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REPORTS
ON
PUBLIC HEALTH AND
MEDICAL SUBJECTS

No. 32.

A FURTHER REPORT
ON
CANCER OF THE BREAST,
With special reference to its associated
antecedent conditions.

By

JANET E. LANE-CLAYPON, M.D., D.Sc. (Lond.).

7 Woods 1926-1930
(32)(57)



MINISTRY OF HEALTH.

LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.
1926.

Price 3s. Net.

Breast Cancer

**PREFATORY NOTE BY THE CHIEF MEDICAL
OFFICER.**

The Right Hon. NEVILLE CHAMBERLAIN, M.P.,
Minister of Health.

SIR,

I may preface this report by a few words regarding the origin and nature of the work which it records. When the Departmental Committee on Cancer* decided to give its early attention to cancer of the breast, arrangements were made in the first instance to obtain a thorough review of the literature of this form of cancer in its relation to surgical treatment, and a previous report in this series by Dr. Lane-Clayton, which dealt fully with this aspect of the matter, was published in 1924.†

Adding the findings of that report to their own experience, the Committee had no hesitation in giving its opinion that the proportion of victims of breast cancer who present themselves

* This Committee which was appointed in 1923 "to consider available information with regard to the causation, prevalence and treatment of cancer and to advise as to the best method of utilising the resources at the disposal of the Ministry for the study and investigation of these problems," consists of the following members:—

Sir George Newman, K.C.B., M.D., F.R.C.P. (Chairman).
C. J. Bond, Esq., C.M.G., F.R.C.S. (Hon. Consulting Surgeon,
Leicester Royal Infirmary).
Sir George Buchanan, C.B., M.D. } Ministry
S. Monckton Copeman, Esq., M.D., F.R.C.P., F.R.S. . . . } of
Major Greenwood, Esq., F.R.C.P. } Health.
Sir F. Gowland Hopkins, D.Sc., M.B., F.R.C.P., F.R.S. (Bio-
chemical Department, University of Cambridge).
Prof. W. S. Lazarus-Barlow, M.D., F.R.C.P. (late of Cancer
Department, Middlesex Hospital).
J. A. Murray, Esq., M.D., F.R.S. (Imperial Cancer Research Fund).
T. H. C. Stevenson, Esq., C.B.E., M.D. (General Register Office).
S. Wyard, Esq., M.D., M.R.C.P. (The Cancer Hospital, Kensington).
Lt.-Col. A. B. Smallman, C.B.E., D.S.O., M.D. (Ministry of
Health), (Secretary).

Additional members (for Surgical Statistics Sub-Committee):—

Sir H. Gilbert Barling, Bt., C.B., C.B.E., F.R.C.S. (Consulting
Surgeon, Birmingham General Hospital).
T. Watts Eden, Esq., M.D., F.R.C.P., F.R.C.S.E. (Charing
Cross Hospital).

† Reports on Public Health and Medical Subjects No. 28, "Cancer of the Breast and its Surgical Treatment," by Dr. Janet E. Lane-Clayton, M.D., D.Sc. (Lond).

for surgical advice and treatment at a sufficiently early stage of the disease to give a good prospect of cure is at present much too small.

This conclusion, which was based on detailed statistical scrutiny of the evidence, has enabled this Department to press with authority for progress to be made with all measures likely to increase the early recognition and diagnosis of cancer of the breast, and with the provision of effective surgical treatment of this condition by modern methods. To aid in securing such progress is an affair properly to be regarded as within the sphere of preventive medicine, if by prevention we mean that many individuals can and should be saved from recurrence of the cancerous condition up to the end of their lives, or at least can be spared from incapacity and pain for many years as a result of timely and appropriate surgical intervention. It may be noted with satisfaction that this subject is now receiving increasing attention in different parts of the country, notably in certain areas in which, following the advice given in the Ministry's circulars, concerted measures have been taken by associations and committees, representing hospitals, municipal authorities and others interested, to develop and improve the local facilities for early diagnosis and early treatment of this disease.

The present report relates to other important aspects of the prevention of cancer of the breast which have called for study. A great many different conditions have been stated or suspected at one time or another to be concerned with the subsequent appearance of this disease. Its occurrence has been thought to be favoured, for example, by certain phases of the reproductive life of women, and by the existence of racial and family predisposition. Much importance has been attributed to the antecedent emergence of a variety of non-cancerous affections of the breast, such as troubles associated with lactation, structural abnormalities of the organ, antecedent injuries and a group of conditions described as "mastitis." The Departmental Committee on Cancer considered that the facts relating to these so-called predisposing conditions required more exact examination, and that an endeavour should be made in respect of each factor under consideration to obtain a statistical analysis which would show whether the suspected relationship to cancer existed or not, and, if it did exist, to supply some indication of its importance.

A special reason for this investigation was furnished by the desire which had been expressed by the official international health offices—the Office International d'Hygiène Publique and the Cancer Commission appointed by the Health Committee of the League of Nations—that an intensive comparative investigation should be made of the antecedent conditions associated with cancer of the breast in certain countries, in which notable differences have been found in the mortality due to this form of cancer. With this object, the Cancer Commission of the League of Nations in 1923 prepared a scheme of enquiry, to be carried out, with the

assistance of the Health Organisation of the League, in the countries selected. Some of the results of this enquiry, notably as it relates to Holland, Italy and England, have already been published by this Commission,* and they give reason to conclude that the differences of mortality from cancer of the breast in the countries concerned are real differences and not the artificial outcome of different methods of certifying and tabulating deaths. The Commission found, moreover, that the lesser mortality of cancer of the breast in one country as compared with another is not to be disposed of by the suggestion that in the first country the condition is ordinarily more rapidly diagnosed and operative treatment is ordinarily resorted to at an earlier date. It was thus the more necessary, from the point of view of the international investigation, to consider and compare various antecedent conditions which are thought to be connected with cancer of the breast, and to seek information from each country regarding the existence and importance of such antecedents.

Both for the purpose of participating in the international inquiry, and to meet its own needs, the Departmental Committee was forced to conclude that a special investigation was more likely to give valid results than any attempts based only on existing records or on the collection of opinions. It was therefore decided to investigate a sufficient and suitable series of cases of cancer of the breast in regard to specified antecedent conditions, and at the same time a parallel and equally representative series of control cases, i.e., women whose conditions of life were broadly comparable to those of the cancer series but who had had no sign of cancer.

In Part I of her report Dr. Janet Lane-Claypon describes the way in which both series of cases were obtained. Great care was taken to secure comparability, and histories were obtained by a small number of competent and accurate observers, following uniform methods which had been discussed with Dr. Lane-Claypon, and were in accord with the scheme of the League of Nations Cancer Commission. It was decided to take two great populous centres well provided with hospitals, the first being London, while the second (seeing that the inquiry originated with the League of Nations and related to Great Britain rather than England and Wales alone) was Glasgow. The introduction to Dr. Lane-Claypon's report sets out the hospitals from which assistance was obtained in both centres. The observers deserve our special thanks, as without their invaluable aid, so willingly and conscientiously given, it would have been quite impossible to have obtained

* League of Nations Health Organisation. Reports of Cancer Commission.

- (a) C.H.333 Volume I: "Report on the Results of Demographic Investigations in Certain Selected Countries."
 (b) C.H.333 Volume II: "Report on the Results of Certain Clinical Enquiries relating to Differences of Cancer Mortality in Certain Selected Countries."

the information on which the report was based.* It should be added that the scheme of investigation and the analyses of the results were undertaken throughout by Dr. Lane-Clayton in consultation at the Ministry of Health with Sir George Buchanan, Dr. Major Greenwood, and Colonel Smallman, the Secretary of the Departmental Committee on Cancer. The information obtained was carefully and fully analysed with the results shown in the body of the report, and summarised, so far as they permit of summary, in its concluding chapter. As a whole they may be said to supply a useful and permanent addition to our knowledge of an obscure subject. For the purpose of understanding the conditions in which cancer arises, the evidence in instances where no relation has been established between the antecedent condition and the occurrence of cancer possesses a value almost as great as that where a relationship of cause or connected sequence has been brought out. I may draw attention, for example, to the belief, fairly generally entertained, that as cancer is promoted by local irritations and disturbances, cancer of the breast is more liable to occur in women whose breasts have been used for suckling at repeated pregnancies, and particularly in those who have been subject to abscess or suppuration of the breast in course of lactation. The present inquiry points definitely to a contrary conclusion. In the first place evidence already obtained from the statistics of many countries and well established by our own, is again confirmed by this report, namely that the married state and the production of children, far from being conditions favourable to the occurrence of cancer of the breast, are substantially antagonistic to it.† The observations made by Dr. Greenwood on this subject in Chapter 8, in connection with the analyses of the cancer and control series, merit attention in this respect. Next, lactation, even when repeated in successive pregnancies, does not appear, *per se*, to be a circumstance which has influence, one way or the other, on liability to cancer.

Nor is there any evidence that acute suppurative mastitis, which is not uncommon in the puerperium, is in any way a contributory cause to the later appearance of cancer in the breast.

* Observer.	Hospital.
Dr. Janet E. Lane-Clayton ..	St. Bartholomew's Hospital. The Cancer Hospital. Middlesex Hospital, and University College Hospital.
Dr. Ruth Dingley	University College Hospital.
Dr. Hilda G. Johnson ..	Samaritan Free Hospital. Florence Nightingale Hospital.
Dr. James Learmonth ..	Western Infirmary, Glasgow.
Dr. Marjorie Martland ..	Elizabeth Garrett Anderson Hospital.
Dr. Ellen B. Orr	Royal Infirmary, Glasgow.
Dr. J. Hinton Robertson ..	Victoria Infirmary, Glasgow.
Dr. Helen Stuart-Robertson ..	Guy's Hospital.

† See Report of League of Nations Cancer Commission—Demographic Investigations in Selected Countries (C.H.333 Vol. I) page 23.

