explains why this condition not infrequently affects the first-born infant, and at the same time, since the normal alpha and beta antibodies are presumably of hetero-genetic immune origin, they are poorly adapted to the antigen, and therefore usually give rise to a milder syndrome than Rh antibodies. However, iso-immune alpha and beta antibodies may also be formed occasionally, and then a more severe form of erythroblastosis may result (Wiener *et al.*, 1949).

Finally, auto-antibodies also occur in two forms—namely, bivalent and univalent. By using trypsin-treated test cells and performing the tests at low temperature I have been able to demonstrate the presence of univalent auto-antibodies not only in the sera of mothers but also in their newborn infants. These are the antibodies which I believe are responsible for physiological icterus, and the fact that natural auto-antibodies are even more poorly adapted to human red cells than the natural alpha and beta antibodies explains the benign nature of this illness. However, some hitherto unexplained instances of icterus gravis may be due to exceptionally potent auto-antibodies in the maternal serum.

The above has been offered as a working hypothesis while further experiments are being carried out to test it. It is hoped also that the publication of the hypothesis at this time may stimulate interest in the field.

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THE OUTCOME OF MENTAL BREAKDOWN IN OLD AGE

BY

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The rising number of first admissions to mental hospitals is now widely recognized as being due to the increased frequency of mental disorders peculiar to the elderly, who constitute an increasing proportion of the total population. It is therefore important that the prospects of an elderly patient admitted to hospital with a mental disorder should be known regarding both the expectation of life and the likely duration of hospital stay. The following investigation has been designed to throw light on this problem.

Case Material and Immediate Outcome of Admission

Clinical and social data were analysed from the case records of all patients over 60 admitted to a mental observation unit in South London during February, March, April, and May, 1946. During this period 454 patients of all ages were admitted (211 men and 243 women), and the fact that 226 (105 men and 121 women)

of these were over 60 demonstrates the size of the problem of psychiatric disorders in old age. The cases were followed while in the observation ward and after their transfer to a chronic sick ward, to a mental hospital, or to the Tooting Bec Hospital for Senile Dementia.

The immediate outcome of admissions to the observation unit is shown in Table I. This reveals a high death

TABLE I.—Immediate Outcome of Admissions to a Mental Observation Unit (February to May, 1946)

	Returned Home	Died	Admitted to			Total
			General Hospital	Mental Hospital	Tooting Bec	
Males ..	7	26	12	23	37	105
Females ..	11	10	1	32	67	121
Total ..	18	36	13	55	104	226

rate of male patients: 26 out of 105 men died within a few days or weeks of admission, while only 10 out of 121 women died during this period. Ten men and two women had been admitted in a confusional state arising as a terminal event in a serious physical illness, without previous evidence of mental ill-health.

Diagnostic Grouping and Outcome of Illness

After the 12 patients with primarily physical disease had been excluded, the 214 (95 men and 119 women) admitted on account of increasing severity of their mental disorder were allocated to two broad diagnostic categories (Table II): 56 patients (26 men and 30 women)

TABLE II.—Diagnostic Grouping and Outcome of 214 Cases

	No. Admitted	No Dying under Hospital Care	No. Discharged	No. Remaining in Hospital
Males:				
Functional psychoses ..	26	9	13	4
Organic psychoses:				
Uncomplicated ..	34	28	2	4
With affective or schizoid colouring ..	35	21	12	2
Total ..	95	58	27	10
Females:				
Functional psychoses ..	30	6	17	7
Organic psychoses:				
Uncomplicated ..	54	31	14	9
With affective or schizoid colouring ..	35	15	9	11
Total ..	119	52	40	27
Both sexes:				
Functional psychoses ..	56	15	30	11
Organic psychoses:				
Uncomplicated ..	88	59	16	13
With affective or schizoid colouring ..	70	36	21	13
Total ..	214	110	67	37

were suffering from essentially "functional" (schizophrenic or affective) psychoses, while 158 (69 males and 89 females) exhibited organic mental symptoms; all of the latter, except 4 with G.P.I., 5 with epileptic psychosis, 3 with alcoholic psychosis, 2 with psychosis due to sub-acute combined degeneration, and 1 each of psychosis due to vitamin deficiency and Paget's disease of the skull, showed senile or arteriosclerotic mental disorders. This organic group was subdivided into patients who in a setting of dementia exhibited symptoms of schizoid or affective colouring, and others who showed a simple dementing illness without positive psychotic symptoms.

