a generation ago when diagnosis would have been less complete.

With a sex-ratio of 5:1, an incidence of 3 in a thousand total live-births implies an incidence of about 5 per thousand male and about 1 per thousand female live-births.

A report was given in the 1961 paper of the early findings of a family study based on index patients treated at The Hospital for Sick Children between 1920 and 1939 inclusive. This series has been enlarged to include girls treated up to and including 1949. It is now fully reported and sufficient details are given in Appendix I for segregation and other analysis. This is referred to as the main series.

In addition, a supplementary family study was made for more recently born index patients, males treated 1953–1962, females treated 1950–1965 (re-

ferred to as the supplementary series). The incidence in children of the index patients in the main series may be compared with the incidence in sibs of the supplementary series without bias from changes in accuracy of diagnosis.

Material and Methods

(a) **Main Series.** The index patients in the main series were those in whom the condition had been confirmed at and treated by Ramstedt's operation at The Hospital for Sick Children, omitting those dying before leaving hospital. The original list included 775 boys (treated 1920–1939) and 310 girls (treated 1920–1949).

The index patients were, where possible, traced, and then all the women and those men who had already had at least one child were visited. The sequence of tracing was: firstly by letter or visit to the original address; secondly, after verification of the precise date of birth and full names at the General Registry Office, by letter forwarded via the Ministry of National Insurance; thirdly, where an individual was identified on the National Health Service Central Register at Southport, by letter forwarded by the local Executive Council to all remaining untraced women and to men on the Register of the Ministry of National Insurance who were not traced by us at the address on that Register; fourthly, many married women, not identifiable by their single names on the two statutory registers, were traced from the Marriage Registers at the General Registry Office, Somerset House.

Of the 775 men, 201 were 'untraced', and of the 310 women, 71 were 'untraced'. Details of tracing are shown in Table I. In some instances the reason why the patient was not traced was known. These included 7 individuals who were known to have died in childhood (many more of the missing men will have been war casualties), 5 who were overseas in the Armed Forces, 10 who had emigrated, and 4 who were known to have been adopted. It is thought that the reasons for failure to trace are probably not such as to lead to any significant bias. Of the 574 men traced, 330 had at least one child and the family study for men is based on these. For women the family study was based on all of the 239 traced irrespective of whether or not they had had children. Two women refused to help, and 4 others had moved house and were lost to us before we had time to visit, and findings are reported on 233 women.

TABLE I
PROPORTION OF INDEX PATIENTS TRACED AND METHODS OF TRACING

	Total Sought	Direct	Ministry of National Insurance	National Health Service	Marriage Registers	Total Traced	Not Traced	Proportion Traced (%)
<i>Main Series</i>								
Male 1920-1939	775	210	341	23	—	574	201	74
Female 1920-1949	310	122	19	73	25	239	71	77
<i>Supplementary Series</i>								
Male 1953-1962	388	222	—	85	—	307	81	79
Female 1950-1965	165	92	—	27	—	119	46	72

The family history, taken at a visit to the home of the index patient or his or her parents, was limited to parents, sibs, children, uncles, aunts, half-sibs, nephews and nieces, and first cousins. Where a history was suggestive of pyloric stenosis in a relative, confirmation was sought from hospital records and death certificates. A relative is classed as affected only if: (a) a hospital or death certificate record was found of Ramstedt's operation; (b) though no hospital record was available, the history of pyloric stenosis in a relative was confirmed by his being seen to have a typical scar of Ramstedt's operation; (c) a hospital record was found of pyloric stenosis treated medically after a paediatrician had felt a tumour; (d) a hospital or death certificate record was found of pyloric stenosis at necropsy. The means by which the diagnosis in each affected relative was confirmed are shown in Appendix I.

Tracing began in 1959. Most men had been interviewed by 1963 and most women by 1965, and the numbers of cousins and nieces and nephews shown relates to the time of the original visit. More recently (late 1964 for men and November 1967 for women) all were re-circularized to bring up to date the numbers of their children.

(b) **Supplementary Series.** The index patients for the supplementary series were those in whom the condition had been confirmed at Ramstedt's operation at The Hospital for Sick Children, in male infants between 1953 and 1962 and in female infants between 1950 and 1965. The list included 388 boys and 165 girls.

They were traced through the original addresses or, where an individual was identifiable on the National Health Service Central Register at Southport, a letter was forwarded to parents by the local Executive Council. In all, 81 boys and 46 girls were 'untraced'. This left 307 boys and 119 girls for the family study. Details of tracing are shown in Table I. Again, something is known about some of those patients not traced; 9 individuals were known to have died in childhood, 27 had emigrated or returned to their native land, and 6 had been adopted. Home visits were made as in the main series, except for 13 families (9 boys and 4 girls) where partial information was obtained by questionnaire.

Results

The findings in the main series for children, sibs, and nieces and nephews are shown in Appendix I.

Individual instances of affected parents, half-sibs, aunts and uncles, and first cousins are noted in the right-hand column of the appendix.

The findings for the supplementary series for sibs and aunts and uncles are shown in Appendix II. Individual instances of other affected relatives, parents, half-sibs, nephews and nieces, and first cousins are shown in the right-hand column.

Consanguinity. In the main series, of the 330 male index patients, 4 (Appendix I: 27, 40, 57, 258) were born to first cousins, 1 (I: 246) to first cousins once removed, and 1 (I: 87) to second cousins. Of the 233 female index patients, 1 (I: 340) only was born to first cousins and none to second cousins.

In the supplementary series, of the 307 male index patients, 1 (II: 216) was born to first cousins, and of the 119 female index patients, none was born to cousins.

First degree relatives.

(a) **Twins.** Of the 330 men in the main series, 5 were twin born. All the co-twins were unaffected. Three were very probably dizygotic twin brothers (I: 65, 120, 212) and 2 were twin sisters (I: 171, 210) and therefore also dizygotic. Of the 233 women in the main series, none was twin born. In the supplementary series, of the 307 boys, 2 were twin born. One (II: 166) had a probably monozygotic twin brother and the other (II: 239) a dizygotic twin brother; both these co-twins were unaffected. Of the 119 girls, 1 (II: 328) was twin born and her twin brother was affected; they were born in 1952, and since males were index patients only if treated between 1953 and 1962 the boy twin was not an index patient. The proportion of index patients who were twin born (8 in 989) is over-all surprisingly low.

(b) **Parents.** In the main series one would not expect to find many parents affected. The mortality from the condition, at least in patients admitted to hospital before 1920, was high but improved rapidly following the first use of Ramstedt's

operation in The Hospital for Sick Children in 1918 (Carter, 1961). The only parent in the main series who proved to be affected was the mother of I: 549, born in 1927 and herself an index patient (I: 352). In a few other instances a parent had a typical history and survived without specific treatment, but there was no documentary confirmation. In the supplementary series, however, 8 of 426 fathers and 4 of 426 mothers were proved affected; it will be seen in Appendix II that 5 of these fathers (of cases II: 9, 25, 384, 406, and 423) and 3 of these mothers (of cases II: 79, 368, and 409) were index patients in the main series. Several further parents in the supplementary series (4 fathers and 9 mothers) had a history suggestive of pyloric stenosis.

(c) *Children.* The patients in the supplementary series, none of whom was more than 17 years old, had had no children. In the main series, it will be seen from Table II that of the children of the male

tainment of affected individuals might be more complete in the more recently born sibs of the supplementary series, but it will be seen in Table II that there was a suggestion of this only in the sibs of the male index patients. Totalling the two series: for male index patients 3.8% (21 of 546) of brothers and 2.7% (15 of 565) of sisters, for female index patients 9.2% (25 of 273) of brothers and 3.8% (10 of 263) of sisters were proved affected. Relative to the general population of the same sex, the ratios are 7.6, 27.0, 18.4, and 38.0, respectively.

Ascertainment of cases of pyloric stenosis among sibs is likely to be reasonably complete except among some of the older sibs, born before the introduction of Ramstedt's operation, of the earlier index patients in the main series. For example, 2 older brothers of I: 184 were probably, but not proved, affected. They had typical histories of prolonged projectile vomiting; one born 1915, died at the age of

TABLE II
FIRST DEGREE RELATIVES—TOTALS, NUMBERS AFFECTED, AND PERCENTAGES (THOSE AFFECTED SHOWN IN BRACKETS)

Index Patients	Children		Sibs		Parents	
	Male	Female	Male	Female	Male	Female
<i>Main Series</i>						
Male						
1920-1939 330	347 (19) 5.48%	337 (8) 2.37%	262 (7) 2.67%	279 (6) 2.15%	330 (0) 0%	330 (0) 0%
Female						
1920-1949 233	106 (20) 18.87%	100 (7) 7.00%	170 (17) 10.00%	158 (10) 6.33%	233 (1) 0.43%	233 (0) 0%
<i>Supplementary Series</i>						
Male						
1953-1962 307	—	—	284 (14) 4.93%	286 (9) 3.15%	307 (4) 1.30%	307 (2) 0.65%
Female						
1950-1965 119	—	—	103 (8) 7.77%	105 (0) 0%	119 (4) 3.61%	119 (2) 1.68%

index patients 5.5% (19 of 347) of sons and 2.4% (8 of 337) of daughters were proved affected, and of the female index patients 18.9% (20 of 106) of sons and 7.0% (7 of 100) of daughters. In these children ascertainment was probably nearly complete. The incidences in the children relative to that in the general population of the same sex are 11, 24, 38, and 70, respectively. One son born in 1959 of a female index patient (I: 381) probably died of the condition, but was never seen by a paediatrician and there was no necropsy confirmation, and so the child could not be scored as affected. In addition, there were a number of children with minor symptoms and signs to which a label of 'pylorospasm' had been given and who had been successfully treated with anti-spasmodics, but in whom no tumour was felt.

(d) *Sibs.* No significant differences were found in the proportion affected among sibs born before or after the index patients, and these have been added together in Table II. It was anticipated that ascer-

tainment of affected individuals might be more complete in the more recently born sibs of the supplementary series, but it will be seen in Table II that there was a suggestion of this only in the sibs of the male index patients.

Offspring of Consanguineous Marriages.

Among the sibs of the 5 male index patients born to first cousin parents there were 5 brothers and 6 sisters, all unaffected. The 1 female index case born to such parents had 1 unaffected sister. The index patient born to the first cousins once removed had 1 affected brother and a normal sister, that born to the second cousin parents had 4 normal brothers. There is therefore no suggestion that the malformations in these patients, born to consanguineous marriages, differ from the remainder in being simple recessive conditions.

Second Degree Relatives. The findings in second degree relatives are summarized in Table III. It will be seen that 1 (a maternal half-brother) of 72 half-sibs of male index patients and 1 (a paternal

TABLE III
SECOND DEGREE RELATIVES—TOTALS AND NUMBERS AFFECTED
(THOSE AFFECTED SHOWN IN BRACKETS)

Index Patients	Children of				Half-sibs			
	Brothers		Sisters		Paternal		Maternal	
	Male	Female	Male	Female	Male	Female	Male	Female
<i>Main Series</i> Male 330 Female 233	125 (1)	123 (0)	137 (5)	157 (1)	9 (0)	12 (0)	4 (0)	9 (0)
	36 (3)	38 (0)	51 (1)	53 (0)	8 (1)	10 (0)	6 (0)	5 (0)
	Sibs of				Half-sibs			
	Father		Mother		Paternal		Maternal	
	Male	Female	Male	Female	Male	Female	Male	Female
<i>Supplementary Series</i> Male 307 Female 119	438 (4)	395 (1)	443 (1)	392 (1)	9 (0)	8 (0)	7 (1)	14 (0)
	144 (0)	146 (0)	165 (0)	139 (0)	4 (0)	1 (0)	1 (0)	1 (0)

half-brother) of 36 half-sibs of female index patients were proved affected. In the case of the paternal half-brother there was also a relationship through the mother, since the father's second wife was a niece of his first wife.