By contrast, other antecedent conditions studied in this investigation have been found in association with the cancer cases, which are sometimes slightly and indefinitely, sometimes quite notably, in excess of their frequency in the control non-cancerous cases. Among the slighter and less definite associations may be included the occurrence of cancer in parent or grandparent; among the more definite is comparative infertility, to which I have already alluded. The breast which has never been called upon for normal function is certainly more liable to become cancerous. Investigation has shown that in all three countries the mortality is greater among single women. And, finally, the investigation has confirmed, and placed on a basis of statistical measurement, the connection between the occurrence of cancer of the breast and a previous injury, as well as its relation to conditions such as deformity of the nipple, and, perhaps the most noteworthy of all, the prevalence of such conditions as chronic non-suppurative mastitis and hyperplasia, to which Dr. Lane-Clayton draws special attention in Part V.

In concluding this brief and summary indication of the nature of the material which will be found in this report, I may refer once more to the practical conclusion drawn from its predecessor. In order to obtain suitable cases for the inquiry we had recourse to certain of the largest and best known hospitals in two great centres—London and Glasgow—hospitals second to none in the matter of facility for skilled treatment. Even at these institutions the clinical condition of those patients who were seen in hospital at the time of the interview showed that only 15 per cent. had presented themselves for treatment at a stage of the disease at which real hope of prolonged relief or a possible cure by surgical treatment could be considered likely. It is well to emphasise this point, and once more to insist that there are many right and useful things that ought to be done now without waiting for the solution of cancer problems to which we may look forward in the near future. It is all to the good that the resources of laboratories and research are being concentrated more and more hopefully on the ultimate causation of cancer and its pathology, and that "field" inquiries, such as those set out in the present report, are being pursued and their results compared with those of other countries in the search for a clearer knowledge of the epidemiology of cancer. But the promise of these investigations and researches should not be allowed to blind us to the fact, of which this volume gives one more illustration, that in this and other countries a mass of disease and suffering is still needlessly continuing which we already have ample means at our disposal to prevent.

I have the honour to be,

Sir,

Your obedient servant,

GEORGE NEWMAN.

Whitehall,
January, 1926.

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A FURTHER REPORT ON CANCER OF THE BREAST, WITH SPECIAL REFERENCE TO ITS ASSOCIATED ANTECEDENT CONDITIONS

By

JANET E. LANE-CLAYTON, M.D., D.Sc. (Lond.).

INTRODUCTION.

A previous report published by the Ministry of Health* dealt with the results obtained after operation for cancer of the breast. It was decided to follow up that inquiry by an investigation into the antecedent histories of some 500 women who either had suffered or were suffering from cancer of the breast. This investigation was to be undertaken in this country on lines which would be as comparable as possible to those being carried out in Holland and Italy, under the scheme of co-ordinated enquiry which was inaugurated by the Cancer Commission of the League of Nations.†

It was hoped by this means to ascertain what influence, if any, certain previous events in the lives of the patients might have had in the production of the disease. Since such observations on cancer patients alone are of relatively small value it was determined to obtain the histories on a similar basis of a like number of other women who were not suffering and who had not suffered from cancer in any part of the body. These served as a control series to the cancer patients. It was decided to secure the life-histories of 500 persons of each of the above categories.

In order to ascertain the best method of inquiry it seemed advisable to consult the heads of two surgical units in London. Two professors of surgery were approached and both at once offered their cordial co-operation in the work. In order to avoid an unduly protracted investigation it was early realised that it would not be possible to await the entry of cases into hospital. The numbers of such patients were found to be considerably less than had been anticipated.

* Cancer of the Breast and its Surgical Treatment—A Review of the Literature. By Janet E. Lane-Clayton. Reports on Public Health and Medical Subjects, No. 28; H.M. Stationery Office. Price 2s. 6d.

† Certain of the results of this international enquiry, which take account of much of the work described in this report, have already been published by the Health Organisation of the League.—C.H. 333, Vol. II., Constable & Co., London.

After a preliminary period of work it was decided to extend the field and to seek the co-operation of other hospitals and also to secure, if possible, the assistance of the large hospitals in Glasgow.

It is a pleasant duty to offer thanks for the ready aid and courtesy shown by all concerned throughout the investigation. Both the surgical and the administrative (or clerical) staffs of the hospitals concerned collaborated heartily in the work so that no difficulty was experienced in a complicated investigation.

There was some uncertainty as to the most suitable source for the control patients. It was decided that for this purpose the women must ordinarily be not less than 45 years of age, and must, so far as could be established, be free of cancer in any part of the body. It was evidently desirable to obtain the histories of women whose general health was good. At first it seemed possible that these might be obtained from maternity hospitals or child welfare centres. But a few mornings' work rendered it evident that the women available from these sources were almost exclusively young women and therefore unsuitable as controls for the cancer series.

After some deliberation it was agreed to seek for the control patients among women over 45 who were either in hospital for some trouble, other than cancer, either surgical or medical, or who were applying for out-patient treatment. Roughly about 400 of the women were in-patients and the rest out-patients. Of the in-patients many were in hospital for treatment of special conditions such as eyes, throats, etc., and some for accidents and so forth.

It is clearly not possible to secure a full control. Apart from the impracticability of such a procedure there is considerable drawback in taking the histories of elderly women in that they cannot remember the past with any real accuracy. Certain of the older cancer patients required to have their memory aided by the relative who usually came up with them.

Some of the elderly women were perfectly clear in their memory of the past but others remembered little or nothing of children who had died, and were uncertain as to the dates of other important events in their lives.

The histories of the cancer patients were taken without regard to age, but in the control series for the most part women under 45 or over 70 were not questioned.

The hospitals which co-operated in the inquiry were :—

The Cancer Hospital.
University College Hospital.
St. Bartholomew's Hospital.
The Middlesex Hospital.
The Elizabeth Garrett Anderson Hospital.
The Samaritan Hospital.

The Western Infirmary, Glasgow.
The Royal Infirmary, Glasgow.
The Victoria Infirmary, Glasgow.

Some cases were also obtained from the Florence Nightingale Hospital and a large number of control cases were obtained by the courtesy of the staff at Guy's Hospital.

The data required of both sets of persons were of too detailed a nature to be supplied with accuracy by anyone but the patient herself. It was therefore necessary to deal only with those cancer patients who were alive and able to attend at hospital for an interview. No attempt was made to follow all the cases in the practice either of any one surgeon or of any one of the hospitals. In a few instances, in actual fact, a large proportion of all living patients in the practice of particular surgeons were interviewed, but this method was not followed determinedly. Usually the patients from whom the histories were obtained were those who had applied to the hospital for treatment without regard to the surgeon under whose care they were placed.

Railway and tram or 'bus fares were offered as an inducement to the patients to attend the hospital for interview and medical examination. In order to avoid unnecessary expenditure it was decided to confine the requests for attendance, at any rate at first, to those patients who at the time of operation lived within about 20 miles of the hospital concerned. To this extent some degree of selection was made throughout the inquiry owing to the great distances from the hospital at which some of the patients lived, or to which they had removed since the operation.

Whoever sent out the requests for attendance looked through the lists of those who had been treated as in-patients for cancer of the breast within about 20 miles' radius, and a letter was sent inviting their attendance for the purpose of ascertaining their condition after the lapse of some time since the operation. Arrangements were made in all instances for the patient to be examined by a member of the hospital staff at the time of attendance so as to obtain a record of her condition and to afford such further treatment as might be found necessary.

With very few exceptions the patients were glad to avail themselves of the offer, and seemed greatly pleased to be examined and be informed of their condition. Comparatively few availed themselves of the offer, which was always made, to refund the costs of the journey. Those who did not reply to the first letter were not approached again, and it is impossible to state whether they were alive, dead, or had changed their address. The patients here under consideration represent therefore, only an unknown proportion of those who were still alive, while those who were dead do not enter the investigation at all. Hence the material is not suitable for calculation of the end results of operation in any given set of patients.

In order to show clearly the scope of the investigation the

headings of the questionnaire used are set out below. In working up the material the order taken in the questionnaire has not been followed since many of the answers in the different sections are inter-dependent and require to be considered in association with one another.

Questionnaire for Cases of Cancer of the Breast and Control Cases.

Date of Admission to Hospital....

- A. GENERAL.—Name.... Date of birth.... Nationality.... Race.... Is patient of Jewish origin?.... Birthplace of parents.... Birthplace of patient.... Present address.... Profession or social status. Details of employment, if any (both before and after marriage).... Name and address of private doctor (if available)....
- B. CIVIL STATE.—Married, widowed or spinster.... Date of marriage.... Date, age and cause of death of husband (if widow).... Children (alive, dead, or any miscarriages, with dates).... Date of birth.... Date of death or state of general health.... Notes as to labours....
- C. APPEARANCE AND HISTORY OF PATIENT.—General type, *i.e.*, nervous, phlegmatic, etc... Has patient any symptoms suggesting disturbance of the organs of internal secretion (*e.g.* goitre)?.... Notes on menstruation.... (a) Age of onset.... (b) Age of cessation.... (c) Notes as to menopause, if past.... (d) Duration and regularity of monthly periods.... (e) Pain, nausea or headache (including pain or discomfort in breasts).... What other illnesses has patient had? Give dates with notes of recovery and notes as to non-cancerous tumours.
- D. FAMILY HISTORY.—The age at and cause of death, if dead, and the age and general health, if alive, of (a) Parents.... (b) Grandparents.... (c) Brothers and sisters.... (d) Children.... Is there any information as to other forms of tumour?.... Are there any tuberculous persons in the family?....

BREAST.

- E. GENERAL FACTS.—Which breast is affected?.... Site of the growth.... When was the growth first noticed?.... What symptoms did patient then complain of?.. Has the patient had any treatment other than in this hospital for the present disease? If so, give details....
- F. ETIOLOGY.—Number of children who were breast-fed.... Duration of feeding in each case, with any notes. Were both breasts used?.... Was any abnormality noticed in either breast? If so, state its nature.... Complications.... (a) Has there been any inflammation of either breast? If so, which? Give details of attack, if possible

.... (b) Was there an abscess?.... Was it opened?.... (c) Did the lesion heal completely or was there a residual nodule?.... (d) Has there been more than one attack of mastitis? If so, how many?.... (e) Give date of attack.... (f) Did patient suckle with the other breast?.... (g) Has the patient been able to use the affected breast since the last attack of mastitis?.... (h) Give any details in regard to compression of the breast, which might have resulted from improper clothing.... (i) Has there been any history of a blow or injury? If so, give details. (Inquiry should be made as to discoloration of the skin or as to any growth being felt at the time of the injury)....