The follow-up to December 31, 1949—that is, over three and a half years later—revealed a striking

difference in the discharge and death rates of the two groups. Of the patients presenting with functional psychoses only 27% died while in hospital, and 54% could be discharged, whereas of patients suffering from organic syndromes 60% died and only 23% left hospital. The discharge may in many cases have been against medical advice, but the patients must have shown improvement from the condition for which they had been sent to the observation unit. Within the organic group there was a higher death rate and lower survival rate of patients with simple dementia than of patients who exhibited affective or schizoid symptoms as well as dementia.

Duration of Stay in Hospital

Of the 214 patients admitted to the observation unit in the early part of 1946 (Table II), 110 were known to have died and only 37 had had continuous hospital care up to December 31, 1949; 67 had been discharged either from the observation ward or from the hospital to which they had been transferred. Thus only a small proportion of old people suffering from mental breakdowns occupy hospital beds for prolonged periods; furthermore, of the 67 patients who could be discharged 47 left hospital within less than three months after admission, and only five stayed for more than one year; 58 of the 110 deaths had occurred within the first three months from admission, and 92 within one year. The accompanying Graph depicts the rate at

Graph showing rate of decline in number of hospital beds occupied by 214 patients (95 men and 119 women).

which the number of patients in hospital diminishes and how it is halved within the first three months, and reduced to almost one-quarter within a year following admission.

Further Follow-up of Discharged Patients

Because of the preliminary nature of this study the difficult and costly business of a personal follow-up of each case was not undertaken. To supplement the information about readmission given by the hospitals concerned, a search was made among the records of the Board of Control and of the Mental Health Department of the L.C.C., and it was found that 16 of the 67 patients originally discharged had been readmitted to a mental hospital or observation ward. Eight of them were again returned to the community and seven were still in hospital on December 31, 1949. Some of these patients were readmitted on several occasions, but only one, with senile dementia, died while in hospital. A search through the register of deaths confirmed the

expectation that a high proportion (not fewer than eight) of ex-patients had died in their homes or general hospitals, but identification of individuals was not certain enough in every case to provide reliable figures. Of 214 psychiatrically ill persons of over 60 admitted to an observation unit between February and May, 1946, 119 are known to have died, 44 were still in hospital, and 51 had not returned to hospital by December 31, 1949, the closing date of the investigation.

These figures express the outlook, after mental breakdown in old age, at its worst because of the unfavourable social status of most of our patients. They contrast with the results reported by Clow (1948) from a mental hospital in New York, where only patients regarded as recoverable and belonging to the higher income groups are accepted. He was able to follow up 228 of 365 patients aged over 60 for from 2 to 11½ years; only 35.1% of these were diagnosed as suffering from organic psychoses and 64.9% were considered to be "functional" cases. The overall mortality rate during stay in hospital was only 14.5%, whereas 24.1% of patients were regarded as recovered, 40% as improved, and 21.9% as unimproved. It is more appropriate to compare our figures with the follow-up of 683 patients over 65 admitted to an American State hospital (Camargo and Preston, 1945), where 85% were diagnosed as suffering from psychotic disorders due to organic cerebral disease, and 47% of all patients died during the first year following admission. At the end of three years 66% had died, 10% had been discharged, and 24% remained under hospital care.

Age Distribution and Mortality

The number of admissions during the eighth decade of life was slightly higher than during the seventh (Table III); thereafter it fell rapidly, and only four