Among the other second degree relatives ascertainment is likely to be most complete among nephews and nieces of the main series, since these were born relatively recently, and next most complete among the aunts and uncles of the supplementary series, mostly born one generation ago. Combining these two groups, for the male index patients 1% (11 of 1143) of uncles and nephews, and 0.3% (3 of 1067) of aunts and nieces were proved affected, and for the female index patients the proportions were 1% (4 of 396) and 0% (0 in 376), respectively. Relative to the general population of the same sex, the ratios are 1.9, 2.8, 2.0, and 0.0, respectively. Over-all in uncles and aunts and nephews and nieces the ratio in relation to the general population is 1.95. There is no apparent higher risk in the relatives of the female than in those of the male index cases, nor in the ratio of affected to the population incidence in male (2.0) as compared with female (1.9) relatives.

Considering just nephews and nieces (more recently born) the proportions affected are: nephews of male index patients 2.3% (6 of 262), nieces 0.4% (1 of 280); and for female index patients, nephews 4.7% (4 of 87), nieces 0% (0 in 91). Compared with the general population, the ratios are 4.6, 3.6, 9.4, and 0.0, respectively; over-all the ratio is 5.0.

Third Degree Relatives. The findings in the third degree relatives (cousins) are summarized in

Table IV. Ascertainment is likely to be more nearly complete in the supplementary series, since these cousins have been born more recently; however, the findings were similar in the two series.

Combining the main and supplementary series for male index patients, 0.9% (25 of 2683) of male cousins and 0.2% (6 of 2580) of female cousins were affected. For female index patients, 0.7% (11 of 1638) of male cousins and 0.3% (4 of 1568) of female cousins were affected. Related to the general population the ratios are 1.9, 2.3, 1.3, and 2.6. There is no higher proportion affected among the cousins of female than the cousins of male patients affected; but for the male cousins the ratio of affected to the population incidence is 1.7, for female cousins the ratio is 2.4. Over-all in the cousins the ratio in relation to the general population is 1.8.

Discussion

On the basis of the preliminary findings in this survey (Carter, 1961) it was noted that modified recessive inheritance was excluded by the finding that the risk to children of patients was as high or higher than the risk to sibs, and that X-linked inheritance was excluded by the frequency with which male patients had affected sons. The best hypothesis was that a major gene was acting on a polygenic background, with those beyond a threshold at risk of developing the condition (provided additional environmental triggers were also present); [a concept which Edwards (1969) has noted goes back to Karl Pearson]. It was also suggested that this polygenic background was modified by sex in such a way that females were protected by their sex.

TABLE IV
THIRD DEGREE RELATIVES—TOTALS AND NUMBERS AFFECTED
(THOSE AFFECTED SHOWN IN BRACKETS)

	Children of							
	Father's Brothers		Father's Sisters		Mother's Brothers		Mother's Sisters	
	Male	Female	Male	Female	Male	Female	Male	Female
<i>Main Series</i>								
Male								
330								
Female								
233								
	345 (2)	309 (1)	292 (2)	272 (0)	323 (2)	320 (1)	399 (5)	441 (2)
	266 (2)	243 (2)	266 (1)	291 (1)	315 (2)	305 (0)	330 (3)	301 (1)
<i>Supplementary Series</i>								
Male								
307								
Female								
119								
	352 (4)	325 (0)	332 (5)	328 (1)	280 (3)	259 (0)	360 (2)	326 (1)
	123 (1)	101 (0)	127 (0)	116 (0)	96 (2)	99 (0)	115 (0)	112 (0)

Male Index Patients
Male cousins: 2683 (25)
Female cousins: 2580 (6)

Female Index Patients
Male cousins: 1638 (11)
Female cousins: 1568 (4)

Thus, female patients were more extreme deviants from the population mean for the polygenically determined liability than male patients. The sex-modified liability to the condition explained the increasing risk to relatives, compared with that in the general population of the same sex, as one passed from male relatives of male index patients through female relatives of male patients and male relatives of female patients to female relatives of female patients. The principle is shown in the Fig.

The pattern of inheritance suggested by the preliminary findings has been fully confirmed in the much larger series now reported. It has, however, become apparent that there is no need to postulate

the presence of a major gene, only sex-modified polygenic inheritance. The information now available on second and third degree relatives, even though ascertainment is almost certainly incomplete in these relatives, makes it improbable that a single gene makes a major contribution.

Falconer (1965) has pointed out that, if the underlying liability is defined as including both the genetic predisposition and the environmental factors involved, the threshold will be absolute, with all those beyond it clinically affected. Further, the proportion affected among relatives of different degrees may be used to estimate the regression coefficient of relatives on index patients for the underlying

FIG. Hypothetical distribution of multifactorial genotype contributing to pyloric stenosis, in males, females, and male relatives of female index patients.

liability, and hence estimates of heritability may be made. Falconer emphasized that the estimate should be regarded as an upper limit to the true heritability, since dominance (in the case of sibs, but not parent and child) and, more important, common within-family environment, will raise the regression coefficient above that due to additive inheritance. Falconer also assumed that the distribution of liability in relatives would be normal, and Edwards (1969) holds that this approximation will cause the heritabilities from first degree relatives to be underestimated by about 10%. The estimates of heritability for pyloric stenosis from this study are summarized in Table V.

The heritabilities of the relatives of the more rarely affected girl patients tend to be higher than for affected boys, and this is perhaps understandable. True heritabilities of over 100% are impossible, and the estimate for the sons of affected women is 100%, but this figure has a standard error of about 10% and, as mentioned above, must be regarded as an upper limit. The heritability estimates for second and third degree relatives tend to be lower than for first degree relatives. Mean unweighted heritabilities are 76, 27 (61 for nephews and nieces only), and 50% for first, second, and third degree relatives, respectively. Inevitably there will be incomplete diagnosis in the aunts and uncles, who belong to an earlier generation and who form the majority of the second degree relatives, and in the first cousins, whose medical history is not always fully known to the person giving the information about the family. These lesser heritabilities, however, indicate no major effect of a single gene on the liability to the condition. The effect of such a gene tends to raise estimates of heritability, made on the assumption of polygenic inheritance, to over 100% for first degree relatives, but raises the esti-

mates even higher for second and third degree relatives. The hypothesis that the liability to the condition depends on multiple alleles at one gene locus, does not [as noted by Edwards (1969)] explain the family patterns observed. In particular on this single gene locus hypothesis the liability in sibs, a quarter of whom would have the same genotype as the index patient, would differ from that in children. The crossed-sex estimates of heritabilities for patients and relatives of unlike sex appear consistent with those for patients and relatives of like sex, which suggests that the genetic liability in the two sexes does largely depend on the same genes.

Two other tests for polygenic inheritance may be attempted on the present data: the effect of severity of the condition in the index patient on the recurrence risks and the effect of having one first degree relative already affected on the recurrence risks. There is no simple measure of severity in pyloric stenosis. Early onset of symptoms in this series is not associated with any alteration in the risk to relatives. There is, however, a striking effect of having one first degree relative already affected. In the main series where a male index patient had already had one affected child, 3 of 9 subsequent sons and 0 of 8 subsequent daughters were affected; for female index patients, 3 of 9 subsequent sons and 2 of 4 subsequent daughters were affected. Similarly, where the index patient had one other sib also affected, combining both series for male index patients, 0 of 9 brothers and 2 of 9 sisters were affected; for female index patients 0 of 9 brothers and 0 of 2 sisters were affected. Combining the two groups: for male index patients the proportions affected are 3 in 18 sons or brothers, and 2 in 17 daughters or sisters; for female index patients 3 in 13 sons or brothers and 2 in 6 daughters or sisters. Though small

TABLE V
HERITABILITY ESTIMATES FROM THE RATIO OF RELATIVES TO GENERAL
POPULATION AFFECTED

Like-sex			Unlike-sex		
	Regression	Heritability %		Regression	Heritability %
Sons on fathers	0.34	68	Daughters on fathers	0.35	70
Brothers on brothers	0.27	54	Sisters on brothers	0.36	72
Daughters on mothers	0.45	90	Sons on mothers	0.56	100
Sisters on sisters	0.39	78	Brothers on sisters	0.37	74
Uncles on nephews	0.08	32	Aunts on nephews	0.11	44
Nephews on uncles			Nieces on uncles		
Aunts on nieces			Uncles on nieces		
Nieces on aunts	0.00	0	Nephews on aunts	0.075	30
First cousins, male	0.077	62	Girl on boy cousins	0.054	43
First cousins, female	0.088	70	Boy on girl cousins	0.003	24

numbers are involved the recurrence risks are overall very significantly higher than for unselected index patients.

The parental consanguinity observed, 5 first cousins, 1 second cousin, and 1 first cousin once removed in about a thousand marriages, is probably about twice that in the general population.

Until recently pyloric stenosis had a high mortality (Carter, 1961). Its high frequency in British and related populations therefore raises the usual problems as to the mechanisms which maintain this high frequency. There is no indication that the high incidence is due to changing environment, for example the introduction of bottle-feeding. The condition is probably much less common in Negro and Mongolian peoples.

Summary

A family study of pyloric stenosis is reported based on two series of index patients treated by Ramstedt's operation at The Hospital for Sick Children. The main series were boys treated from 1920 to 1939 and girls treated from 1920 to 1949. These were traced in adult life, and so gave information on offspring and nephews and nieces, as well as sibs and first cousins. The supplementary series of boys treated from 1953 to 1962 and girls treated from 1950 to 1965 gave information on sibs, aunts and uncles, and first cousins.

Adopting strict criteria for a diagnosis of pyloric stenosis in relatives, with most cases confirmed at operation, it was found that some 20% of the sons and 7% of the daughters of girl patients developed pyloric stenosis, in comparison with about 5% of sons and 2½% of daughters of boy patients. The proportion of sibs affected was lower than that of offspring, and again there was a higher risk to the relatives of the girl patients. The estimated population incidence of pyloric stenosis from previous surveys is 0.5% of live-born boys and 0.1% of live-born girls.

The best hypothesis to explain these findings is that the genetic component in liability for pyloric

stenosis is polygenic, and modified by sex in such a way that girls require significantly stronger genetic liability before they develop the clinical condition. Applying Falconer's method of analysis, the estimates of heritability from first degree relatives are about 65% for male index patients and 85% for female index patients. These are upper estimates, since it is probable that some of the familial resemblance is due to common within-family environment. Estimates of heritability from aunts and uncles, nephews and nieces, and first cousins tend to be somewhat lower, averaging 27% for the second degree and 50% for the third degree relatives. This may be in part due to less complete diagnosis and in part due to lower within-family environmental resemblances, but these lower estimates do make it improbable that a single mutant gene makes a major contribution to the genetic liability.