- G. CLINICAL FACTS (from hospital data).—Was growth adherent to (a) skin.... (b) deep fascia.... Was growth ulcerated?.... Were any enlarged glands palpable in axilla?.... or elsewhere?.... Date and nature of operation.... Was the case considered inoperable?.... Any evidence of Cancer in other parts of the Body? (Ovaries and uterus especially).... Any special notes, including post-operative state....
- H. PATHOLOGIST'S REPORT.—(This should include a summary of the diagnosis, microscopy of the primary growth and, if possible, of any axillary gland investigated, autopsy, etc.).

Several different methods were tried of arranging the large mass of data which had been collected. There is no one way by which the data can be set out so as to offer a series of independent sections. To some extent the results obtained are interdependent and interwoven with one another. Hence in writing the report and arranging the sections attention has been paid rather to the results of the investigation as they were found, than to the theoretical considerations of the probable relationship of the subjects dealt with.

Evidently one of the important points was the suitability of the material of the two series for comparison. It was necessary before proceeding to detailed analysis to be quite certain that the women of the control series were in fact controls to the women of the cancer series.

The results have been set out in five parts dealing as far as may be independently with the following queries:—

- I. Are the data of the cancerous and non-cancerous patients suitable for comparison?
- II. Is there an appreciable difference in any of the more important features of the reproductive life of the women in the two series?
- III. Do the family or life-histories (other than reproductive) offer any points of similarity or of contrast, especially as to previous breast troubles?

IV. What information can be obtained from the material as to the condition of the patients at the time of operation for cancer of the breast and matters relating to this, *e.g.*, do they attend as a whole at an early or at a late stage of the disease, and what is the chief method of making application for treatment?

Further, a fifth part has been prepared dealing with certain data which may be regarded as relating to cancer of the breast in general.

Throughout the report in taking out the data for comparison between the two series each series was divided arbitrarily into two divisions, A and B. The results for each of these divisions were obtained separately and then added to form the tables which are given later. The object of this separation was to demonstrate whether or no there were marked divergencies between the results of the two analyses. In fact they were thoroughly concordant; the averages proved almost identical in the two divisions.

Hence not only does the material appear to be statistically homogeneous, but a sample of even 250 cases seems adequate to furnish steady averages for the characters here under investigation.

PART I.

A Study of the Suitability for Comparison of the Material in the Cancer and the Control Series.

Certain general points required investigation in order to ascertain how far the life-histories which had been taken for the two series were comparable. These are:—

- (a) the nationality of the women,
- (b) their age,
- (c) their civil state, and
- (d) their social status so far as this was ascertainable.

A direct assessment of this last factor was evidently difficult and liable to considerable error. It might be expected that a series of somewhat better-to-do women would attend hospital for surgical treatment than for the other forms of disease from which the women in the control series were suffering. It was decided to study the occupations pursued by the women of the two series and the rates of mortality occurring among the young children in their families.

Roughly, the woman who is better off financially than her fellows will either go out less to work or will pursue occupations generally regarded as denoting a higher social status. Also the mortality rate among young children has commonly been regarded as decreasing with an increase in social status. It was felt, therefore, that a combined consideration of these two factors should prove adequate to furnish satisfactory information of the financial position of the two series of women.

CHAPTER I.

The Nationality, Age and Civil State of the Women in the Two Series.

The nationality of the patients was asked for and obtained in all cases. It was considered important in view of possible racial differences in the incidence of cancer.

It was to be anticipated that the largest number of women in London would be English and that in Glasgow they would be Scotch with an admixture of Irish, and this was found to be the case. The proportion of other nationalities is rather unexpectedly small, but may in part be accounted for by the situation of the London hospitals which took part in the inquiry, and which, as a whole, are at some distance from those districts in which the majority of the foreign inhabitants of London habitually reside.

The nationalities are shown in Table 1.

TABLE 1.

Showing the nationalities of the women concerned.

Nationality.	CANCER SERIES.	CONTROL SERIES.
	No. of Women.	No. of Women.
English	296	307
Scotch	178	146
Irish	23	46
Welsh... ..	3	4
Italian	1	1
Jewish	1	2
	(a Pole)	(1 Russian and 1 English)
Others—		
One each Canadian, Australian, French, Swiss, German, Dutch	6	—
One each Polish, Danish and Greek	—	3
	508	509

For all practical purposes the nationalities may be regarded as being English and Scotch only. There is no reason to believe that there were any others of Jewish extraction besides those mentioned above. The county of origin of the parents as well as of the patients themselves was obtained, but the data have not been worked up, as being of doubtful value.

The age of the women is of importance and has already been referred to in the introduction as regards the control cases.

Seeing that many of the cancer patients were interviewed at a considerable interval after the operation it was considered

advisable to show their ages both in 1924 and at the time of operation. The results are shown in Table 2.

TABLE 2.

Showing the age distribution of the women in the cancer and control series.

Age-Periods.	CANCER SERIES.				CONTROL SERIES.	
	Age at Operation.		Age in 1924.		Age in 1924.	
	No. of Cases.	Percentage of Total.	No. of Cases.	Percentage of Total.	No. of Cases.	Percentage of Total.
15-	1	0.2	1	0.2	0	0.0
20-	1	0.2	1	0.2	0	0.0
25-	5	1.0	3	0.6	1	0.2
30-	20	3.9	14	2.8	8	1.6
35-	39	7.7	30	5.9	12	2.3
40-	64	12.6	50	9.8	28	5.5
45-	101	19.8	85	16.7	142	27.9
50-	102	20.1	101	19.9	127	25.0
55-	68	13.4	84	16.5	74	14.5
60-	57	11.2	62	12.2	69	13.6
65-	35	6.9	39	7.7	28	5.5
70-	12	2.4	30	5.9	17	3.3
75-	3	0.6	7	1.4	3	0.6
80-	0	0.0	1	0.2	0	0.0
	508	100.0	508	100.0	509	100.0

Mean Age. 51.4 years. 53.75 years. 53.56 years.

The mean age of both series in 1924 is almost identical, that of the cancer patients being 2.35 years less at operation than in 1924. The cases in the control series below the age of 45 were taken under a misapprehension of the age of the patients concerned, but have been allowed to stand. The somewhat sudden rise in the numbers for the age-period 45-49 in the control series was to be expected in view of the limit of age, which was set at a minimum of 45 years.

The civil state of the women is shown in Table 3, together with the age distribution of the several states. The age at operation alone has been given, as being the more directly relevant for the purpose in hand. The number of single women in the control series is slightly less than in the cancer series; in view of the known prevalence of cancer of the breast among single women this difference was perhaps to be anticipated.

TABLE 3.

Showing the distribution according to age and civil state of the women in the cancer and control series.

Age-Period	CANCER SERIES. (Age at operation.)				CONTROL SERIES. (Age in 1924.)			
	Married	Widowed	Single	Totals	Married	Widowed	Single	Total
15-	0	0	1	1	0	0	0	0
20-	0	0	1	1	0	0	0	0
25-	3	0	2	5	1	0	0	1
30-	15	0	5	20	6	0	2	8
35-	25	1	13	39	10	0	2	12
40-	39	7	18	64	23	3	2	28
45-	68	13	20	101	95	18	29	142
50-	74	13	15	102	78	25	24	127
55-	36	13	19	68	46	15	13	74
60-	17	27	13	57	39	20	10	69
65-	9	18	8	35	17	8	3	28
70-	6	5	1	12	6	10	1	17
75-	0	3	0	3	0	2	1	3
80	0	0	0	0	0	0	0	0
	292	100	116	508	321	101	87	509

Mean ages in years—

49.5	58.9	49.7	51.4	52.51	57.7	52.73	53.56
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Percentage distribution according to civil state—

57.5	19.7	22.8	100.0	63.1	19.8	17.1	100.0
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The mean age of the widowed women is higher in both series than that of the other women, as was also to be expected.

CHAPTER 2.

The Social Status of the Women in the Two Series.

It has been explained in the introduction that an attempt to estimate the social status was made by studying the occupation and the rates of child mortality in the two series. The occupation of the women is considered first.

The Occupation of the Women.

The schedule contained a question upon the occupation of the women both before and after marriage, and this information has

been worked up. There is considerable difficulty in tabulating the outside occupations of women, even though the data are fairly detailed. Women often either give up or change their occupation at or soon after marriage, and it is commonly less regular than is the case with men.

Even in considering the apparently most simple form of occupation, namely housework, we are far from any fixed standard. It cannot be assumed that the life of a woman who works at home is easier than that of a woman who goes out to work. Ordinarily this may be so, since many women who go out to work also do their own housework. But the work of a woman with a large family who stays at home may well be heavier than that of a woman who goes out to work and does her own housework, but who has no family. Such factors, important as they doubtless are psychologically, are not assessable for the present inquiry. The only basis for comparison which can be made here between the two series is the nature of the occupation and the number of women who pursued it.

The first main division was made between the women who went out to earn and those who did not do so. Then a further division was made between those who had been out to work all their lives and those who had earned only before marriage. There were a few women in the control series who were at home till marriage and went out to work afterwards. A note has been made in the table to show these. It is not quite certain whether some of the women, especially the single women who stated that they were only doing housework, were not working for payment either by those with whom they lived or by going out for a part of the day. They are few in number so that the error, if it exists, is small.

Many of the women complained of the very heavy work they had had to do all their lives. The general appearance of the women, even of many who did not complain of their work, left little room for doubt that they had been working very hard for a number of years. There would not, however, appear to be any difference between the two series in this respect.