TABLE III.—Age Distribution and Mortality

Age	No. Admitted			No. Discharged or Surviving			No. Dying in Hospital		
	M	F	Total	M	F	Total	M	F	Total
60-64 ..	18	17	35	10	13	23	8	4	12
65-69 ..	19	23	42	9	15	24	10	8	18
70-74 ..	20	27	47	9	17	26	11	10	21
75-79 ..	21	24	45	9	11	20	12	13	25
80-84 ..	11	14	25	0	7	7	11	7	18
85-89 ..	5	11	16	0	4	4	5	7	12
90-94 ..	1	3	4	0	0	0	1	3	4
Total ..	95	119	214	37	67	104	58	52	110

patients were admitted over the age of 90. Up to the age of 75 the patients who died after admission were fewer than those who were discharged or survived in hospital during the follow-up period. Here again there was a difference between the sexes: a relatively larger proportion of women were found among the higher age groups, but the tendency to die rather than to survive following admission showed itself in the men 10-15 years earlier than in the women. The striking differences in the mortality of male and female patients noted during the original observation period were further demonstrated during the stay in long-term hospitals: over the whole period of hospital treatment, 58 of 95 (61%) men as against 52 of 119 (44%) women died; by contrast, more female patients (23% of those originally admitted) than males (11%) remained in hospital, while there was little sex-difference in the number of discharges (Table II). The higher death rate shown

by the men was not due to a greater incidence of organic cerebral disease among them—73% as against 75% in women.

Camargo and Preston (1945) also found with their State hospital cases that 73% of male patients had died during the three years after admission as against only 59% of the women. The greater number of women, their lower death rate, and their greater tendency to survive after a mental breakdown are findings which agree entirely with Sheldon's (1950) observations on old people in general: though they have a lower death rate, women show a much higher morbidity rate than men, who tend to "maintain a better physique," but their "hold on life is nevertheless brittle"; women have "in spite of increasing decrepitude . . . a power of sheer survival denied to the men."

Social Factors

In order to assess the importance of social factors in the causation and outcome of mental breakdown in our group of elderly people, only those patients were reviewed who had not a record of psychiatric treatment earlier in life. There were 83 men and 107 women who had maintained outward mental stability throughout life until they came up against the effects and problems of old age. As it is often said that mental decline in old age is hastened or even precipitated by increasing social isolation, the relationship between type of illness, marital status, and degree of social integration before admission to the observation unit was tabulated (Table IV).

TABLE IV.—Type of Illness, Marital Status, and Degree of Social Integration of 190 Patients Without History of Psychiatric Illness Before the Age of 60

	Males (83)						Females (107)					
	Living with Spouse, Relatives, Friends			Living Alone or in Institution			Living with Spouse, Relatives, Friends			Living Alone or in Institution		
	M.	W.	S.	M.	W.	S.	M.	W.	S.	M.	W.	S.
Functional psychoses	9	3	1	2	2	3	9	2	3	1	4	2
Organic psychoses	24	12	3	2	13	9	16	26	5	1	32	6
Total	33	15	4	4	15	12	25	28	8	2	36	8
	52			31			61			46		

M. = Married; W. = Widowed; S. = Single.

Widows seem more liable to develop organic psychoses: of the 86 females so affected 58 (67%) were widows, of whom over half had been living alone or in institutions; only 52% of a female control population were widows (Table V). With the men we do not find this association between proneness to organic mental illness and the widowed state, presumably because men tend to be widowed at a later age than women, and thus to remain in the married category well into a

TABLE V.—Comparison of Marital Status of a Random Sample of Old People in Two London Boroughs (Rowntree, 1947) and of Patients Admitted to Mental Observation Unit

	Males over 65		Females over 60	
	125 Men in Two London Boroughs	71 Men Admitted to Observation Unit	321 Women in Two London Boroughs	107 Women Admitted to Observation Unit
Married	67%	38%	28%	23%
Widowed	25%	39%	52%	60%
Single	8%	23%	20%	17%

period of life during which dementing processes become increasingly common. The incidence of organic as opposed to functional psychoses is the same—three to one—in men living with their wives or relations, men living alone, and women belonging to a family group: only women living alone or in institutions show a higher proportion of organic disorders—over five cases to every one of functional psychosis.

A comparison was made between these patients and the normal old people in two London boroughs who were studied by the Rowntree Committee (1947). The observation-ward patients differ from old people living in the community in the proportions of married, widowed, and single individuals (Table V). With both sexes there are fewer patients in the married and more in the widowed state than is the case with the control population, and this fits in well with Sheldon's (1948) observation that mental impairment among elderly people was positively correlated with the widowed state. Even more striking is the difference between the proportion of single old men in the control group (8%) and among male patients (23%). One might be tempted to conclude that men who failed to found a family earlier in life also failed to adjust to old age. Certainly, high physical vitality is often assumed to be correlated positively to the marriage rate: it was found in Germany that of 81 female and 43 male centenarians 80 women and 41 men had been married (Greiff, 1933). On the other hand, single old men are less likely than others to find a niche within the community where a certain amount of mental disturbance will be tolerated, and are thus more liable to be sent to public institutions and mental hospitals.