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Appendix I

Relatives of Index Patients—Main Series

M: male, F: female, R: Ramstedt's operation, T: pyloric tumour (but no operation), A: pyloric stenosis confirmed at necropsy, -: 0, NK: not known.

	Date of Birth	Children		Sibs				Children of				Parents, Half-sibs, Aunts, Uncles, and 1st Cousins Affected	
		M	F	Born Before		Born After		Brothers		Sisters			
		M	F	M	F	M	F	M	F	M	F		
MALE PATIENTS													
1	12/19	1	2	1	1	2R	-	1	4	-	1	-	
2	5/20	-	2	-	-	1	1	-	-	1	2	-	
3	5/20	-	3	-	-	1	2	-	1	-	3	-	
4	5/20	2	1	-	3	-	-	-	-	7	9	-	
5	2/21	1	1	-	-	-	2	-	-	-	-	-	
6	8/21	1	1	-	-	-	-	-	-	-	-	-	
7	9/21	-	1	-	1	1	-	-	-	-	-	-	
8	2/22	1	-	-	-	-	2	-	-	3	-	-	
9	3/22	1	1	-	-	-	-	-	-	-	-	-	
10	4/22	1	3	2	-	-	3	2	2	4	1	-	
11	4/22	-	1	1	1	3	-	1	-	-	-	-	
12	5/22	1	-	1	1	3R ^{I.67}	1	6	3	-	2	-	
13	5/22	-	1	-	1	-	-	-	-	-	-	-	
14	6/22	1	-	-	-	-	-	-	-	-	-	-	
15	7/22	3	-	-	-	-	-	-	-	-	-	-	
16	9/22	1	1	-	-	2	2	2	2	3	-	-	
17	11/22	-	1	-	-	-	-	-	-	-	-	-	
18	11/22	2R	2	-	-	3	3	2	4	-	-	-	
		R											
19	12/22	4	-	-	-	-	-	-	-	-	-	-	
20	12/22	1	1	1	-	-	-	1	2	-	-	-	
21	1/23	-	2	-	-	-	-	-	-	-	-	-	
22	1/23	-	2	-	1	4	2	-	-	2	3	-	
23	1/23	1	1	-	-	1	-	-	-	-	-	-	
24	2/23	1	2	-	2	-	-	-	-	2	2	-	
25	2/23	1	1	-	-	-	-	-	-	-	-	-	
26	3/23	3	-	-	-	-	-	-	-	-	-	-	
27	4/23	-	2	1	2	-	-	1	-	-	-	-	
28	4/23	4	1	1	-	-	-	2	-	-	-	-	
29	5/23	2	1	-	-	1	-	-	-	-	-	-	
30	5/23	1	1	-	-	2	-	-	-	2	-	-	
31	5/23	1	4	-	-	-	-	-	-	-	-	-	
32	5/23	1	-	-	-	-	-	-	-	-	-	-	
33	7/23	1	-	-	-	-	-	-	-	-	-	-	
34	9/23	2	1	2	-	2	-	-	2	-	-	-	
35	9/23	2	2	-	1	-	-	-	-	-	2	-	
36	10/23	1	1	-	-	-	-	-	-	-	-	-	
37	10/23	2	-	-	-	2	-	-	2	-	-	-	
38	12/23	-	2	-	1	-	-	-	-	-	-	-	
39	12/23	1	-	-	-	1	-	1	1	-	-	-	
40	1/24	1	1	-	-	-	2	-	-	-	2	-	
41	1/24	1	1	3	-	-	1	3	2	-	2	-	
42	2/24	1	1	-	-	1	1	-	1	-	-	-	
43	4/24	1	1	-	-	-	-	-	-	-	-	-	
44	6/24	1	-	1	-	-	1	-	1	3	-	-	
45	7/24	1	-	-	-	-	-	-	-	-	-	-	
46	12/24	-	2	-	-	-	-	-	-	-	-	-	
47	2/25	2	1	-	-	1	-	-	-	-	-	-	
48	2/25	-	1	-	-	-	-	-	-	-	-	-	
49	2/25	2	2	1	-	-	1	-	1	1	1	-	
50	3/25	2R ^{II.25*}	-	-	-	-	1R ^{I.349}	-	-	2R	1	-	
51	3/25	-	1	1	3	-	-	1	-	4	1	-	
52	3/25	3	3	-	5	2	-	3	1	5	4	-	
53	4/25	1	3	-	-	-	1	-	-	1	1	-	
54	5/25	2	1	-	-	-	1	-	-	-	-	-	
55	5/25	1	2R	-	-	-	2	-	-	-	-	-	
56	6/25	1	1	-	-	1	-	-	-	-	-	-	
57	8/25	1	1	-	-	1	-	-	-	-	-	-	
58	8/25	2	1	-	1	1	1	-	-	-	3	-	
59	8/25	1	2	-	-	-	-	-	-	-	-	-	
60	8/25	2R	-	-	-	-	1	-	-	-	3	-	
61	9/25	2	1	-	1	-	1	-	-	1	1	-	
62	9/25	2	2	1	2A	3	1	2	-	1	-	-	
63	9/25	1T	1	4	-	-	1	3	1	-	-	-	
64	9/25	2	3	-	1	3	3	3	4	3	1	-	

* II.25 etc. refers to Appendix II, patient 25.

Appendix I—continued

	Date of Birth	Children		Sibs				Children of				Parents, Half-sibs, Aunts, Uncles, and 1st Cousins Affected	
				Born Before		Born After		Brothers		Sisters			
		M	F	M	F	M	F	M	F	M	F		
65	10/25	2	—	—	—	—	—	—	—	—	—	—	—
66	10/25	1	—	—	—	—	1	—	—	—	—	—	—
67	10/25	2	1	3R ^{I.12}	—	1	1	5	3	—	1	—	—
68	11/25	—	3	—	—	—	—	—	—	—	—	—	—
69	12/25	—	1	—	1	—	2	—	—	—	—	—	—
70	2/26	2	—	—	—	—	1	—	—	—	—	—	—
71	2/26	1	2	6	2	1	5	6	7	5	7	—	—
72	2/26	2	2	1	1	—	—	—	—	—	—	—	—
73	3/26	2	—	—	—	—	1	—	—	1	—	—	—
74	4/26	—	3	—	—	—	—	—	—	—	—	—	—
75	5/26	—	3	—	—	1	1	2	1	1	1	—	—
76	5/26	1	2	—	—	1	—	—	—	—	—	—	—
77	6/26	2	1	—	1	1	—	—	—	1	1	—	—
78	6/26	1	1	1	—	1	1	—	—	—	—	—	—
79	7/26	2	—	—	—	1	1	—	1	2	—	—	—
80	8/26	1	2	—	2	—	—	—	—	—	1	—	—
81	9/26	2	—	—	—	—	—	—	—	—	—	—	—
82	9/26	1	1	3	—	—	—	1	2	—	—	—	—
83	11/26	1	4	1	—	—	3	—	—	—	—	—	—
84	12/26	—	2	2	5	—	—	2	2	1	4	—	—
85	1/27	2	—	—	—	—	—	—	—	—	—	—	—
86	1/27	1	—	NK	NK	NK	NK	NK	NK	NK	NK	—	—
87	1/27	2	2	1	—	1	—	—	—	—	—	—	—
88	2/27	2	—	1	1	—	3	—	—	5	3	—	—
89	2/27	1	—	—	—	—	—	—	—	—	—	—	—
90	2/27	3	—	—	—	—	—	—	—	—	—	—	—
91	2/27	2	1	2	—	1	—	—	1	—	—	—	—
92	2/27	1	—	1	—	—	—	1	—	—	—	—	—
93	2/27	3	—	—	—	—	—	—	—	—	—	—	—
94	3/27	1R	1	—	—	1	—	—	—	—	—	—	—
95	3/27	2	1	—	—	1	—	—	2	—	2	—	—
96	4/27	1	2	—	—	—	—	—	—	—	—	—	—
97	4/27	2R	2	1	1	—	—	2	1	1	—	—	—
98	5/27	2	—	—	—	2	—	—	—	—	—	—	—
99	5/27	1	1	2	1	—	—	5	5	—	—	—	—
100	6/27	2	1	—	2	—	—	—	—	—	—	—	—
101	7/27	1	1	—	—	2	—	—	—	—	—	—	—
102	7/27	1	2	1	—	2	—	—	—	—	—	—	—
103	8/27	1	1	3	1	3	1	10	1	1	—	—	—
104	9/27	1	1	—	—	—	—	—	—	—	—	—	—
105	10/27	3	1	—	1	—	—	—	—	—	—	—	—
106	10/27	2	—	1	1	—	—	1	—	—	—	—	—
107	11/27	1	2	—	—	—	1	—	—	2	1	—	—
108	1/28	1	2	2	1	—	—	3	1	—	—	—	—
109	1/28	2	—	—	—	—	1	—	—	—	—	—	—
110	1/28	1	2	—	—	—	—	—	—	—	—	—	—
111	2/28	2	1	1	—	—	—	1	—	—	—	—	—
112	2/28	1	1	—	—	—	—	—	—	—	—	—	—
113	4/28	—	2	—	1R ^{I.341}	—	1R ^{I.370}	—	—	2	2	—	—
114	5/28	—	3	1	—	—	—	—	—	—	—	—	—
115	5/28	3	—	—	—	—	—	—	—	—	—	—	—
116	5/28	1	—	2	—	—	—	3	—	—	—	—	—
117	6/28	1	2	—	1	—	—	—	—	—	1	—	—
118	7/28	1	1	—	—	—	—	—	—	—	—	—	—
119	8/28	1	1	—	—	—	2	—	—	—	—	—	—
120	8/28	2	—	2	—	—	—	1	4	—	—	—	—
121	9/28	—	2	1	—	—	—	—	—	—	—	—	—
122	10/28	2T	1	—	—	—	—	—	—	—	—	—	—
		T											
123	11/28	2	—	—	—	—	1	—	—	—	—	—	—
124	12/28	2R ^{II.9}	—	—	—	—	2	—	—	—	1	—	Mo. si. son R
125	1/29	3	—	—	2	1	—	1	1	2	4R ^{I.546}	—	—
126	2/29	1	1	—	—	—	—	—	—	—	—	—	—
127	2/29	—	1	—	—	—	—	—	—	—	—	—	—
128	3/29	1	1	1	1	—	—	—	—	—	1	—	—
129	4/29	1	—	—	—	—	—	—	—	—	—	—	—
130	4/29	1R	1	1	1	—	—	—	—	—	—	—	—
131	5/29	2	1	1	—	—	—	—	—	—	—	—	—
132	6/29	2	1	—	—	—	—	—	—	—	—	—	—