Nearly all of the women in both the series were doing and had been doing all their own housework, at any rate until recently, even if they had also been out to work for their livelihood. Among the elderly women of both series there were a number who were now living with some friend or relative who relieved them of a part, at any rate, of their own domestic work.

In the whole series we find that 130, or 25.5 per cent., of all the cancer patients had never earned their own livelihood, and that 118, or 23.2 per cent., of the control patients were in the same category.

We may now turn to the occupations pursued by the women and see how far they agreed in the two series. Two difficulties arose. In the first place the occupations as given by the patients were very diverse and it was found necessary to adopt somewhat more general classifications than those actually given. After consider-

able experimentation the following headings were adopted and have been used for both series.

<i>Nature of Occupation.</i>	<i>Types of workers included in it.</i>
1. Domestic service ...	Lady's maid, housemaid, parlourmaid, general servant, and those "in service."
2. Factory or warehouse work ...	Weavers, workers in jam factories, packers, various kinds of paper workers, etc.
3. Dressmakers ...	Dressmakers, milliners, tailoresses, coatmakers, mantle makers, etc.
4. Machinists ...	As the type of work was doubtful in some cases only those who styled themselves machinists have been included.
5. Clerks ...	Secretaries, typists, bank clerks, telephonists.
6. Shop assistants ...	Saleswomen, showwomen, barmaids, etc.
7. Laundryworkers ...	Those working in laundries, taking in washing, ironers, etc.
8. Cooks or kitchen work ...	All grades, some highly skilled.
9. Skilled trades ...	A large variety including an engineers' tracer, a vellum worker, a fishing-fly tier, a theatre dresser, etc.
10. Housekeepers, manageresses, etc.	Housekeepers and all holding responsible posts either in hotel or boarding-houses or keeping lodging, shops, etc.
11. Teachers ...	Elementary school teachers, teachers of foreign languages, governesses and highly skilled specialised teachers.
12. Nurses, etc. ...	Trained nurses, untrained women working as nurses, children's nurses, midwives, etc.
13. Sundries ...	In this class are those who had several occupations which they either performed irregularly or varied from time to time.

It is evident that there is a wide variety of occupation within each of the headings finally selected. There is, however, no means of assessing the relative degree of strain either as between the different headings or between the varieties of work in each heading.

No attempt has therefore been made to grade the workers, although it is recognised that there must be wide diversity of payment and hence presumably of financial ease or stringency among the cases which are shewn together.

Among the married women there were many who ceased work at or soon after marriage, while there were a further number who after a few years of marriage went out again to work. Some of these last took up a different occupation from that before marriage, but the majority continued in work of a similar nature, even if it was not the same. Where there was a definite change of work, that undertaken before marriage has been the employment selected. This was done on account of the long latent period known to elapse in the development of tar and other occupational cancer in human beings, so that it seemed likely that such effect (if any) as there might be in producing the cancer would be due to the earlier profession.

No account has been taken of some degree of intermittent

work among the married women who ordinarily went out to work after marriage.

The results of the investigation both as to occupation and civil state are shown in Tables 4 and 5, as also the numbers working before marriage only.

The figures in the tables are so similar as to suggest that there is here something in the nature of a sample of the general types of occupation pursued by women as a whole. No account has been taken of those who from age or the recent inheritance of a small sum of money had retired from work at the time of the interview.

If the percentages of those women who undertook outside work, sub-divided according to their civil state, be compared we get figures which are extraordinarily similar.

Civil State.	CANCER SERIES.	CONTROL SERIES.
	No. of Women as percentage of total.	No. of Women as percentage of total.
Married women	69.7	77.7
Widowed ,,	78.2	68.0
Single ,,	82.6	83.9
All states	74.3	76.9

In general the single women worked all their lives. In both series the number of widowed women who either went out to work again after marriage or after widowhood is high.

If the degree of outside occupation be regarded as a criterion of social status there is nothing in the figures just given to suggest that there was, on the whole, any appreciable difference on this point between the women of the two series. Further, it is fair to assume that the occupation figures do not afford any indication of a relationship between cancer and either outside work in general, or of any special occupation in particular.

TABLE 4.

Showing the nature of the occupations pursued by the women of the cancer series.

Nature of Occupation.	Married.		Widowed.		Single	Totals.	
	Before marriage only.	After marriage also.	Before marriage only.	After marriage also.		Before marriage only.	All the working life.
Own housework only	—	88	—	22	20	—	130
Domestic Service...	41	9	11	6	17	52	32
Factory or Warehouse	26	10	8	6	4	34	20
Dressmakers, etc.	19	12	4	9	17	23	38
Machinists	7	2	0	0	1	7	3
Clerks	6	2	0	3	7	6	12
Shop Assistants ...	14	3	3	5	10	17	18
Laundry-work ...	1	2	1	3	1	2	6
Cooks and Kitchen-work	3	6	0	3	4	3	13
Skilled Trades ...	1	7	0	0	5	1	12
Housekeepers, Manageresses, etc.	0	14	0	7	14	0	35
Teachers	3	3	1	1	9	4	13
Nurses	6	3	0	6	6	6	15
Sundry Callings ...	2	1	0	2	0	2	3
	129	162	28	73	115	157	350
No note					1		
					116		

TABLE 5.

Showing the occupations pursued by the women of the control series.

Nature of Occupation.	Married.		Widowed.		Single	Totals.	
	Before marriage only.	After marriage also.	Before marriage only.	After marriage also.		Before marriage only.	All the working life.
Own housework only	—	72	—	32	14	—	118
Domestic Service...	49	19	14	5	16	63	40
Factory or Warehouse	39	14	5	4	3	44	21
Dressmakers, etc.	19	10	3	3	6	22	19
Machinists ...	10	3	2	1	1	12	5
Clerks ...	5	3	1	0	6	6	9
Shop Assistants ...	12	4	4	1	5	16	10
Laundry-work ...	8	11	4	3	1	12	15
Cooks and Kitchen-work	7	4	0	2	4	7	10
Skilled Trades ...	0	1	0	0	0	0	1
Housekeepers, Manageresses, etc.	—	7	—	5	10	—	22
Teachers ...	0	1	0	1	8	0	10
Nurses ...	8	*3	0	**4	10	8	17
Sundry callings ...	3	*6	0	2	2	3	10
After marriage only	—	4	0	5	—	0	9
	160	162	33	68	86	193	316

* In each of these groups were three women who worked after marriage only.

** In this group were two women who worked after marriage only.

The Deaths among Children.

In considering the deaths among the children of a family, it seemed desirable to deal only with completed families, that is, with families in which the mother had passed the climacteric. For the present purpose as well as in other instances in which completed families were necessary for accurate comparison, only those women who were married and had passed the climacteric have been considered.

The infant mortality rate, that is the number of deaths under the age of one year per thousand children born, is commonly regarded as affording a rough index of the social status of the population concerned, and perhaps also as some indication of the general state of health of the mother. Although, since the experience covers many years, we cannot compute rates of infant mortality fairly comparable with the current rates for England

and Wales, we may compare the results of the two series one with another.

It was decided first of all to take out the deaths of all the children regardless of any limit of age. It was then found that the deaths occurring over the age of five years were few in number, and scattered over such a number of years as to be without value for the present work. Hence they have been omitted and only deaths occurring among children under five years of age have been dealt with.

In the first instance the deaths under five were grouped in five age-groups and according to the cause of death, so far as this was known to the mother. The age-groups were 0-3 months, 4-6, 7-9, and 10-12 months, also 1-5 years.

The causes of death did not give any information of value. Those dying under three months succumbed (except for 3 or 4 cases in all) within 14 days after birth, and may be regarded as having died from ante- or intra-natal causes. There were 37 of these in the cancer series, and 58 in the control series.

The deaths between the ages of 4 and 12 months showed those

TABLE 6.

Showing the deaths among children under five years, in the families of women of the "cessation group" of the cancer series.

No. of viable children in family.	No. of such families.	Total No. of live births in those families.	Deaths 0-1 year.		Deaths 0-5 year.	
			No.	Percentage of births.	No.	Percentage of births.
1	29	29	6	20.7	1	3.4
2	33	64	6	9.4	4	6.25
3	34	100	6	6.0	9	9.0
4	33	128	9	7.0	9	7.0
5	21	103	7	6.8	4	3.9
6	16	92	5	5.4	10	10.9
7	14	81	4	4.9	12	14.8
8	20	154	12	7.8	13	8.4
9	5	42	7	16.7	10	23.8
10	5	49	2	4.1	3	6.1
11	1	11	0	0.0	4	36.3
12	0	0	0	0.0	0	0.0
13	1	13	2	15.4	0	0.0
14	1	9	2	22.2	3	33.3
	213	875	68	—	82	—
Percentages on total live births				7.8		9.37

* This term is used to denote the group of women who had already passed the menopause. Hence these tables deal only with completed families.

features common to children dying at this age. The causes given were pneumonia, meningitis, wasting, teething, whooping cough, measles, diarrhoea and vomiting and so forth.

The deaths over one year were, with few exceptions, due to one or other of the exanthemata.

The number of children in the family was taken out and is referred to in detail later. For the present purpose the information has been used to show the proportion of deaths in relation to the size of family, and the figures are given in Tables 6 and 7.

TABLE 7.

Showing the deaths among children under five years in the families of the women of the "cessation group" of the control series.

No. of viable children in family.	No. of such families.	Total No. of live births in those families.	Deaths 0-1 year.		Deaths 1-5 years.	
			No.	Percentage of births.	No.	Percentage of births.
1	23	22	2	9.1	0	0.0
2	28	55	4	7.3	4	7.3
3	32	95	6	6.3	8	8.4
4	25	96	10	10.4	6	6.3
5	19	93	6	6.4	13	14.0
6	31	178	19	10.7	11	6.2
7	17	112	9	8.0	21	18.8
8	20	155	23	14.8	16	10.3
9	13	112	16	14.3	8	7.1
10	7	65	1	1.5	8	12.3
11	10	108	11	10.2	13	12.0
12	10	115	12	10.4	15	13.0
13	6	75	9	12.0	18	24.0
14	0	0	0	0.0	0	0.0
15	3	44	6	13.6	6	13.6
16	0	0	0	0.0	0	0.0
17	1	17	0	0.0	8	47.1
	245	1,342	134	—	155	—
				10.0	—	11.5
				10.0	—	11.0

Percentages on total live births
Percentages in families of not more than 14 children.