While only about 3% of the elderly population of this country have been estimated to live in institutions and homes for the aged (Sheldon, 1950), 17.4% of our patients had passed through public assistance institutions (22.5% of male and 14% of female admissions). Lewis (1946) demonstrated that in this country many aged and mentally disordered people are retained in these institutions: transfer to an observation ward may only mean that the already deteriorated inmate has become acutely disturbed in his behaviour. The fact that an elderly person enters an institution may therefore signalize not so much social failure due to bereavements and other environmental happenings as, quite often, social isolation on account of mental deterioration. When we compare the social status of members of the normal control group with that of patients admitted to the observation unit direct from their homes (Table VI), little difference is found between normal persons and

TABLE VI.—Comparison of Domestic Status of Healthy Old People Living at Home (Rowntree, 1947) With That of Elderly Patients Admitted to a Mental Observation Unit

	Males over 65			Females over 60		
	Living at Home	Adm. Obs. Unit from Home	Adm. Obs. Unit from Home or Institution	Living at Home	Adm. Obs. Unit from Home	Adm. Obs. Unit from Home or Institution
Living with spouse	56 (44.8)	27 (49.1)	27 (38.0)	63 (19.6)	26 (28.3)	26 (24.3)
Living with family or friends	43 (34.4)	17 (30.9)	17 (24.0)	164 (51.1)	35 (38.0)	35 (32.7)
Living outside family group	26 (20.8)	11 (20.0)	27 (38.0)	94 (29.3)	31 (33.7)	46 (43.0)
Total	125	55	71	321	92	107

Percentages in parentheses.

patients in respect of the proportion of socially isolated people to persons living either with their marital partners or friends and relations; the proportion of socially isolated individuals among the patients (and especially in the case of men) becomes strikingly higher only when subjects admitted from institutions are included in the comparison.

Persons admitted from institutions or from a lonely existence—for example, women outside a family group whom we have found to make up a large proportion of dementing patients (Table IV)—are also older as a group than patients who had remained socially integrated (Table VII). In contrast to the decline in numbers

TABLE VII.—*Relationship Between Age and Social Integration (190 Patients Without History of Mental Breakdown Before 60)*

Age	At Home with Spouse or Relations			Alone or in an Institution		
	M	F	Total	M	F	Total
60-64	8	8	16	4	1	5
65-69	12	14	26	6	5	11
70-74	11	16	27	5	11	16
75-79	13	12	25	7	12	19
80-84	4	5	9	7	9	16
85-89	3	4	7	2	7	9
90-94	1	2	3	—	1	1

with rising age among the sample drawn from the two London boroughs, which mirrors the age distribution of the country as a whole (*Annual Abstract of Statistics*, 1949), we find a relatively larger proportion of patients belonging to the higher age groups (Table VIII): in

TABLE VIII.—*Percentage Distribution by Age Groups of Old People Living in Two London Boroughs (Rowntree, 1947) and of Patients Admitted to an Observation Unit (No History of Mental Breakdown Before 60)*

Age:	60-64	65-69	70-74	75-79	80-84	85 and Over
Males:						
Elderly population of two London boroughs	—	40.0	37.6	15.2	4.8	2.4
Patients admitted to observation unit ..	—	25.4	22.5	28.2	15.5	8.4
Females:						
Elderly population of two London boroughs	24.6	21.8	28.4	14.0	8.4	2.8
Patients admitted to observation unit ..	8.4	17.8	25.2	22.4	13.1	13.1

other words, the patients, as a group, are older than the healthy elderly population, and by reason of their greater age alone are more vulnerable to social stresses.