Appendix I—continued

	Date of Birth	Children		Sibs				Children of				Parents, Half-sibs, Aunts, Uncles, and 1st Cousins Affected
				Born Before		Born After		Brothers		Sisters		
		M	F	M	F	M	F	M	F	M	F	
133	6/29	1	1	2	—	—	—	1	—	—	—	—
134	8/29	—	1	—	—	—	2	—	—	2	2	—
135	8/29	1	—	—	—	1	2	—	—	—	—	—
136	8/29	1	2	—	—	1	1	—	—	—	—	—
137	9/29	1	1	—	—	—	1	—	—	—	2	—
138	10/29	—	3	—	—	—	—	—	—	—	—	—
139	10/29	2	3	—	—	1	2	2	—	2R	3	—
140	11/29	1	1	—	—	1	—	—	—	—	—	—
141	12/29	1	—	—	—	—	—	—	—	—	—	—
142	12/29	2	1	1	—	—	—	2	—	—	—	—
143	1/30	3	2	3	1	1	1	—	1	2	—	—
144	1/30	1	—	1	—	1	1	1	2	—	—	—
145	3/30	1	2	—	—	—	—	—	—	—	—	Mo. bro. son R
146	3/30	—	1	1	1	—	—	—	—	1	1	—
147	4/30	1	1	2	1	1	—	—	—	1	—	—
148	4/30	2	1	—	—	1	1	1	—	—	—	—
149	5/30	1	—	—	2R	—	—	—	—	2	—	—
150	6/30	—	1	—	—	—	—	—	—	—	—	—
151	7/30	1	2	—	1	—	1	—	—	—	2	—
152	7/30	1R	1R ^{II.384}	—	—	1	1	—	—	—	—	—
153	7/30	—	2	—	—	—	—	—	—	—	—	—
154	10/30	1R	2	—	—	1	—	—	—	—	—	—
155	1/31	—	2	—	—	—	1	—	—	—	—	—
156	1/31	2R	2	—	1	—	1	—	—	2	—	—
157	3/31	1	—	1	—	1	5	—	3	1	4	—
158	5/31	1	1	—	—	—	1	—	—	—	—	—
159	6/31	1	—	—	—	1	—	1	1	—	—	Mo. si. dau. R
160	7/31	1	2	—	1	—	—	—	—	2	2	—
161	7/31	1R	1	1	—	—	—	1	1	—	—	—
162	8/31	—	2	—	—	—	—	—	—	—	—	—
163	8/31	—	2	—	—	—	1	—	—	—	1	—
164	8/31	1	1	1	2	1	—	1	1	2	2	—
165	9/31	2	1	1	—	—	1	1	1	—	—	—
166	10/31	2	—	—	—	—	—	—	—	—	—	—
167	12/31	1R	—	NK	NK	NK	NK	NK	NK	NK	NK	—
168	1/32	1	1	—	—	—	—	—	—	—	—	—
169	1/32	—	2	—	—	1	—	—	—	—	—	—
170	2/32	1	1	—	—	1	—	—	—	—	—	—
171	3/32	1	—	2	1	1	1	2R	4	2	4	—
172	3/32	—	1	—	1	—	—	—	—	—	—	—
173	3/32	2	—	—	—	1	—	—	—	—	—	—
174	4/32	2	—	—	—	1	—	1	—	—	—	—
175	5/32	2	—	—	—	—	1	—	—	—	—	—
176	6/32	2	—	1	—	—	—	1	—	—	—	—
177	7/32	—	1	—	—	3	2	—	—	1	1	—
178	9/32	2	—	—	—	—	—	—	—	—	—	—
179	10/32	3	1	—	1	1	1	1	1	2R	1	—
180	11/32	—	2	—	—	2	—	—	—	—	—	Mo. si. son R ^{I.288}
181	11/32	2	1	—	—	3R	—	—	—	—	—	—
182	12/32	1	—	—	—	2	—	1	2	—	—	—
183	1/33	1	2	—	—	—	—	—	—	—	—	—
184	1/33	—	2	—	—	—	2	—	—	—	—	—
185	5/33	—	1	—	—	—	—	—	—	—	—	—
186	5/33	1	2	—	—	—	1	—	—	—	—	—
187	5/33	—	2	—	—	1	2	—	—	—	—	—
188	5/33	1	2	—	—	—	—	—	—	—	—	—
189	5/33	1	1	—	—	1	2	—	—	—	1	—
190	6/33	—	2	1	—	—	—	—	1	—	—	—
191	6/33	—	1	—	—	—	—	—	—	—	—	Fa. bro. son R
192	6/33	1	1	—	—	—	—	—	—	—	—	—
193	7/33	1	1	1	—	—	—	—	1	—	—	—
194	9/33	2	1	—	—	—	—	—	—	—	—	Fa. si. son R ^{I.319}
195	10/33	1	—	—	1	—	—	—	—	1	—	—
196	11/33	2	1	—	—	1	—	—	—	—	—	—
197	11/33	—	2	1	1	—	—	—	2	1	—	—
198	11/33	2	1	—	—	—	1	—	—	—	2	—
199	11/33	2	—	—	—	—	1	—	—	—	2	—
200	12/33	—	1	—	1	—	—	—	—	1	1	—
201	12/33	1	—	—	—	—	1	—	—	1	—	—

Appendix I—continued

	Date of Birth	Children		Sibs				Children of				Parents, Half-sibs, Aunts, Uncles, and 1st Cousins Affected
		M	F	Born Before		Born After		Brothers		Sisters		
		M	F	M	F	M	F	M	F	M	F	
202	1/34	1	1	-	-	1	-	-	-	-	-	Mo. si. son R
203	2/34	1	-	2	-	-	-	2	3	-	-	—
204	3/34	2	1T	1	-	2	-	-	-	-	-	—
205	4/34	-	1	-	-	-	-	-	-	-	-	—
206	4/34	1	1	1	-	1	-	-	4	-	-	—
207	4/34	-	2	-	-	-	1	-	-	-	-	—
208	4/34	-	1	-	-	-	1	-	-	-	-	—
209	4/34	1	1	-	-	-	1	-	-	-	-	—
210	5/34	-	1	1	2	1	-	1	2	1	5	—
211	6/34	2	1	-	-	2	-	-	-	-	-	—
212	6/34	1	1	-	-	-	1	1	-	-	-	—
213	7/34	1	1	-	-	-	1	-	-	-	-	—
214	7/34	-	2T	1	1	-	-	3	-	-	-	—
215	7/34	2	-	-	1	-	2	-	-	-	-	—
216	8/34	1	1R	-	-	-	-	-	-	-	-	—
217	8/34	2	1	1	2	-	-	-	-	1	1	—
218	8/34	2	1	2	-	-	-	2	-	-	-	—
219	8/34	-	2	1	1	1	1	2	-	1	1	—
220	9/34	2	-	1	3	-	-	1	1	3	3	—
221	9/34	-	1	-	-	-	-	-	-	-	-	—
222	10/34	-	2	-	-	-	-	-	-	-	-	—
223	12/34	-	1	-	-	-	-	-	-	-	-	—
224	12/34	1	1	-	1	-	-	-	-	1	-	—
225	12/34	-	2	-	-	-	-	-	-	-	-	—
226	1/35	1	-	-	-	-	-	-	-	-	-	—
227	1/35	2	1	-	-	-	1	-	-	-	-	Mo. bro. dau. R
228	3/35	1	1	-	-	2	-	-	-	-	-	—
229	3/35	-	3	-	-	-	-	-	-	-	-	—
230	3/35	1	1	-	-	-	-	-	-	-	-	—
231	3/35	2	-	-	-	-	-	-	-	-	-	—
232	3/35	1	-	-	-	-	1	-	-	-	1	—
233	4/35	1	-	-	-	-	-	-	-	-	-	—
234	4/35	1	2	-	-	-	-	-	-	-	-	—
235	5/35	-	3	-	-	-	-	-	-	-	-	—
236	5/35	1	1	-	-	-	3	-	-	-	-	—
237	6/35	-	1	-	-	-	-	-	-	-	-	—
238	8/35	1	1	-	-	2R	1	-	-	1	1	Fa. bro. dau. R
239	8/35	2	-	-	-	2	-	-	-	-	-	—
240	8/35	-	1	1	2	-	-	1	1	1	3	—
241	8/35	-	4	-	-	-	-	-	-	-	-	Mo. si. dau. R
242	9/35	1	2	-	-	1	-	-	-	-	-	—
243	9/35	-	1	-	-	-	1	-	-	-	1	—
244	9/35	-	1	-	2	-	-	-	-	2	2	—
245	9/35	2	1	-	-	-	-	-	-	-	-	—
246	10/35	-	1	-	-	1R	1	-	-	-	-	—
247	11/35	-	1	-	-	-	-	-	-	-	-	—
248	11/35	1	2	-	-	1	-	-	-	-	-	—
249	12/35	2	-	-	-	-	-	-	-	-	-	—
250	12/35	-	1	-	-	-	-	-	-	-	-	—
251	1/36	1	-	-	-	1	2	-	-	1	2	—
252	1/36	1	-	3	1	-	-	-	-	-	-	—
253	1/36	1	1	-	1	1	-	-	-	1	2	—
254	1/36	-	3	-	2	-	-	-	-	2	-	—
255	2/36	1	2	-	-	1	-	1	-	-	-	—
256	3/36	1	1	-	-	-	-	-	-	-	-	—
257	3/36	1	2	-	-	-	1	-	-	2	1	—
258	3/36	1	-	1	-	-	2	2	2	-	-	—
259	3/36	1	-	-	-	-	1	-	-	-	-	—
260	3/36	-	1	1	1	1	1	1	1	5	4	—
261	4/36	-	1	1	-	-	-	-	1	-	-	—
262	6/36	1	-	-	-	-	1	-	-	-	-	—
263	6/36	2	-	1	1	-	-	1	2	-	-	—
264	6/36	1	-	2R	2	-	1R	-	-	-	3	—
265	7/36	1	-	-	-	-	-	-	-	-	-	—
266	7/36	1	-	-	-	-	-	-	-	-	-	—
267	8/36	2	-	-	-	-	1	-	-	-	-	—
268	8/36	3R	-	-	-	4	2	-	-	-	1	—
269	8/36	-	2	-	1	-	-	-	-	-	2	—
270	8/36	1	-	1	-	3	-	2	4	-	-	—