It is known that the infant death-rate tends to increase with the size of family so that it was necessary to attend to this point. The percentages given show the proportion of deaths among the total children in families of any given size. The results are irregular and do not offer a satisfactory field for deductions. In order to obtain, if possible, more definite results it was decided to group the families, and the results of grouping are shown in Table 8.

TABLE 8.

Showing the deaths among children under five years in both series, the families being grouped.

No. of children in family.	Total live births.	Deaths 0-1 years.		Deaths 1-5 years.	
		No.	Percentage of total.	No.	Percentage of total.
1, 2 and 3 ...	193	18	9.3	14	7.3
4, 5 and 6 ...	323	21	6.5	23	7.1
7, 8 and 9 ...	277	23	8.3	35	12.6
10, 11 and 12	60	2	3.3	7	11.7
13 and 14 ...	22	4	18.2	3	13.6

B.—CONTROL SERIES.

1, 2 and 3 ...	172	12	7.0	12	7.0
4, 5 and 6 ...	367	35	9.5	30	8.2
7, 8 and 9 ...	379	48	12.7	45	11.9
10, 11 and 12	288	24	8.3	36	12.5
13 and 14 ...	75	9	12.0	18	24.0
(15, 16 and 17)	61	6	10.0	14	23.0

This has the effect of decreasing the irregularities, but in families of over nine children the figures are hardly such as would justify any comparison.

It is evident that many factors must have been in operation among the children dying after the first three months of life which it is impossible to assess here. With the object of eliminating so far as possible post-natal environment it seemed advisable to compare the deaths from ante- and intra-natal causes in the two series. That is to say, to add miscarriages, the deadbirths and the deaths under 3 months, and to compare these with the total number of pregnancies. Full details on these points are given in Chapters 7 and 9.

Taking the figures from Chapters 7 and 9 we get:—

Cancer Series.

Total pregnancies 1,023.

Deaths from ante- and intra-natal causes 179—(102 miscarriages, 46 deadbirths, 31 deaths under 3 months).

Percentage of deaths in all pregnancies 17.5.

Control Series.

Total pregnancies 1,521.

Deaths from ante- and intra-natal causes 237—(129 miscarriages, 50 deadbirths, 58 deaths under 3 months).

Percentage of deaths in all pregnancies 15.6.

The difference between the percentages of the two series 1.9 ± 1.0 , is not significant.

If the miscarriages are omitted from all the figures the percentages become 8.3 and 7.8 respectively. In either case the proportion of deaths in the cancer series is slightly higher than in the control.

If now the number of deaths between 4 and 12 months be considered up to and including families of nine children—after which the figures become too uneven for comparison—the percentages found are 4.2 per cent. for the cancer and 5.7 per cent. for the control series. The difference between the percentages is reversed.

The figures for the deaths from post-natal causes under one year suggest that the cancer patients were of slightly better social status than the controls; but the deaths from ante-natal and intra-natal causes suggest the opposite, as do also the occupation figures.

As a further effort to establish a difference (if it existed), the occupations of the women in the cessation groups were taken out separately from those of the women as a whole, which have been already considered. Out of 261 women in the cessation groups in the cancer series, 98, or 37.5 per cent. went out to work after marriage, and out of 280 women in the cessation groups of the control series 76, or 26 per cent. went out to work after marriage.

Generally it appears that no appreciable differences in social status between the women of the two series can be shown to have existed.

Summary of Part I.

The material obtained in the cancer and in the control series can be regarded as suitable for comparison as judged by the similarity of

- (a) nationality,
- (b) age,
- (c) civil state,
- (d) social status, as measured by occupation and by deaths among children.

PART II.

A Comparison between certain Phases of the Reproductive Life of the Women in the Cancer and the Control Series.

The mortality rates from cancer of the breast in England, as also in other countries, show an excess of deaths among single women when compared with the proportion of unmarried women in the general population.

A consideration of this fact renders it reasonably certain that there is a close connection between some phase or phases of sexual activity and the occurrence of cancer of the breast.

The death-rates for widows at later ages are higher than those among married women, which also points in the same direction.*

The present investigation was designed to bring into relief (if possible) any differences there might be in the various phases of reproductive life both among the cancer and the control patients, and also between the married and unmarried women.

Evidently the only basis for comparison between all the women in both series is in regard to the phenomena of the monthly sexual cycle—its onset, the cycle itself, and its cessation. The completed schedules provided adequate data on the menstrual and the menopausal histories of the women, and it is believed that they offer the material for one of the most comprehensive studies yet made on these points.

The married women and widows had in common the factor of marital intercourse, but of varying duration, according to the age at marriage and also to the age of widowhood in the case of widows. It is probable that widowhood is only of importance if it occurred before the menopause. Hence widows who were married up to the time of the menopause have been reckoned in the group of married.

But all married women did not have children, so that there is a division of the married and widowed into those who had and those who did not have children, that is those among whom the mammary gland never had the stimulus of either pregnancy or lactation.

Among the married women who became pregnant it is necessary to consider the total number of pregnancies—both those ending in abortions and those ending in the birth of viable children. Also the extent to which lactation was practised.

These subjects are dealt with in detail in the following chapters.

* See, e.g., Table I, p. 18. League of Nations publication, C.H. 333. Vol. I.

CHAPTER 3.

The Catamenia—Onset, Cessation and Total Duration.
The Age of Onset.

The first point to be considered is evidently the age at onset of the catamenia, and is available for exactly 1,000 women. Seventeen patients were unable to remember the age at which their monthly periods commenced. The data are shown in Table 9.

Close similarity prevails in the figures for both series taken as a whole. The mean ages at onset differ by 0.11 years or approximately 32 days, being less by this period in the control series. The age of onset is, however, somewhat more widely spread in the control series, 20 per cent. showing an onset under the age of 13 as against 13.34 per cent in the cancer series. Further just over 1.4th of all the women, or 25.74 per cent. in the control series, show an onset over 15 years of age as compared with 22.4 per cent. in the cancer series.

It is not possible, at present, to say whether there is any significance in these variations. In the meantime it may be pointed out that the mean age of onset for precisely 1,000 women is just under 15 years.

The Age at Cessation of the Catamenia.

The age at cessation is known for a proportion only of the women of both series, seeing that some had not yet reached the menopause. In the literature the view is often expressed that there is a relationship between cancer of the breast and the menopause. This idea has doubtless arisen from a study of the ages of hospital in-patients suffering from cancer of the breast. If, however, the mortality rates be separated into age-periods, it is found that in proportion to the population alive at those ages, the mortality from cancer of the breast increases continuously with the advance in years. The different range of ages shown in the clinical figures arise from the facts that there are more women alive at or about the age of the menopause than later, and that the women of later ages do not so readily seek treatment at a hospital.

A study of the mortality rates shows that there is no direct association between cancer of the breast and the menopause.

Remarkably little appears to be known of the relationship, if any, of the age of onset and of cessation of the catamenia to the question of health or disease. It was therefore decided to work up fully these points so far as was possible with the available material.

The number of women who had passed the menopause in each series is almost identical being 330 in the cancer series and 335 in the control series. Fifteen women in the cancer series, and 29 in the control series had been subjected to an artificial menopause produced either by the removal of the uterus or of both ovaries. In a few of the control cases the women were in hospital for the operation at the time of the interview, but in the majority it had been performed several years previously.

In no case in the control series had the operation been carried out for cancer. The cases of artificial menopause have been omitted entirely from tables dealing with women in the cessation groups.

TABLE 9.

Showing the age at the onset of the catamenia in the women of the cancer and control series.

Age at onset.	CANCER SERIES.		CONTROL SERIES.	
	No.	Percentage of total.	No.	Percentage of total.
9	0	0.0	2	0.4
10	1	0.2	9	1.8
11	15	3.0	20	4.0
12	50	10.1	70	13.9
13	97	19.6	81	16.0
14	135	27.3	121	23.9
15	86	17.4	72	14.2
16	46	9.6	65	12.9
17	43	8.7	41	8.1
18	15	3.0	17	3.4
19	4	0.8	4	0.8
20	2	0.4	2	0.4
21	1	0.2	1	0.2
Not stated or not remembered.	495 13	100.0 —	505 4	100.0 —
	508	—	509	—

Mean age	...	14.82 years	14.71 years.
Percentage with onset under 13 years	=	13.34	...
Percentage with onset 13 to 15 years	=	64.24	...
Percentage with onset over 15 years	=	22.42	...
			20.0
			54.26
			25.74

The wide range of age at which the cessation of menstruation took place may be regarded as somewhat surprising. In each series there was one woman who commenced menstruating at the age of 20 and ceased at 21. One was unmarried and the other had no children.

The women who continued menstruating until well beyond the age of fifty years were carefully questioned and there seems no reason to doubt the accuracy of their statements. They do not belong to the oldest group of women, and in several cases only a few years had elapsed since the climateric. The figures are shown in Table 10.

The age at cessation has been worked out in relation to the civil state. It seemed not unlikely that, the ordinary physiological stimulus being absent, menstrual life might end earlier in the unmarried than in the married women. But, on the contrary,

TABLE 10.
Showing the age at cessation of the catamenia in those women of both series who had passed the menopause.