Dayton (1940) and Pollock (1945) have demonstrated that the incidence of mental disorders in the population rises with increasing age, or, to quote Malzberg (1940), that "the probability of a mental disorder is a direct function of age." Consequently, where in our patients there appeared to be an association between mental breakdown and social isolation, the latter might have been not a cause but rather a symptom of mental impairment, or a complication which in its turn produced a further aggravation of the mental disorder. Certainly, the degree of social integration before admission had surprisingly little influence on the outcome of the mental breakdown (Table IX). The proportion of patients who died in the course of their illness was about the same, regardless of whether they had been living with friends or whether they had been admitted from a lonely existence or an institution. Among the patients who were discharged from hospital there was a slight

TABLE IX.—*Outcome of Admission to Mental Observation Unit in Relation to Domestic Status (190 Patients Without History of Mental Illness Before 60)*

	Males (83)		Females (107)		Both Sexes	
	Living Alone	Living with Relatives and Friends	Living Alone	Living with Relatives and Friends	Living Alone	Living with Relatives and Friends
Discharged	3 (10)	17 (33)	14 (30)	16 (26)	17 (22)	33 (29)
Remaining	5 (16)	4 (7)	13 (28)	13 (22)	18 (23)	17 (15)
Died ..	23 (74)	31 (60)	19 (42)	32 (52)	42 (55)	63 (56)
Total ..	31	52	46	61	77	113

Percentages are given in parentheses.

preponderance of men admitted from family care, but the position was reversed in the case of female patients. It may be noted in passing that all but one of the 17 patients who had been living away from their families before admission and who could be again discharged were taken into the homes of friends or relations.

It is plainly insufficient to assess the degree of social integration solely on the basis of marital and domestic status, as had to be done in the present study; an old person who is living within the family circle but is neglected may in actual fact feel much more lonely than one who lives alone but is frequently and regularly visited by his friends (Sheldon, 1948). Thorough social investigations, such as that by Lewis and Goldschmidt (1943) into the backgrounds of patients admitted to the Tooting Bec Hospital, demonstrate the overwhelming importance of social factors leading to admission to hospital. That social factors contribute to senile deterioration has been stressed in numerous publications during the last fifteen years, and this has helped to turn the psychiatry of old age away from fatalistic preoccupations with brain pathology and dementia into the field of social therapy. Many suggestions have been advanced for preventing or mitigating senile deterioration by social reforms and reorientations, and many claims made. It thus seems highly desirable to evaluate critically the role of social factors and their relation to the biological process of ageing in causing mental ill-health in old people.

Summary

Of 214 patients over 60 years of age admitted to a mental observation unit and followed up for three and a half years, 44 were still in hospital, 119 were known to have died, and 51 had not, after discharge, been readmitted under psychiatric care by the end of the follow-up period.

Only a small proportion of the old people studied occupied hospital beds for prolonged periods; the number of patients remaining in hospital was halved within the first three months and almost quartered within a year after admission.

The social status of the patients is compared with that of a sample of elderly people living in their own homes, and differences found in respect of marital state, social isolation, and previous necessity for institutional care are discussed.

In those suffering from mental disorder a higher mortality was found in elderly men than in elderly women. When the elderly patients were classified into two groups—those with symptoms secondary to cerebral degeneration and those with "functional" disorders without demonstrable cerebral disease—the former group showed the higher mortality and the latter a higher discharge rate. In the organic group, death within the period of observation occurred more often in those with simple dementia than in those in whom the dementia was associated with schizoid symptoms.

I wish to express my thanks to Professor Aubrey Lewis for his interest during this investigation and his helpful criticism in the drafting of the paper. My thanks are also due to Dr. O. W. Roberts, medical superintendent, Dulwich Hospital, for allowing me access to the case records, and to the physician-superintendents of numerous hospitals, as well as to Dr. the Hon. W. S. Maclay, Senior Commissioner, and Mr. F. W. Allen, of the Records Department of the Board of Control, and Mr. F. J. Spivey, of the Mental Health Department of the L.C.C., for their assistance with the follow-up of patients.

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PHAECHROMOCYTOMA OF ADRENAL GLAND, WITH SUSTAINED HYPERTENSION

BY

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Phaeochromocytoma is an uncommon cause of human hypertension. However, the clinical result which follows successful diagnosis and treatment is in itself good reason why every effort should be made to recognize the condition as early as possible.