Appendix I—continued

	Date of Birth	Children		Sibs				Children of				Parents, Half-sibs, Aunts, Uncles, and 1st Cousins Affected
				Born Before		Born After		Brothers		Sisters		
		M	F	M	F	M	F	M	F			
271	10/36	-	1	-	-	-	-	-	-	-	-	-
272	11/36	1R	-	1	1	-	-	1	2	-	2	-
273	12/36	1	-	-	-	-	1	-	-	1	-	-
274	1/37	-	1	-	2	-	-	-	-	1	3	-
275	2/37	2	-	-	1	-	-	-	-	-	-	-
276	4/37	-	1	NK	NK	NK	NK	NK	NK	NK	NK	-
277	4/37	1	-	-	-	2	2	-	2	-	-	-
278	4/37	1	-	1	-	-	2	-	-	-	-	-
279	4/37	1	-	1	2	-	-	1	1	1	-	-
280	5/37	1	-	-	-	1	-	-	-	-	-	-
281	5/37	2	-	-	-	1	1	-	-	-	-	-
282	5/37	1	1	-	-	1	-	2	3	-	-	-
283	5/37	1	2	-	-	1	2	-	-	-	-	-
284	6/37	1	-	1	-	-	-	-	-	-	-	-
285	7/37	-	2	-	-	-	-	-	-	-	-	-
286	7/37	-	2	-	-	-	1	-	-	-	-	-
287	7/37	1	-	NK	NK	NK	NK	NK	NK	NK	NK	-
288	7/37	1	2	-	-	1	2	-	-	-	-	Mo. si. son R ^{I.180}
289	7/37	1	1	-	-	-	-	-	-	-	-	-
290	8/37	1	1	1	-	-	1	-	-	-	-	-
291	8/37	-	1	NK	NK	NK	NK	NK	NK	NK	NK	-
292	9/37	-	1R ^{II.406}	-	-	-	-	-	-	-	-	-
293	9/37	1	1	-	-	-	1	-	-	-	2	-
294	9/37	1	-	-	-	-	-	-	-	-	-	-
295	10/37	4	1	-	3	2	2	-	2	6	2	-
296	10/37	1	1	-	-	1	1	-	-	-	-	-
297	11/37	2	-	-	-	-	1	-	-	-	-	-
298	11/37	-	1	-	-	-	-	-	-	-	-	-
299	1/38	-	1	-	-	1	-	-	-	-	-	-
300	1/38	-	1	-	1	-	-	-	-	1	1	Fa. si. son R
301	1/38	-	2	-	-	-	-	-	-	-	-	-
302	2/38	-	1	-	-	-	1	-	-	-	-	-
303	2/38	1	1	NK	NK	NK	NK	NK	NK	NK	NK	-
304	6/38	1	1	-	-	-	-	-	-	-	-	-
305	6/38	-	2R ^{II.423}	-	-	-	1	-	-	-	-	-
306	6/38	1	-	NK	NK	NK	NK	NK	NK	NK	NK	-
307	7/38	-	1	-	-	-	2	-	-	-	-	-
308	8/38	1	1	-	-	-	1	-	-	-	-	-
309	8/38	-	3	1	1	1	1	-	1	-	1	-
310	9/38	-	1	-	-	-	-	-	-	-	-	-
311	9/38	1	-	-	-	1	1	-	-	1	-	-
312	9/38	1	-	-	2	1	-	-	-	2	1	-
313	10/38	1	1	-	1	-	-	-	-	1	1	-
314	11/38	1	-	3	1	1	1	1	1	2R ^R	2	-
315	12/38	-	2	-	-	-	-	-	-	-	-	-
316	12/38	1	-	-	-	-	1	-	-	-	2	-
317	12/38	1	1	-	-	-	-	-	-	-	-	-
318	12/38	-	1	-	-	1	1	-	1	-	-	-
319	12/38	-	1	-	-	-	2	-	-	-	-	Mo. bro. son R ^{I.194}
320	1/39	2	-	-	1	-	-	-	-	-	-	-
321	1/39	1R	-	1	-	1	-	-	-	-	-	-
322	2/39	-	1	-	-	2	-	-	-	-	-	-
323	2/39	1	-	-	1	-	-	-	-	-	-	-
324	3/39	1	-	-	-	-	1	-	-	-	-	Mo. si. son R
325	4/39	-	1	-	-	-	1	-	-	-	-	-
326	5/39	1	1	-	-	1	-	2	-	-	-	-
327	7/39	1	-	-	-	-	-	-	-	-	-	-
328	8/39	-	1	-	-	-	2	-	-	-	-	-
329	8/39	1	1R	-	-	-	1	-	-	-	-	-
330	10/39	1	-	2	1	2	-	3	2	4	1	-
FEMALE PATIENTS												
331	2/21	2	1	-	-	-	-	-	-	-	-	-
332	4/21	1	-	-	-	-	-	-	-	-	-	-
333	3/22	-	-	-	-	-	1	-	-	-	-	-
334	1/23	-	-	-	1	1	2	1	1	1	1	-
335	10/23	1	-	2	1	-	-	1	1	1	1	-
336	11/23	1R	1	-	-	-	-	-	-	-	-	-

Appendix I—continued

	Date of Birth	Children		Sibs				Children of				Parents, Half-sibs, Aunts, Uncles, and 1st Cousins Affected
		M	F	Born Before		Born After		Brothers		Sisters		
		M	F	M	F	M	F	M	F	M	F	
404	8/36	2	1	-	-	-	-	-	-	-	-	-
405	9/36	1R	-	-	-	-	-	-	-	-	-	-
406	9/36	-	1	-	-	-	1	-	-	-	-	-
407	10/36	-	1	2	1	-	-	-	5	1	2	-
408	11/36	2R	-	-	1	3	1	-	-	1	1	-
409	11/36	2	-	-	-	-	-	-	-	-	-	-
410	1/37	-	-	-	-	-	-	-	-	-	-	-
411	1/37	-	-	NK	NK	NK	NK	NK	NK	NK	NK	-
412	1/37	2	-	-	-	-	-	-	-	-	-	-
413	3/37	1	1	-	-	-	-	-	-	-	-	-
414	5/37	1	1	1	-	-	-	-	2	-	-	-
415	7/37	-	-	-	-	-	-	-	-	-	-	-
416	7/37	-	2	-	-	-	-	-	-	-	-	-
417	9/37	4	1	2	1	1	2	8	1	1	2	-
418	9/37	1	1	-	-	-	2	-	-	-	-	-
419	10/37	-	-	-	-	-	-	-	-	-	-	-
420	12/37	1	1R	-	1	1	2	-	-	2	1	-
421	2/38	-	2	-	-	-	-	-	-	-	-	-
422	7/38	-	2	-	-	2	2	-	-	-	-	-
423	9/38	-	1	3R R	2	-	-	1	-	-	3	-
424	9/38	-	-	-	-	1	-	-	-	-	-	-
425	11/38	1	-	2	-	-	-	1	1	-	-	-
426	2/39	-	2	2	-	-	-	2	-	-	-	-
427	4/39	-	-	-	-	-	-	-	-	-	-	-
428	7/39	-	2	-	-	-	1	-	-	-	-	-
429	8/39	-	1	-	1	-	-	-	-	-	-	-
430	9/39	-	-	-	-	-	2	-	-	-	-	-
431	10/39	-	-	-	1	-	-	-	-	-	1	-
432	12/39	1	-	-	-	1	1	-	-	-	-	-
433	3/40	1	1	1	-	-	-	1	-	-	-	-
434	5/41	1	-	1	-	-	-	-	-	-	-	-
435	7/41	-	2	-	-	1	1R	-	-	-	1	-
436	11/41	1R	-	-	-	1	1	-	-	1	-	-
437	2/42	-	-	-	-	-	-	-	-	-	-	-
438	3/42	1R	-	-	-	1	-	-	-	-	-	-
439	6/42	1	1	-	-	2	-	-	-	-	-	-
440	7/42	-	-	-	-	1	-	-	-	-	-	-
441	7/42	3R R	-	1	3	1	-	-	-	-	3	-
442	8/42	-	1	2R	1	-	-	1R	-	-	-	-
443	8/42	-	-	-	-	1R	-	-	-	-	-	-
444	10/42	-	2	-	-	-	1	-	-	-	-	-
445	11/42	-	1	-	-	2	1	-	-	-	-	-
446	12/42	-	-	-	1	-	-	-	-	-	-	-
447	1/43	-	-	-	-	-	-	-	-	-	-	-
448	1/43	-	-	-	-	-	-	-	-	-	-	-
449	1/43	3	1	2	3	1	-	-	-	5	1	-
450	1/43	-	-	-	-	-	-	-	-	-	-	-
451	7/43	-	2	-	-	1	-	-	-	-	-	-
452	7/43	-	-	-	-	1	-	-	-	-	-	-
453	8/43	-	1	-	-	-	-	-	-	-	-	-
454	11/43	-	-	-	-	1	-	-	-	-	-	-
455	12/43	3R	-	-	1	-	1	-	-	-	-	-
456	12/43	-	-	1R	-	1	1	-	-	-	-	-
457	12/43	-	-	-	-	3	-	-	-	-	-	-
458	1/44	-	2	-	1R	1	-	-	-	-	1	-
459	2/44	-	-	-	-	-	1R	-	-	-	-	-
460	3/44	-	-	-	-	2	1	-	-	-	-	-
461	4/44	-	-	-	-	-	1	-	-	-	-	-
462	6/44	-	-	-	-	1	-	-	-	-	-	-
463	7/44	-	-	1	1	-	-	-	1	1	-	-
464	8/44	-	-	-	-	1	-	-	-	-	-	-
465	9/44	1R	-	-	-	-	1	-	-	-	-	-
466	10/44	-	-	1R	-	-	-	-	-	-	-	-
467	10/44	-	-	-	-	1	2	-	-	-	-	-
468	10/44	1	-	-	-	-	-	-	-	-	-	-
469	11/44	-	1	-	-	-	-	-	-	-	-	-
470	11/44	-	-	-	-	-	-	-	-	-	-	-

Fa. bro. dau. R^{1.542}

Mo. si. dau. R

Mo. bro. R

copyright.