Age at Cessation.	CANCER SERIES.				CONTROL SERIES.			
	Married at Menopause.	Widowed before Menopause.	Unmarried.	Total.	Married at Menopause.	Widowed before Menopause.	Unmarried.	Total.
Under 40	15	1	2	18	17	0	4	21
40-	9	1	5	15	17	0	2	19
42-	13	2	3	18	22	0	4	26
44-	36	3	9	48	47	1	6	54
46-	26	2	10	38	35	4	16	55
48-	42	2	8	52	31	7	6	44
50-	54	10	20	84	48	9	10	67
52-	29	4	6	39	22	2	4	28
54-	7	1	4	12	10	1	2	13
56-	0	0	1	1	3	1	0	4
58-	2	0	0	2	0	0	1	1
60	0	1	0	1	0	0	0	0
Age doubtful	233	27	68	328	252	25	55	332
	0	1	1	2	2	1	0	3
Mean age in years	233	28	69	330	254	26	55	335
	48.1	49.3	48.44	48.27	47.3	50.12	47.58	47.56

Table 10 shows that such difference as there is results in a slightly higher age for the unmarried women.

The age of cessation for widows is distinctly higher in both series. It may be noted that the separation into married and widowed here is different from that given in Table 3. In that table the civil state at the time of the interview was taken whereas here the civil state at the time of the menopause is taken. There is some divergence between the two since a fair number of widows re-married after the menopause and others who were married at the menopause became widows later.

The higher ages at cessation for the widows suggests the possibility that the cessation of marital intercourse at an age when sexual life is still active may tend to prolong menstrual life.

The probable error of the difference is found to be:—

Cancer series—Mean.

Married = 48.1 ± .187

Widowed = 49.3 ± .598

Diff. = 1.2 ± .627

Control series—Mean.

Married = 47.30 ± .186

Widowed = 50.12 ± .350

Diff. = 2.82 ± .396

The greater difference of age at the climacteric between the married and widowed women of the control series appears therefore to be significant. The suggestion may perhaps be hazarded that the widowed women of the control series being as a whole healthier than the widows in the cancer series exhibit a greater reaction. The numbers are small and the hypothesis rests on a slender basis.

The Total Duration of Menstrual Life.

A somewhat vague idea seems to exist to the effect that the duration of menstrual life is roughly the same in all women, and that the age of cessation depends upon the age at onset. The present material offered the opportunity of testing this possibility.

A general figure for the duration of menstrual life could be obtained by taking the difference between the mean age at onset and the mean age at cessation, as given in Tables 9 and 10. But the number of women in the onset tables is not the same as in the cessation tables, and it seemed possible that the two samples might not have been sufficiently similar for the purpose in hand.

In order to remove any source of inaccuracy the duration was taken out separately for the cessation groups and the result is shown in Table 11. In fact the results obtained by both methods are remarkably similar. If the mean ages in Tables 9 and 10 be subtracted the one from the other, it is found that the cancer patients show a mean duration of 33.45 years as compared with 33.76 years in Table 11 and the control series in Tables 9 and 10 give 32.85 years as compared with 33.11 in Table 11.

A glance at Table 11 shows that the possibility of any similarity

TABLE 11.
Showing the duration of menstrual life in the women of both series who have passed the menopause.

Duration in years.	CANCER SERIES.				CONTROL SERIES.			
	Married at Menopause.	Widowed before and at Menopause.	Unmarried.	Total.	Married at Menopause.	Widowed before and at Menopause.	Unmarried.	Total.
Under 20	2	0	1	3	3	0	1	4
20-	1	1	0	2	4	0	0	4
22-	7	0	1	8	3	0	0	3
24-	7	0	3	10	13	0	2	15
26-	10	2	5	17	20	0	2	22
28-	20	1	2	23	25	1	7	33
30-	22	3	10	35	37	3	6	46
32-	43	4	9	56	36	5	12	53
34-	37	1	15	53	39	5	6	50
36-	40	8	13	61	32	7	7	46
38-	27	2	5	34	27	1	8	36
40-	8	3	3	14	9	1	1	11
42-	3	0	0	3	4	0	2	6
44-	2	0	0	2	0	0	0	0
46-	0	1	0	1	0	0	0	0
Doubtful duration	239	26	67	322	262	23	54	339
	4	2	2	8	2	3	1	6
Mean duration in years ...	233	28	69	330	264	26	55	335
	33.72	34.92	33.45	33.76	32.85	34.83	33.63	33.11

in the duration of menstrual life among all women has no foundation whatever in fact. The duration varied from 1 to 47 years. The three of shortest duration are two of one year each, and one of eight years. All others under 20 years duration, fall into the period of 18-19 or the next below 20 years. Clearly there is no constancy whatever in the duration of potential reproductive life and each woman is a law unto herself in the matter.

It is interesting to note that the mean duration of menstrual life as shown in Table 11 is also higher among widows than among either the married or single women. So that the figures in Tables 10 and 11 suggest that not only is the average age of cessation in widows higher but that this is a result of a longer average menstrual life.

The probable error has been worked out and the following figures obtained:—

Cancer series—Mean.

Married	=	33.72 ± .212	
Widowed	=	34.92 ± .706	Diff. = 1.20 ± .74
Widowed	=	34.92 ± .706	
Unmarried	=	33.45 ± .372	Diff. = 1.47 ± .80

Control series—Mean.

Married	=	32.85 ± .210	
Widowed	=	34.83 ± .397	Diff. = 1.98 ± .45
Widowed	=	34.83 ± .397	
Unmarried	=	33.63 ± .432	Diff. = 1.20 ± .59

Here again the divergence between the duration of the menstrual life of the married and widowed women appears to have some significance.

In general it may be noted that the age of onset in the control series is slightly lower, and that the total duration is also slightly less than in the cancer series. It would be easy to put forward speculations as the probable meaning of this, but such suggestions are idle until more is known of the physiology of the menopause.

CHAPTER 4.

The Menstrual Histories of the Women.

A variety of matters require consideration in dealing with the menstrual histories. Among the chief are (1) the interval elapsing between the monthly periods, (2) the duration of the period, (3) the extent of the loss, and (4) the prevalence of local or general disturbance in relation to the cycle. These are dealt with below in the order named.

The Intervals between the Monthly Periods.

The details upon this point have been taken out and are shown for 1,003 women in Table 12.

TABLE 12.

Showing the intervals stated to have elapsed between the menstrual periods of the women in the cancer and control series.

Interval in days.	CANCER SERIES.				CONTROL SERIES.			
	Married	Widowed	Single	Total	Married	Widowed	Single	Total
14-21	1	0	1	2	1	0	1	2
21-28	29	8	10	47	40	6	8	54
28	237	82	93	412	247	89	63	399
28-30	4	1	6	7	3	2	0	5
Irregular ..	15	7	7	29	29	3	14	46
No note ..	286 6	98 2	113 3	497 11	320 1	100 1	86 1	506 3
	292	100	116	508	321	101	87	509
Percentage of those at 28 days	82.9	83.7	82.3	82.9	77.2	89.0	73.3	78.9
Percentage irregular ..	..	..	..	5.9	..	..	..	9.1
Percentage fairly regular but at other intervals ..	..	..	..	11.2	..	..	..	12.1

Taking the percentage totals at 28 days we have :—

Cancer series = 82.9 per cent.

Control ,, = 78.9 ,,

Diff. = 4.0 ± 2.48

It is interesting to note that the regularity is apparently greater among the cancer patients than among the control patients. This does not denote that there is an advantage in irregularity, since the control patients were not healthy women, but were nearly all attending hospital for some cause or other. It only means that there is no association between cancer of the breast and irregularity of the monthly periods. The differences may also be fortuitous.

The Duration of the Monthly Periods.

The duration of the monthly periods as given by the women is shown in Table 13.

TABLE 13.
Showing the duration of the menstrual periods in the women of both series.

Duration in days.	CANCER SERIES.				CONTROL SERIES.				Totals. No. Per Cent.
	Married.	Widowed.	Single.	Totals. No. Per Cent.	Married.	Widowed.	Single.	Totals. No. Per Cent.	
1-2	4	3	3	10	9	0	1	10	2.0
2-3	29	6	16	51	37	13	8	58	11.5
3-4	75	25	31	131	71	32	27	130	25.6
4-5	77	32	40	149	75	20	17	112	22.1
5-7	83	25	19	127	105	27	32	164	32.5
Over 7	10	3	3	16	22	6	0	28	5.5
Irregular ...	3	1	1	5	2	1	1	4	0.8
No note ...	281	95	113	489	321	99	86	506	
	11	5	3	19	0	2	1	3	
	292	100	116	508	321	101	87	509	
Per cent. in each series at 4-5 days	27.3	33.7	35.4	30.5	23.3	20.2	19.8	22.1	
" 5-7 "	29.5	26.3	16.8	26.0	32.4	27.3	36.5	32.5	

The remaining figures are either so similar or so small as to render a presentation of the percentages unnecessary.

The probable error of the mean duration of the menstrual periods in the two series has been taken out and the following figures obtained:—

$$\begin{aligned} \text{Cancer series} &= 4.5 \pm 0.42 \\ \text{Control ,,} &= 4.6 \pm 0.40 \quad \text{Diff.} = .17 \pm .062. \end{aligned}$$

which is not significant.

It is not suggested that this table is entirely free from error. It is rare for the periods to be of so constant a duration throughout life as to enable any woman to mention a precise number of days which would be correct for the whole duration of menstrual life. The number of days given by the women probably represents the figure which was most commonly correct and the patient is perhaps unconsciously offering a mean figure. It is believed, however, that the table is at least reasonably accurate to within 24 hours of the real duration.

As a whole the duration is longer in the control series, there being a larger number of women in whom the period lasted over five days, especially among the married women.

The Degree of Loss.

The extent of "loss" as given by the patients is shown in Table 14.

TABLE 14.

Showing the Degree of "Loss" according to the statements of the Women of both Series.

Degree of "Loss."	CANCER SERIES.				CONTROL SERIES.			
	Married	Widowed	Single	Total	Married	Widowed	Single	Total
Scanty ..	9	7	5	21	14	4	1	19
"Normal" ..	253	88	104	445	283	92	82	457
Excessive ..	25	4	4	33	24	4	3	31
No note ..	287	99	113	499	321	100	86	507
	5	1	3	9	0	1	1	2
	292	100	116	508	321	101	87	509
Percentage of "normal" in each column..	88.2	88.8	92.0	89.2	88.2	92.0	95.3	90.1

The remaining figures are so similar and at the same time so small as to render it unnecessary to show the percentages.