The association of an adrenal medullary tumour with hypertension was probably first recognized by Labbé *et al.* (1922), although the occurrence of such tumours had been noted earlier. The condition was the subject of an able review by MacKeith (1944), who collected 152 cases from the earlier literature. The usual clinical syndrome ascribed to phaeochromocytoma then comprised paroxysmal hypertension, sweating, and a number of symptoms referable to overaction of the sympatho-adrenal system. MacKeith recognized that some cases might resemble malignant hypertension and others essential hypertension, but did not enter into details. Green (1946), however, recognized that phaeochromocytoma might occur not infrequently in patients with sustained hypertension, and there was little to distinguish such cases from essential hypertension. In a series of 51 cases selected from the literature for their completeness of data, Green showed that intermittent hypertension was present in only 14, sustained hypertension being found in the other 37. The problem in the diagnosis of this condition is therefore twofold: first, to recognize the possibility that phaeochromocytoma is the cause underlying a story of paroxysmal disturbances in a patient with normal blood pressure when seen; and, secondly, to differentiate between the rare phaeochromocytoma with sustained hypertension and the common essential hypertension.

The clinical features of phaeochromocytoma with paroxysmal hypertension have been adequately described in the literature. MacKeith's (1944) paper gives

most of the symptoms. If the possibility of such a condition is considered a correct diagnosis should frequently be made.

The second, perhaps more common, situation in which hypertension is sustained presents a difficult diagnostic problem. This has led to the development, in recent years, of a number of pharmacological tests to differentiate phaeochromocytoma with sustained hypertension from that with essential hypertension. In spite of the successful application of certain of these tests—notably the benzodioxane test (Go'denberg *et al.*, 1947) and the histamine test of Roth and Kvale (1945)—some disadvantages still attend their general use. In 1950 Smithwick *et al.* emphasized certain clinical features, unusual in essential hypertension, which were to be observed in cases of phaeochromocytoma. In addition, their observations suggest that the response to simple routine investigations on patients with sustained hypertension should reveal a substantial number of those patients in whom the hypertension is due to phaeochromocytoma.

It now seems clear that phaeochromocytomata contain a mixture of adrenaline and noradrenaline in varying proportions (Holton, 1949; Go'denberg *et al.*, 1949). The vascular responses to these substances in the human have been reported in the literature (Goldenberg *et al.*, 1948; Swan, 1949; Barcroft and Konzett, 1949). The relationship of noradrenaline to phaeochromocytoma has been discussed in detail by Barnett *et al.* (1950). Therefore this aspect of phaeochromocytoma will not be considered here. Suffice it to point out that the symptom-complex may vary according to the pressor substance which predominates in the circulation, but that knowledge of the effects of very large amounts of the amines in man is lacking at present.

The present paper has been stimulated by the occurrence of a case of unsuspected phaeochromocytoma in this hospital. The patient was thought to be suffering from hypertensive vascular disease and was to be submitted to splanchnic sympathectomy for that condition. Details of the case are given below. The remainder of the paper is concerned with the diagnosis of phaeochromocytoma with sustained hypertension, the recent literature on phaeochromocytoma with paroxysmal hypertension having been summarized by Walton (1950).

Case Report

A 42-year-old Stock Exchange clerk was admitted to St. Thomas's Hospital on October 2, 1950. He had been a known hypertensive for eight years, but had come to hospital because of difficulty in using his right hand for one week. In 1941 he was called for service with the R.A.F. There is no record of the blood pressure at that time. In May, 1942, he complained of mild dyspnoea on exertion and frontal headache. The arterial blood pressure was found to be 170/110, and there was a cloud of albumin in the urine. Further investigation revealed red blood cells in the urine but no casts. The renal function was not impaired. The patient was invalided from the Service with the diagnosis of essential hypertension. On subsequent medical examinations by the Ministry of Pensions from 1943 to 1950 the arterial blood pressure varied between 180/115 and 210/130.

On admission the patient complained of tiredness, headache, and, as a major symptom, sweating. The latter symptom had troubled him from the age of 16, but at this time it had worsened considerably. The sweats were confined to the face and neck; the palms of the hands and the lower part of the body remained dry. Only rarely was axillary sweating noticed. When questioned about this symptom