Appendix I—continued

	Date of Birth	Children		Sibs				Children of				Parents, Half-sibs, Aunts, Uncles, and 1st Cousins Affected	
				Born Before		Born After		Brothers		Sisters			
		M	F	M	F	M	F	M	F	M	F		
471	11/44	1	-	-	1	-	-	-	-	-	-	-	-
472	12/44	-	-	-	1	1	-	-	-	1	-	-	-
473	1/45	-	-	-	1	1	-	-	-	-	-	-	Fa. si. son R Fa. si. dau. R
474	1/45	-	1	-	-	1	-	-	-	-	-	-	-
475	2/45	-	1	1	-	1	-	-	-	-	-	-	-
476	3/45	-	-	1R	1	-	-	-	-	-	-	-	-
477	3/45	2	-	-	-	-	-	-	-	-	-	-	-
478	5/45	-	-	-	1	-	-	-	-	-	-	-	-
479	6/45	-	-	1R	-	-	-	-	-	-	-	-	-
480	7/45	-	-	-	-	-	-	-	-	-	-	-	Mo. si. son R
481	9/45	-	-	-	-	-	-	-	-	-	-	-	-
482	9/45	-	-	-	-	-	1	-	-	-	-	-	-
483	9/45	-	-	2	1	-	-	1	1	-	-	-	-
484	11/45	-	-	-	-	-	-	-	-	-	-	-	-
485	11/45	1	-	-	-	2	3	NK	NK	NK	NK	-	-
486	11/45	-	-	-	-	-	-	-	-	-	-	-	-
487	1/46	-	-	1	-	1	-	-	-	-	-	-	-
488	2/46	-	-	1	1	-	-	-	-	1	1	-	-
489	2/46	2	-	1R	-	1	1	-	-	-	-	-	-
490	2/46	-	-	1	-	-	-	1	1	-	-	-	-
491	3/46	-	-	-	-	3	2	-	-	-	-	-	-
492	3/46	-	-	-	1R	-	-	-	-	-	-	-	-
493	4/46	-	-	-	-	-	-	-	-	-	-	-	-
494	4/46	-	-	-	-	-	-	-	-	-	-	-	-
495	4/46	-	-	-	1	-	-	-	-	-	1	-	-
496	4/46	-	-	-	-	-	-	-	-	-	-	-	-
497	5/46	-	-	-	-	-	1	-	-	-	-	-	-
498	5/46	1	-	-	-	1	1	-	-	-	-	-	-
499	6/46	-	-	2	1	-	-	-	-	1	-	-	-
500	6/46	-	-	-	-	1	-	-	-	-	-	-	-
501	7/46	-	-	-	-	-	-	-	-	-	-	-	-
502	8/46	-	-	-	-	1	-	-	-	-	-	-	-
503	8/46	2R	-	1	-	1	-	-	-	-	-	-	-
504	8/46	1	-	-	-	2	1	-	-	-	-	-	-
505	8/46	-	-	-	1	-	-	-	-	-	-	-	-
506	10/46	-	-	-	3	1	-	-	-	-	3	-	Pat. half bro. R
507	10/46	-	-	1	-	-	-	-	-	-	-	-	-
508	11/46	-	1	-	-	-	-	-	-	-	-	-	-
509	12/46	-	-	1	-	-	-	-	-	-	-	-	-
510	12/46	-	2	1	-	-	-	-	-	-	-	-	-
511	12/46	-	-	-	-	1	2R R	-	-	-	-	-	-
512	12/46	-	-	-	-	1	-	-	-	-	-	-	-
513	1/47	-	-	-	-	-	-	-	-	-	-	-	-
514	1/47	-	-	1	1	-	-	-	-	-	-	-	-
515	1/47	-	-	-	1	-	1	-	-	-	-	-	-
516	1/47	1	-	-	1	1	-	-	-	1	-	-	-
517	1/47	-	-	1	-	-	-	-	-	-	-	-	-
518	1/47	-	-	1	2	2	1	-	-	3	1	-	-
519	2/47	-	-	1	-	-	-	-	-	-	-	-	-
520	2/47	-	-	1	-	-	-	-	-	-	-	-	-
521	2/47	-	-	-	-	-	1	-	-	-	-	-	-
522	2/47	-	-	-	1	-	-	-	-	-	2	-	-
523	3/47	-	-	-	2R	-	-	-	-	-	2	-	-
524	3/47	-	-	-	-	-	-	-	-	-	-	-	-
525	4/47	1	-	1	-	-	-	-	-	-	-	-	-
526	5/47	-	-	-	1	1	-	-	-	-	-	-	-
527	5/47	-	1	-	-	1	1	-	-	-	-	-	-
528	5/47	-	-	3	3	-	-	4R	4	1	-	-	-
529	5/47	-	-	-	1	-	-	-	-	-	-	-	-
530	6/47	1	-	-	-	2	1	-	-	-	-	-	-
531	6/47	-	-	-	-	-	-	-	-	-	-	-	-
532	7/47	-	-	-	-	-	1	-	-	-	-	-	-
533	8/47	-	1	1	-	-	-	-	-	-	-	-	-
534	8/47	-	-	-	-	1	-	-	-	-	-	-	-
535	9/47	-	-	-	-	2R ^{II.202}	1	-	-	-	-	-	-
536	9/47	-	-	1	-	-	-	-	-	-	-	-	-
537	9/47	-	-	2	1	-	-	-	-	-	-	-	-

Appendix I—continued

	Date of Birth	Children		Sibs				Children of				Parents, Half-sibs, Aunts, Uncles, and 1st Cousins Affected	
				Born Before		Born After		Brothers		Sisters			
		M	F	M	F	M	F	M	F	M	F		
538	10/47	-	-	-	-	-	-	-	-	-	-	-	-
539	11/47	1	-	-	-	-	-	-	-	-	-	-	-
540	11/47	-	-	-	-	-	1	-	-	-	-	-	Mo. bro. A
541	12/47	-	-	-	1	-	-	-	-	-	1	-	Fa. bro. dau. R ^{1.430}
542	2/48	1	-	-	-	1	-	-	-	-	-	-	-
543	2/48	-	-	1	-	-	-	-	-	-	-	-	-
544	3/48	-	-	-	-	1	-	-	-	-	-	-	-
545	5/48	1	-	-	1	-	-	-	-	2	1	-	Mo. bro. R ^{1.125}
546	8/48	-	-	-	-	-	1	-	-	-	-	-	-
547	8/48	-	-	-	-	-	-	-	-	-	-	-	-
548	9/48	-	-	-	-	-	1	-	-	-	-	-	-
549	9/48	-	-	-	-	1R	1R	-	-	-	-	-	Mo. I. ³⁵²
550	10/48	-	-	2	-	-	-	-	-	-	-	-	-
551	10/48	-	-	-	-	4	1	-	-	-	-	-	-
552	12/48	-	-	-	1	-	-	-	-	-	-	-	-
553	12/48	-	-	1	-	-	-	-	-	-	-	-	Mo. bro. son R Mo. si. son R Mo. si. son R
554	1/49	-	-	-	1	-	-	-	-	-	-	-	-
555	3/49	-	-	-	-	-	-	-	-	-	-	-	-
556	4/49	-	-	-	-	2	-	-	-	-	-	-	-
557	5/49	-	-	-	-	-	-	-	-	-	-	-	-
558	6/49	-	-	-	1	-	-	-	-	-	-	-	-
559	6/49	-	-	1	-	-	-	-	-	-	-	-	-
560	7/49	-	-	-	-	-	-	-	-	-	-	-	-
561	7/49	-	-	-	-	-	1	-	-	-	-	-	-
562	8/49	-	-	-	-	-	-	-	-	-	-	-	-
563	12/49	-	-	1	3	1	3	-	-	-	1	-	-

Appendix II

Relatives of Index Patients—Supplementary Series

M: male, F: female, R: Ramstedt's operation, T: pyloric tumour (but no operation), A: pyloric stenosis confirmed at necropsy, -: 0, NK: not known.

	Date of Birth	Sibs				Sibs of Parents				Parents, Half-Sibs, Nephews and Nieces, and 1st Cousins Affected
		Born Before		Born After		Father's		Mother's		
		M	F	M	F	M	F	M	F	
MALE PATIENTS										
1	1/53	-	-	1	-	2	1	1	-	—
2	1/53	-	-	-	1	-	3	1	1	—
3	2/53	-	-	-	1	-	-	-	1	—
4	2/53	1	-	-	1	2	2	-	1	—
5	2/53	-	-	1	2	-	-	1	1	—
6	2/53	1	1	-	2	NK	NK	5	4	—
7	3/53	-	-	-	-	1	2	2	1	—
8	3/53	1	1	-	-	2	2	1	2	Mo. R
9	3/53	-	-	1	-	-	2	1	-	Fa. R ^{1,124}
10	4/53	-	1	-	-	-	-	2	1	—
11	4/53	1	-	-	-	NK	NK	NK	NK	—
12	5/53	1	-	1	-	1	-	2	1	—
13	5/53	-	1	-	1	1	-	1	-	—
14	5/53	-	-	1	1	2	1	7	5	—
15	6/53	-	1	-	-	-	2	2	2	—
16	6/53	1	-	1	1	2	-	1	-	—
17	6/53	-	2	-	1	NK	NK	NK	NK	—
18	6/53	1R	-	-	1	2	-	2	1	—
19	6/53	-	-	1	3	4	2	3	3	—
20	7/53	-	2	1	-	-	1	-	1	—
21	7/53	3R	1	-	-	2	6	3	-	—
22	7/53	-	-	-	-	-	3	-	2	—

Appendix II—continued

	Date of Birth	Sibs				Sibs of Parents				Parents, Half-sibs, Nephews and Nieces, and 1st Cousins Affected
		Born Before		Born After		Father's		Mother's		
		M	F	M	F	M	F	M	F	
23	7/53	1	1	-	-	-	1	-	-	-
24	7/53	-	-	-	1	-	1	-	2	-
25	8/53	1	-	-	-	-	1R ^{1.349}	-	-	-
26	8/53	-	-	1	-	-	1	-	-	-
27	8/53	-	-	2	-	-	-	2	4	-
28	8/53	-	1	-	1	1	-	3	1	-
29	8/53	-	1	2	-	-	-	4	4	-
30	8/53	1	-	-	-	1	1	2	-	-
31	9/53	2	1	-	-	-	4	1	1	-
32	9/53	1	-	-	2	4	1	-	2	-
33	9/53	1	-	-	-	1	4	1	-	-
34	9/53	1	1	2R	4R	-	1	1	3	-
35	9/53	-	-	1	-	1	2	1	1	-
36	9/53	1	2	-	-	4	3	-	1	-
37	10/53	1	-	1	-	-	1	1	2	-
38	10/53	-	-	-	-	1	-	1	2	-
39	10/53	1	1	2	1	1	-	-	-	-
40	10/53	-	-	-	-	3	3	2	6	-
41	10/53	2	1	-	-	1	1	1	2	-
42	10/53	1	1	-	-	3	1	-	-	-
43	10/53	-	-	1	1	1	1	-	1	-
44	11/53	-	1	-	-	6	2	1	3	-
45	11/53	-	1	-	-	3	2	-	1	-
46	11/53	-	-	-	1	-	2	-	-	-
47	11/53	2	-	1	-	2	-	-	-	-
48	11/53	-	2	1	1	3	1	3	2	-
49	12/53	-	-	-	3	4	1	4	4	-
50	12/53	1	1	-	1	2	-	1	2	-
51	12/53	-	1	-	3	3	1	1	1	-
52	12/53	-	1	-	-	2	-	3	1	-
53	12/53	-	1	1	1	3	3	1	1	-
54	1/54	2	1	1	1	6R	4	4	1	-
55	1/54	-	1R ^{II.319}	3	1	NK	NK	NK	NK	-
56	1/54	-	-	-	-	-	1	2	1	-
57	1/54	-	-	1	1	3	1	-	2	-
58	1/54	-	-	-	1	-	-	-	1	-
59	1/54	-	2	-	-	3	4	-	-	-
60	2/54	2	-	-	-	1	5	3	3	-
61	3/54	1	1T	1	-	2	1	3	2	-
62	3/54	-	-	-	-	-	-	2	2	-
63	3/54	-	1	-	-	2	1	1	1	-
64	4/54	-	-	-	-	1	1	3	-	-
65	4/54	-	-	1R	2	-	2	3	6	-
66	4/54	-	-	2	2	3	1	-	1	-
67	5/54	3	2	1	1	3	3	3	4	-
68	6/54	2	-	-	-	-	1	2	-	-
69	6/54	2	-	-	-	3	4	-	1	-
70	7/54	1	2	-	-	4	2	3	-	-
71	8/54	-	-	1	2	2	-	-	1	-
72	8/54	-	1	-	-	-	3	1	-	-
73	8/54	2	3	-	-	5	4	2	-	-
74	8/54	-	-	-	1	1	2	2	-	-
75	8/54	-	-	-	-	2	1	2	1	-
76	9/54	-	-	-	1	-	1	3	-	-
77	9/54	-	-	1	1	-	2	1	2	-
78	9/54	1	-	-	1	1	-	1	-	-
79	10/54	1	-	1	1R	NK	NK	1	2	-
80	10/54	-	-	-	1	1	3	-	-	-
81	10/54	2	-	-	-	1	-	4	3	-
82	11/54	3	3	1	1	2	1	2	4	-
83	11/54	-	-	-	-	1	1	1	1	-
84	11/54	-	2	-	-	3	1	3	2	-
85	12/54	1	-	3	1	1	-	-	-	-
86	12/54	-	-	1	1	3	4	4	4	-
87	1/55	-	-	-	-	1	1	2	1	-
88	1/55	2	1	1	-	-	1	NK	NK	-