Some general fallacies are almost certainly present here owing to the widely divergent conceptions of different women as to what may be regarded as "normal." As a whole, however, the statements made seemed to correspond fairly accurately with the duration so that the figures are probably sufficiently correct to be of value. Apart from a slight excess of "normal" cases in the control series the two series may be regarded as similar.

Disturbances associated with Menstruation.

In the first place the presence or absence of any disturbance whatever was taken out and the results are shown in Table 15. The control series shows a slightly higher proportion of disturbances than the cancer series. This may be entirely without significance.

TABLE 15.

Showing the general figures for those women in both series who complained of disturbance in connection with menstruation. (Details of the disturbances are shown in Table 16.)

Disturbances.	CANCER SERIES.				CONTROL SERIES.			
	Married	Widowed	Single	Total	Married	Widowed	Single	Total
None ..	146	54	44	244	144	40	38	222
Yes ..	141	45	70	256	176	60	49	285
No note	287	99	114	500	320	100	87	507
	5	1	2	8	1	1	1	2
	292	100	116	508	321	101	88	509

Percentages.

None ..	50.9	54.5	38.6	48.8	45.0	40.0	43.7	43.8
Yes ..	49.1	45.5	61.4	51.2	55.0	60.0	56.3	56.2

The probable error of the disturbances during menstruation is given by

$$\begin{aligned} \text{Cancer series} &= 51.2 \text{ per cent.} \\ \text{Control ,,} &= 56.2 \text{ per cent.} \quad \text{Diff.} = 5.0 \pm 3.14. \end{aligned}$$

which is not significant.

Next, the local as opposed to the general disturbances were taken out, and also the association of both forms of trouble. The results are shown in Table 16.

TABLE 16.
Showing the nature of the disturbances complained of in connection with menstruation in the women of both series.

Nature of Disturbance.	CANCER SERIES.				CONTROL SERIES.			
	Married.	Widowed.	Single.	Total.	Married.	Widowed.	Single.	Total.
I. Abdominal Pain.								
(a) Sometimes ..	12	2	11	25	17	11	8	36
(b) Always ..	41	17	27	85	53	16	18	87
(1) As a girl ..	14	3	6	23	7	1	2	10
(2) Till marriage ..	10	5	0	15	8	1	0	9
(3) Till 1st child ..	5	2	0	7	2	2	0	4
(c) and headache ..	10	1	4	15	21	8	6	35
(d) and nausea ..	2	1	2	5	4	1	7	12
(e) and both (c) and (d) ..	3	0	3	6	4	2	0	6
(f) and backache ..	2	2	2	6	7	2	0	9
II. Headache.								
(a) Sometimes ..	12	5	6	23	12	2	2	16
(b) Always ..	6	0	2	8	20	5	3	28
(c) and nausea ..	9	3	2	14	5	3	1	9
(d) and backache ..	2	1	2	5	1	1	0	2
III. Nausea ..	4	1	2	7	5	1	1	7
IV. Pains in Back or Legs or Joints ..	9	1	0	10	9	3	1	13
V. Miscellaneous.								
Always felt cross ..	0	1	1	2	1	0	0	1
Felt exhausted ..	—	—	—	—	0	1	0	1
Fainting fits ..	—	—	—	—	—	—	—	—
No pain ..	141	45	70	256	176	60	49	285
	146	54	44	244	144	40	38	222
No note ..	287	99	114	500	320	100	87	507
	5	1	2	8	1	1	0	2
	292	100	116	508	321	101	87	509
The abdominal pain is noted as having been very severe in the following ..	5	1	8	14	22	8	11	41

In the cancer series two married women in II (c) were only troubled with the headache and nausea till early womanhood.

In the control series two of the widows entered under I (b) 2 had pain until after the second confinement.

And in the same series two of the widows entered under I (c) had no pain or headache after early womanhood.

The number of married women in whom some form of disturbance persisted throughout life is higher than might have been expected and was not confined to those women who had not borne children. The abdominal pain and general disturbance was almost always associated with the onset of menstruation, and was rarely premenstrual. This is in contrast to the breast troubles considered below where the discomfort or pain was in nearly every case premenstrual in origin, although it frequently continued until the second day after onset. In one instance there was pain in both abdomen and breasts which was inter-menstrual only.

Table 17 shows the number of cases in which there was discomfort of one kind or another in the breasts associated with the menstrual periods. In Table 18 the nature of the trouble complained of is shown more precisely.

TABLE 17.

Showing the number of instances in which the women of both series complained of some form or other of breast trouble in connection with menstruation.

(For details see Table 18.)

Breast Trouble.	CANCER SERIES.				CONTROL SERIES.			
	Married	Widowed	Single	Total	Married	Widowed	Single	Total
None ..	224	85	89	398	269	84	73	426
Yes ..	68	14	25	107	51	16	13	80
No note ..	292	99	114	505	320	100	86	506
	0	1	2	3	1	1	1	3
	292	100	116	508	321	101	87	509

Percentages.

None ..	76.7	85.9	78.1	78.8	84.1	84.0	84.9	84.2
Yes ..	23.3	14.1	21.9	21.2	15.9	16.0	15.1	15.8

The probable error relating to the above is given by
 Cancer series = 21.2
 Control " = 15.8 } diff. = 5.4 ± 2.43.

TABLE 18.
Showing the nature of the breast trouble complained of in connection with menstruation by the women of both series.

Nature of Complaint.	CANCER SERIES.				CONTROL SERIES.			
	Married.	Widowed.	Single.	Total.	Married.	Widowed.	Single.	Total.
	1. Pain only	11	2	5	18	9	6	3	18
2. Pain and fulness	7	1	2	10	14	5	4	23
3. Pain and tenderness	7	1	4	12	2	1	2	5
4. Pain in opposite breast since operation	4	0	1	5	1	0	1	2*
5. Pain at menopause	0	0	1	1	0	1	1	2
6. Tenderness only	6	1	1	8	4	0	1	5
7. Fulness only	8	1	2	11	5	0	0	5
8. Tenderness and swelling or fulness	8	3	4	15	3	1	0	4
9. Discomfort in breasts	15	5	5	25	13	2	1	16
None	66	14	25	105	51	16	13	80
No note	226	85	89	400	269	84	73	426
	292	99	114	505	320	100	86	506
	0	1	2	3	1	1	1	3
	292	100	116	508	321	101	87	509

NOTES.—In the *Cancer Series* eight married women and one single woman complained of great pain in the breasts, which were also described as being rigid, swollen or hard.

Two married women had trouble only as girls, and one had trouble only since marriage.

One woman complained of trouble only in the breast, which did not later become cancerous.

One single woman complained of the heaviness of her breasts at menstruation.

In the *Control Series* one married woman and three widowed women complained of very severe pain in the breasts, and one widow also complained of severe pain and fulness.

One married woman had pain only before marriage.

One married woman complained of a "drawing sensation in both breasts and thyroid."

* Since an operation for "chronic mastitis."

TABLE 19.
Showing the relation between breast trouble in connection with menstruation and other associated symptoms, in the women of both series.

Nature of Associated Symptoms.	CANCER SERIES.				CONTROL SERIES.			
	Married.	Widowed.	Single.	Total.	Married.	Widowed.	Single.	Total.
	1. Headache	2	2	2	6	8	1	1	10
2. Backache	3	1	0	4	2	1	0	3
3. Nausea	1	0	0	1	0	0	0	0
3a. Headache and nausea	3	0	1	4	1	0	0	1
4. Abdominal pain—								
(a) Slight	17	4	9	30	9	3	3	15
(b) Severe	10	1	4	15	5	3	1	9
(c) and headache	2	0	0	2	3	0	0	3
(d) and backache	2	0	0	2	1	0	0	1
(e) and nausea	0	0	0	0	1	0	0	1
(f) and both (d) and (e)	5	1	1	7	1	1	1	3
No other pain	45	9	17	71	31	9	6	46
	21	5	8	34	20	7	7	34
	66	14	25	105	51	16	13	80
Percentage of those with breast pain, etc., on total number in series	23.2	14.1	21.9	21.2	15.9	16.0	15.1	15.8
Percentage of those with breast pain, etc., who had no other trouble	31.8	35.7	32.0	32.4	39.2	43.8	53.8	42.5
Percentages with breast pain, etc., with mild disturbance (1, 2, 3, and 4a)	—	—	—	39.0	—	—	—	35.0
Percentages of breast pain, etc., with much disturbance	—	—	—	28.6	—	—	—	22.5

It seemed possible that there might be a constant association between breast trouble and some special form of general disturbance. This has been taken out, and the results are shown in Table 19.

It may be noted that one married woman had pain in both breasts and abdomen only at intermenstrual periods.

Among those with slight abdominal pain there were seven who had pain in the breasts in early life only, one till marriage and one till after the first confinement. Three had pain in the breasts occasionally. These instances were practically evenly distributed among the two series.

The figures do not suggest any association of breast troubles with other disturbances. The association is more frequent with abdominal pain or with headache, but as these are the two commonest forms of disturbance as shown in Table 16 no importance can be attributed to this.

In all the tables the total number of women complaining of breast trouble is somewhat higher in the cancer series than in the control series. How far this association may be psychological and due to the fact of their recent operation cannot be gauged.

The probable error does not suggest that there is any appreciable importance in the divergence.

It may be noted that approximately 50 per cent. of all the women in both series suffer from one or other form of disturbance. This denotes a very large aggregate amount of ill-health and discomfort if not actual suffering, even though the discomfort or suffering is not of prolonged duration.

Generally, it does not appear that there are any important divergences between the menstrual histories of the women in the two series. Such divergences as there are do not justify any deductions being made from them on account of their small size.

CHAPTER 5.

The Histories of the Menopause of the Women in the Cessation Groups of Both Series.

The histories of the menopause have been taken out in some detail for both series. It may be said at once that, like the menstrual histories, they show no striking divergences between the women in the two groupings.