Appendix II—continued

	Date of Birth	Sibs				Sibs of Parents				Parents, Half-sibs, Nephews and Nieces, and 1st Cousins Affected
		Born Before		Born After		Father's		Mother's		
		M	F	M	F	M	F	M	F	
89	2/55	1	—	—	—	1	—	2	3	—
90	3/55	—	—	2	—	NK	1	1	—	—
91	3/55	—	—	—	1	4	1	—	3	Fa. bro. son R
92	3/55	—	—	—	—	—	2	1	1	—
93	3/55	—	1	—	—	—	2	—	—	—
94	4/55	—	—	1	—	—	1	1	2	Mo. si. son R ^{II.77}
95	4/55	—	1	—	1	1	1	3	—	—
96	4/55	—	—	1	2	NK	NK	NK	NK	Mat. half bro. R
97	5/55	1	—	—	—	1	4	1	3	—
98	6/55	1	1	1	—	—	—	—	1	—
99	7/55	—	2	—	—	3	4	2	—	—
100	7/55	2	—	—	—	—	1	2	1	Mo. bro. son R
101	8/55	—	—	—	—	6	2	—	—	—
102	8/55	—	1	1	1	3	—	2	—	—
103	8/55	—	—	1	—	3	2	—	2	—
104	8/55	—	—	1	1	1	2	3	1	—
105	9/55	—	—	—	3	1	—	—	2	—
106	9/55	1R	—	—	1	1	3	3	1	—
107	10/55	—	1	1	2	—	—	4	2	—
108	12/55	—	—	—	1	—	1	—	1	—
109	1/56	—	—	1	1	—	—	1	—	—
110	1/56	—	2	—	1	3	2	2	1	—
111	2/56	2	—	—	—	2	1	2	1	—
112	2/56	—	—	—	—	1	2	—	1	—
113	2/56	—	1R ^{II.337}	—	1	—	2	4	1	—
114	2/56	1	—	1	—	NK	NK	NK	NK	—
115	2/56	1	—	—	1	2	—	1	1	—
116	3/56	1	—	—	1	2	1	2	1	—
117	4/56	—	—	1	—	—	2	1	—	—
118	4/56	—	—	—	1	1	—	1	4	—
119	4/56	1	1	—	—	2	—	—	2	—
120	5/56	1	2	2	—	4	3	1	—	—
121	6/56	1	—	1	—	4	6	—	4	—
122	6/56	—	—	—	—	1	—	2	1	—
123	6/56	—	—	2	—	—	—	1	1	—
124	7/56	1	2	—	—	3	4	2	—	—
125	7/56	—	1	—	—	1	1	—	1	—
126	7/56	1	—	—	3	—	—	2	—	Fa. R
127	7/56	1	3	2	—	4	3	2	1	—
128	8/56	1	—	1	—	1	1	—	2	—
129	9/56	—	—	1	—	—	—	1	1	—
130	9/56	1	1	—	1	7	2	—	—	—
131	10/56	—	—	1	—	4	3	4	—	—
132	11/56	—	1	—	1	1	1	—	—	—
133	11/56	—	—	3	—	1	—	—	—	—
134	12/56	3	1	3	3	3	2	2	5	—
135	12/56	—	—	—	—	—	—	3	1	—
136	1/57	1	—	—	—	—	3	—	—	—
137	1/57	—	1	—	—	3	1	2	2	—
138	2/57	—	1	—	—	1	6	2	1	—
139	2/57	—	2	1	—	2	—	—	—	—
140	2/57	2	—	—	—	6	—	3	1	—
141	2/57	—	—	1	2	4	6	5	5	—
142	3/57	—	—	1	—	2	4	2	2	Fa. si. dau. R ^{II.361}
143	3/57	2	2	—	—	3	1	1	1	—
144	3/57	—	—	2	—	2	2	1	—	—
145	3/57	—	—	1	—	2	—	1	—	—
146	4/57	1	—	—	—	1	1	1	—	—
147	4/57	—	—	—	1	1	—	1	—	—
148	5/57	—	1	2	1	—	—	—	2	—
149	5/57	1	—	—	—	1	1	3	1	—
150	6/57	—	—	1	—	—	—	—	—	—
151	6/57	—	1	1	1	—	—	1	2	—
152	7/57	2	—	—	—	1	1	1	3	—
153	7/57	—	—	1	1	—	1	—	1	—
154	8/57	—	—	1	1	—	—	—	—	—
155	8/57	—	2	—	—	—	—	2	2	—
156	9/57	1	—	—	—	2	—	—	1	—
157	10/57	1	1	—	—	1	1	—	1	—

Appendix II—continued

	Date of Birth	Sibs				Sibs of Parents				Parents, Half-sibs, Nephews and Nieces, and 1st Cousins Affected
		Born Before		Born After		Father's		Mother's		
		M	F	M	F	M	F	M	F	
158	10/57	1	1	-	-	NK	NK	NK	NK	-
159	11/57	-	-	-	1	-	-	-	-	-
160	11/57	2	1	-	-	-	1	1	-	-
161	11/57	-	-	1	1	-	1	-	1	-
162	12/57	-	-	-	-	3	1	-	-	-
163	12/57	-	-	1	-	5	1	2	2	-
164	1/58	2R	-	-	-	1	3	2	2	-
165	1/58	-	-	-	1	4	2	1	2	-
166	1/58	1	-	-	-	NK	NK	NK	NK	-
167	2/58	-	-	3T	-	3	3	3	4	-
168	3/58	-	-	-	2	-	-	-	-	Fa. R
169	3/58	-	2	-	-	1	1	1	1	-
170	3/58	1	1	-	-	4	3	1	-	-
171	4/58	-	1	1	-	1	3	1	5	-
172	5/58	1	-	2	-	-	1	1	1	-
173	5/58	-	-	1	-	-	-	-	-	-
174	6/58	-	1	-	2	-	3	1	-	-
175	7/58	-	2	-	-	2	2	2	-	-
176	7/58	-	-	-	-	5	-	-	1	-
177	7/58	-	1	1	1	NK	NK	NK	NK	-
178	8/58	-	-	2	-	1	-	1	-	-
179	8/58	-	-	-	-	-	1	-	1	-
180	8/58	-	1	-	1	-	1	-	-	-
181	9/58	1	-	1	-	1	1	1	-	-
182	11/58	-	-	2R	-	-	2	-	2	-
183	11/58	-	-	-	-	3	-	1	1	-
184	12/58	1	2	-	-	3	5	3	5	-
185	12/58	-	-	2R ^{II.227}	-	NK	NK	NK	NK	-
186	1/59	-	-	2	1	1	-	1	-	-
187	2/59	-	1	-	-	5	4	5	3	-
188	2/59	-	-	-	2	1	-	1	-	-
189	2/59	-	1	-	-	4	1	2	-	-
190	2/59	-	-	1	1	1	-	1	-	-
191	2/59	-	1R	1	-	NK	NK	1	1R	-
192	3/59	1	-	1	-	2	-	1	-	-
193	3/59	-	-	2	-	-	-	3	3	-
194	3/59	1	-	-	-	2	-	4	4	-
195	3/59	-	1	-	-	1	3	1	2	-
196	4/59	-	-	1	-	1	-	1	-	-
197	4/59	-	-	-	-	1	2	-	1	-
198	4/59	-	-	-	-	-	2	3	1	-
199	4/59	-	-	-	-	-	1	7	2	-
200	5/59	-	-	1	-	1R	1	2	-	-
201	5/59	-	-	1	-	2	1	4	2	-
202	6/59	1	1R ^{I.535}	-	1	4	-	4	2	-
203	7/59	-	1	2	-	-	1	1	2	-
204	7/59	-	-	-	-	NK	NK	NK	NK	-
205	7/59	-	1	-	-	3	-	-	1	-
206	7/59	-	1	-	-	3	2	-	1	-
207	8/59	-	1	-	-	3	1	4	1	-
208	8/59	-	-	-	-	1	-	-	1	-
209	8/59	1	1	-	-	3	2	1	3	-
210	8/59	-	1	-	-	1	3	-	2	-
211	9/59	-	-	-	1	2	2	1	5	-
212	9/59	1	-	-	-	-	-	2	-	-
213	9/59	-	-	1	-	4	1	4	2	-
214	10/59	1	-	1	1	4	2	2	-	-
215	11/59	3	1	-	2	1	2	3	-	-
216	12/59	2	-	-	-	1	2	6	1	-
217	12/59	-	1	-	-	1	1	1	-	-
218	1/60	-	-	-	-	2	1	2	2	-
219	1/60	-	1R	-	-	1	1	2	2	-
220	2/60	-	1	-	-	2	2	1	1	-
221	2/60	-	-	-	-	1	4	4	5	-
222	2/60	-	1	-	-	-	-	2	4	-
223	3/60	-	1	-	1	2	1	-	-	-
224	3/60	-	-	-	-	1	-	-	-	-
225	3/60	-	1	-	1	1	2	1	-	-
226	3/60	-	1	-	1	-	3	-	4	-

Appendix II—continued

	Date of Birth	Sibs				Sibs of Paren:s				Parents, Half-sibs, Nephews and Nieces, and 1st Cousins Affected
		Born Before		Born After		Father's		Mother's		
		M	F	M	F	M	F	M	F	
227	5/60	1R ^{II.185}	—	1	—	NK	NK	NK	NK	—
228	6/60	1	—	1	1	—	3	2	1	—
229	6/60	—	1	1	—	4	2	7	4	—
230	6/60	1	—	—	1	—	—	2	—	—
231	6/60	1	1	1	—	1	2	4	6	—
232	7/60	2	2	—	—	—	—	—	—	—
233	7/60	—	—	1R	—	2	4	1	1	—
234	7/60	—	1	1	2	5	5	5	1	—
235	7/60	—	1	—	1	1	—	1	1	—
236	8/60	2	1	—	—	2	4	—	1	—
237	9/60	1	1	—	—	—	2	2	5	—
238	9/60	1	—	—	—	—	—	2	1	—
239	9/60	—	—	—	—	NK	NK	NK	NK	—
240	10/60	—	—	—	—	5	3	3	1	—
241	10/60	1	—	—	1	—	1	1	3	—
242	11/60	—	—	—	1	1	—	2	1	—
243	11/60	—	1 ^T	—	—	—	1	—	2	—
244	11/60	—	2	—	3	—	1	1	1	Fa. si. son R
245	12/60	—	—	1	1	1	—	1	1	—
246	12/60	—	—	—	—	3	1	2	1	—
247	12/60	1	—	—	—	—	1	—	—	—
248	12/60	—	—	1	1	3	5	4	1	Fa. si. son R
249	12/60	—	—	—	—	3	1	2	1	—
250	12/60	1	—	1	1	NK	NK	NK	NK	—
251	1/61	3	—	—	—	—	—	2	1	—
252	1/61	—	—	—	—	1	3	1	3	—
253	1/61	—	—	—	—	1	5	4	2	—
254	2/61	—	—	1	—	2	2	2	3	—
255	2/61	—	1	—	—	1	2	—	3	—
256	3/61	—	—	—	—	—	—	3	2	—
257	3/61	—	1	1	—	2	1	1	—	—
258	4/61	—	—	1	—	—	2	7	1	—
259	4/61	—	—	1	2	—	3	2	2	—
260	5/61	—	1	—	—	1	2	—	2	—
261	5/61	—	—	1	1	3	—	—	1	—
262	5/61	—	—	1	—	—	1	—	1	—
263	5/61	—	—	—	—	2	2	4	3	—
264	5/61	—	1	1	1	—	—	2	2	—
265	6/61	—	1	—	—	—	1	4	1	—
266	6/61	—	1	—	—	—	—	—	1	—
267	6/61	—	1	—	—	1	1	1	1	—
268	6/61	1	2	—	—	3	2	4 ^R	1	Mo. bro. son R
269	6/61	—	1	—	2	1	—	2	2	—
270	7/61	—	—	—	—	NK	NK	1	NK	—
271	7/61	—	—	1R	—	1	—	1	2	—
272	8/61	—	—	1	—	—	—	—	—	—
273	8/61	1	—	1R	—	1	—	—	1	—
274	8/61	—	—	—	—	3	2	3	4	Fa. si. son R
275	8/61	2	—	1	—	1	—	1	1	—
276	9/61	—	—	—	—	3	—	—	1	—
277	9/61	—	—	—	—	2	1	1	1	—
278	10/61	—	—	—	1	1	—	3	—	—
279	10/61	2	—	—	—	—	1	—	—	—
280	10/61	—	—	—	—	3	1	2	1	—
281	10/61	—	3	—	—	NK	NK	NK	NK	—
282	12/61	—	—	1	—	—	—	5	3	—
283	12/61	3	2	1R	—	6R	4	2	3	Fa. bro. son R ^{II.54}
284	1/62	—	—	2	1	—	—	1	1	—
285	2/62	—	—	—	1	3	1	—	1	—
286	2/62	—	2	—	—	1	—	1	—	—
287	2/62	1	—	—	—	1	—	1	1	—
288	2/62	1	2	—	—	—	2	1	3	—
289	2/62	—	—	—	1	—	—	—	—	—
290	3/62	—	—	1	—	5	2	—	1	—
291	3/62	1	—	—	—	1	—	—	—	—
292	3/62	1	—	—	2	2	1	4	2	—
293	3/62	—	—	—	1	1	1	4	2	—
294	4/62	—	—	—	—	3	—	2	—	—
295	5/62	—	1	—	—	3	1	—	—	—

Appendix II—continued

	Date of Birth	Sibs				Sibs of Parents				Parents, Half-Sibs, Nephews and Nieces, and 1st Cousins Affected
		Born Before		Born After		Father's		Mother's		
		M	F	M	F	M	F	M	F	
296	5/62	-	-	1	-	5	5	1	1	Mo. bro. son R
297	5/62	-	-	-	-	1	-	2	2	
298	5/62	-	-	1	-	1	-	2	3	
299	6/62	-	-	2	1	-	3	2	-	
300	7/62	-	1	-	-	2	-	-	-	
301	7/62	2	-	-	1	4	5	4	7	
302	8/62	-	-	1	-	-	-	-	-	
303	8/62	-	-	1	-	-	-	1	-	
304	9/62	-	-	-	1	4	2	2	2	
305	10/62	-	-	2	-	1R	-	1	-	
306	11/62	1	-	-	-	-	2	-	-	
307	11/62	-	-	-	1	-	2	2	1	
FEMALE PATIENTS										
308	1/50	-	1	1	-	2	-	1	4	-
309	2/50	-	-	-	2	2	1	4	1	-
310	3/50	-	2	1	1	2	2	5	1	-
311	4/50	-	-	1	-	-	-	-	1	-
312	5/50	-	-	1R	-	5	3	1	3	-
313	5/50	-	1	-	-	-	1	2	2	-
314	10/50	-	1	-	-	-	1	2	-	-
315	11/50	-	-	1	-	4	2	1	1	-
316	2/51	-	-	1	-	1	-	1	-	-
317	4/51	1	-	3	4	3	1	6	5	-
318	5/51	1	-	-	-	2	1	-	-	-
319	5/51	-	-	4R ^{II.55}	1	NK	NK	NK	NK	-
320	7/51	-	1	-	-	1	3	-	1	-
321	9/51	-	2	-	1	NK	NK	3	NK	-
322	10/51	-	1	-	-	-	3	1	1	-
323	2/52	-	-	1	-	-	-	-	1	-
324	2/52	-	-	1	-	2	3	-	1	-
325	2/52	-	-	1R	1	2	9	-	4	-
326	3/52	-	-	-	1	1	-	1	1	-
327	4/52	-	1	-	1	-	1	1	1	-
328	6/52	1	-	-	-	-	-	-	-	-
329	12/52	-	-	-	-	1	1	-	-	-
330	12/52	-	2	-	-	-	-	1	1	-
331	5/53	-	-	2	1	1	1	3	1	-
332	6/53	-	-	-	1	2	3	1	1	-
333	8/53	-	1	-	-	6	3	1	-	-
334	10/53	-	-	1	-	2	3	2	1	-
335	1/54	-	1	1	-	1	2	2	1	-
336	3/54	-	-	2	1	1	2	-	-	-
337	5/54	-	-	1R ^{II.113}	1	-	2	4	1	-
338	6/54	-	-	-	-	NK	NK	1	-	-
339	6/54	1	-	-	-	-	1	-	-	-
340	7/54	-	-	-	-	2	1	2	5	-
341	8/54	1	-	-	-	2	2	-	2	-
342	9/54	-	-	1	-	2	1	2	2	-
343	10/54	-	2	-	-	2	5	1	1	-
344	11/54	1	-	-	-	2	1	4	3	-
345	3/55	3	-	-	-	NK	NK	NK	NK	-
346	4/55	1	1	-	-	2	4	1	2	-
347	5/55	1	-	-	-	1	-	1	1	-
348	5/55	-	-	2R	1	2	-	-	1	-
349	12/55	1	-	-	-	1	-	-	1	-
350	1/56	-	2	1	-	1	-	4	2	-
351	5/56	-	2	-	-	-	1	-	-	-
352	6/56	2	1	-	1	-	2	-	-	-
353	10/56	-	1	-	1	1	3	4	3	-
354	11/56	-	-	-	1	5	6	2	-	-
355	4/57	-	1	1R	-	3	1	2	-	-
356	5/57	-	-	2	2	3	2	8	1	-
357	5/57	-	-	1	1	1	2	1	1	-
358	6/57	-	1	-	-	-	-	1	2	-
359	6/57	1	-	1	-	1	-	4	3	Mo. bro. son T
360	6/57	-	-	-	-	-	-	3	2	-
361	7/57	-	-	-	3	1	1	3	3	Mo. bro. son R ^{II.142}
362	8/57	4	-	-	-	-	-	-	3	-

Appendix II—continued

	Date of Birth	Sibs				Sibs of Parents				Parents, Half-sibs, Nephews and Nieces, and 1st Cousins Affected
		Born Before		Born After		Father's		Mother's		
		M	F	M	F	M	F	M	F	
363	8/57	1R	—	—	—	2	2	—	2	—
364	10/57	—	1	—	—	1	1	2	3	Fa. bro. son R
365	1/58	1	—	—	1	5	1	4	—	—
366	1/58	—	—	—	1	5	6	4	4	—
367	1/58	—	—	1	1	—	1	1	3	—
368	1/58	—	—	—	—	—	—	—	—	Mo. R ^{1.362}
369	1/58	—	—	—	—	2	2	—	—	—
370	4/58	1	3	—	—	—	—	2	—	—
371	12/58	1	—	1	—	1	2	4	1	—
372	12/58	—	—	—	2	1	—	1	1	—
373	1/59	—	—	1	—	2	—	1	—	—
374	1/59	—	—	1	3	1	3	—	1	—
375	1/59	—	—	1	—	4	—	—	—	—
376	6/59	2	3	—	—	5	7	2	2	—
377	6/59	1	—	1	—	NK	NK	NK	NK	—
378	7/59	—	—	—	1	—	—	—	—	Fa. R
379	10/59	—	1	—	—	—	1	—	1	—
380	11/59	—	—	—	—	—	—	—	—	—
381	1/60	—	1	—	—	2	1	2	1	—
382	2/60	—	—	1	—	1	—	5	3	—
383	4/60	—	1	—	—	1	—	1	1	—
384	5/60	—	—	1R	—	1	1	1	—	Fa. R ^{1.152}
385	5/60	1	1	—	—	2	3	—	—	—
386	5/60	—	1	—	—	2	—	—	1	—
387	7/60	—	—	1	—	—	—	1	—	—
388	8/60	1	—	—	—	NK	NK	NK	NK	—
389	11/60	—	—	1	—	1	—	6	5	—
390	1/61	—	1	1	—	—	—	—	4	—
391	4/61	—	1	1	—	NK	NK	NK	NK	—
392	4/61	—	1	—	—	—	—	3	1	—
393	4/61	—	1	—	1	NK	NK	NK	NK	—
394	6/61	—	—	2	—	—	1	—	1	—
395	7/61	—	—	1	—	—	—	2	2	—
396	7/61	—	—	1	—	1	—	—	1	—
397	9/61	3	—	—	—	NK	NK	NK	NK	—
398	10/61	—	—	1	—	NK	NK	NK	NK	—
399	12/61	—	—	1	—	2	—	1	—	—
400	12/61	—	3	—	—	—	—	3	4	—
401	12/61	—	—	1	—	2	2	1	—	—
402	1/62	—	1	—	—	1	—	—	1	—
403	2/62	—	—	1	—	4	3	7	1	—
404	3/62	—	—	1	—	1	1	—	1	—
405	6/62	1	2	—	—	5	3	3	4	—
406	7/62	—	—	—	—	—	—	1	—	Fa. R ^{1.292}
407	8/62	—	—	—	2	2	7	1	—	—
408	3/63	—	—	—	1	NK	NK	NK	NK	—
409	4/63	2	—	—	—	1	—	—	—	Mo. R ^{1.367}
410	4/63	—	1	—	1	—	1	4	2	—
411	4/63	—	—	2	—	1	—	1	—	—
412	7/63	—	—	—	1	1	1	—	1	—
413	9/63	—	1	—	—	1	1	3	3	—
414	9/63	—	1	1	1	—	—	—	1	—
415	10/63	—	—	1	—	1	3	3	3	—
416	4/64	1	—	—	—	—	1	1	1	—
417	6/64	1	1	1	—	2	—	3	1	—
418	6/64	1	1	1	—	1	3	1	1	—
419	6/64	—	—	1	—	—	1	1	—	—
420	8/64	—	—	1	—	—	—	1	—	—
421	10/64	3	—	—	1	2	—	—	1	—
422	12/64	1	2	—	—	1	3	—	1	—
423	1/65	—	1	—	—	—	1	—	1	Fa. R ^{1.305}
424	6/65	—	1	—	—	—	1	—	2	—
425	7/65	—	—	1	—	1	—	—	—	—
426	10/65	—	—	—	—	2	1	1	—	—