In the first set of schedules no specific question was asked as to the menopause, and a number of schedules were filled in without the data required for this purpose. Hence in each series there are a fair number of cases among those examined early in the inquiry which are devoid of information upon the menopause.

TABLE 20. Showing the nature of the menopause in the women of the cessation groups of both series.

Nature of Menopause.	CANCER SERIES.			CONTROL SERIES.			
	Married.	Widowed.	Single.	Married.	Widowed.	Single.	Total.
I. No Disturbance.	56	30	30	57	29	17	103
(a) Gradual cessation	26	18	8	35	9	6	50
(b) Sudden cessation							
Total	82	48	38	92	38	23	153
II. Disturbance (for details see Table 21).	66	24	15	81	25	22	128
No note	26	15	18	32	13	9	54
Totals	174	87	71	205	76	54	335
Percentage having some disturbance	44.6	33.3	28.3	46.8	39.7	48.9	45.6
Menopause occurred without disturbance after birth of last child in	4	9	0	12	4	0	16
(These are included above.)							

The probable error for the disturbances during the menopause gives :-

Cancer series = 38.5
 Control " = 45.6 } = diff. - 7.1 ± 4.18.

Table 20 shows the general position in tabular form. For this table all the women in the cessation groups have been included except those having an artificial menopause. Under the heading of "gradual cessation" have been entered all those cases in whom the schedule merely stated that there had been no symptoms of any kind at the menopause, as well as those in which the cessation was explicitly stated to have been gradual. The next group—those with sudden cessation—includes only those cases in which such information was given. No disturbances were noted in either of these groups.

It is interesting to note that the menopause occurred without symptoms after the birth of the last child in a number of cases in each series. Probably this is the termination most closely in accordance with natural physiological conditions.

The percentages in table 20, show a somewhat higher incidence of disturbances among the women of the control series, but the difference is not significant, having regard to its probable error. It is not proposed here to make a detailed analysis of the possible causes of this divergence, but a few remarks may not be out of place. In Table 21, which may now be helpful, is shown the nature of the disturbances and if comparison be made it is then found that the excess in the number of disturbances among the control women is entirely confined to the lesser disturbances. The proportion of women having severe disturbances is slightly higher in the cancer series than in the control series. In considering the whole position it seems unlikely that the increase on the general number of disturbances in the control series is significant.

In order to eliminate an error which might perhaps have proved considerable, the nature of the complaints among the women of the control series was examined. It was found that there were 24 women who were suffering from some form or another of gynecological trouble at the time of the interview, which does not coincide with the time of the menopause, since many were long past the menopause. The menopause had passed without disturbance in 10 out of the 24, and in three there was no note on the menopause.

If all these cases be removed entirely from the series the percentage falls by 0.5 per cent. only.

It is also possible that a psychological factor plays a part. The women of the control series may have more lively recollections of their sufferings during the menopause than the cancer patients in whom the trouble of the operation for cancer may have somewhat dulled the memories of the menopause.

Interesting accounts of their symptoms were given by some of the women in both series. Those who suffered severely were often able to give good accounts of their troubles. The degree of suffering, both mental and physical is evidently much greater than can reasonably be accounted for by the physical condition, and this was recognised by the patients themselves.

In order to see whether there was any relationship between

TABLE 21.
Giving details of the disturbances at the menopause in the women of the cessation groups of both series.

Nature of Disturbance.	CANCER SERIES.			CONTROL SERIES.		
	Married.	Widowed.	Total.	Married.	Widowed.	Total.
1. Nervous Disturbance.						
(a) Slight	17	12	29	29	10	39
(b) Severe	16	3	19	22	1	23
2. Excessive Loss or a few floodings	20	5	25	17	8	25
3. 1 and 2 together	10	2	12	6	5	11
4. Pain as sole symptom	2	2	4	7	1	8
5. Gastric hemorrhage	1	—	1	—	—	—
6. Violent attacks of diarrhea and vomiting	0	0	0	—	—	—
	66	24	90	81	25	106
	43.9	29.2	40.0	43.2	28.0	31.8
			40.0			38.3

NOTE.—Under Nervous Symptoms, Slight, are included those cases which showed flushings, slight dizziness, one or more fainting attacks, some vomiting or nausea. The greater number were histories of flushings only.
Under Nervous Symptoms, Severe, are included cases of prolonged depression or melancholia, exhaustion, usually accompanied by severe flushings, sweatings, etc., intense malaise or general ill-health, and include two nervous breakdowns, one in each series. Two years seems to have been the shortest duration of the symptoms and eight years the longest.
If 1(a) and 2 be regarded as, on the whole, slight disturbances and the rest as severe, we get the following percentages for the incidence of severe symptoms.

menstrual and menopausal disturbances in the same women, the cases in which there had been menstrual trouble in the cessation groups were taken out. The proportion of those having menstrual disturbance who later had menopausal disturbance was almost identical with that for the series as a whole. There was therefore no definite evidence of any association between menstrual and menopausal disturbances. The figures, however, suggested a slight increase in the proportion of menopausal disturbances among the women of the control series who had suffered from menstrual disturbances. But the divergence was small, and as a whole the figures were too few for any deductions of value to be drawn.

The material has not been worked out in further detail seeing that the present object is to consider the divergences between the two series. It is recognised that there are almost certainly points of interest which might emerge if the material were treated as a whole, and the data worked out further. The present report is scarcely suitable for a general discussion on the menopause which would require consideration of literature and data outside the scope of the present investigation.

CHAPTER 6.

The Age at Marriage and the Duration of Marriage.

It is now necessary to consider those points in the schedule which concern married and widowed women only. The various phases of the reproductive life must be studied in some detail. For certain of the phases a wrong impression would be created, and erroneous results obtained if the figures were taken out on women who were still in the reproductive period of their lives. Hence, except for group A in the next Table (see Table 22) the women considered are exclusively those who had passed the menopause. Further those women who had an artificial menopause have likewise been omitted from the calculations seeing that they must be regarded as being abnormal at all events for the present inquiry.

The women thus grouped have already been dealt with under the cessation groups in earlier tables.

The age at marriage could clearly be used for all the married women in the two series, but the duration of marriage in relation to reproduction can only be dealt with in respect of those women who belong to the cessation groups. Further, there are a small number of women in each series who became widows before they had reached the menopause and who therefore, were married only for a part of their reproductive life, apart from the question

of age at marriage. These three groups of women have been shown separately in respect of their age at marriage in Table 22. It was feared that there might be important differences if these last women were removed. While it is true that there are some divergences in the actual figures they are all in the same direction and are all slight.

In both series there were a few women who had been widows after a short period of marriage but who had married again

TABLE 22.

Showing the age at marriage of certain groups of women in both series.

Age Period.	Group A.		Group B.		Group C.	
	All Married and Widowed Women.		All in Group A. who had passed the Climacteric.		All in Group B. who were still married at the Climacteric.	
	Cancer.	Control.	Cancer.	Control.	Cancer.	Control.
10-	0	1	0	1	0	1
12-	1	0	1	0	1	0
14-	4	3	3	2	1	2
16-	6	18	5	14	5	13
18-	30	53	17	38	14	34
20-	54	83	31	52	27	46
22-	74	68	44	45	40	40
24-	58	58	37	37	33	33
26-	40	43	25	29	24	25
28-	40	28	31	19	27	20
30-	25	18	16	10	15	8
32-	24	9	21	6	18	6
34-	9	11	7	8	6	8
36-	9	14	7	6	6	6
38-	5	5	2	3	3	2
40-	4	5	4	4	4	4
42-	4	1	4	1	3	1
44-	2	3	1	3	1	3
46-	2	0	2	0	2	0
48-	2	1	2	1	2	1
50-	0	1	0	1	0	1
	391	423	260	280	332	254
Not known	1	0	1	0	1	0
	392	423	261	280	233	254
Mean ages in years	26.21	24.93	26.85	24.72	26.99	25.56

within a year or two after the death of the first husband. These women have been reckoned as married, the short interval of widowhood being neglected. Those who married again after a long interval either just before or at the menopause have been regarded as widows whose husbands died before the climacteric had been reached. These various classes were analysed separately in respect of all the points dealt with in this and in the subsequent chapters of this part of the report. But it was found that the differences in the various groups were so small as to be negligible. It was therefore decided to include in Table 22 all the widows and married women who had passed the menopause other than those subjected to an artificial one. That there were found to be very slight divergences is probably accounted for by the facts that the numbers of widows concerned are very small, and are almost similar in the two series, being 30 and 25 in the cancer and control series respectively.

Table 22 shows the distribution and the mean ages of the several groups. The age at marriage of the control series is lower throughout than that of the cancer series although some variations are seen in the differences.

The Duration of Marriage.

Seeing that the mean age at marriage is lower in the control series than in the cancer series it was deemed necessary to take out the duration of marriage in the two series. In the first instance the complete duration of marriage was taken from the time of marriage up to the time of interview or of widowhood. The results obtained are shown in Table 23.

TABLE 23.

Showing the total duration of marriage in the married and widowed women of both series, who had passed the climacteric.

Duration in years.	Cancer.	Control.
0-	16	4
5-	10	10
10-	18	16
15-	18	23
20-	39	35
25-	50	48
30-	48	55
35-	27	42
40-	24	34
45-	4	11
50-	6	2
	<hr/>	<hr/>
	260	280
Doubtful	1	0
	<hr/>	<hr/>
	261	280

Mean duration 26.94 ± .488 years 29.39 ± .425 years.
Excess duration of controls over cancer series = 2.45 ± .647 years.

The mean duration of marriage on this basis is found to be 2.45 years longer in the control series than in the cancer series.

In considering the reproductive life, however, it is evidently necessary to regard the duration of marriage before the menopause only. Then also it becomes necessary to throw out those instances where the marriage terminated before the climacteric: likewise those women who married after the menopause. The results are given in Table 24.

TABLE 24.

Showing the duration of marriage before the climacteric in the women who were still married at that period.

Duration of marriage in years.	Cancer.	Control.
0-	2	2
2-	1	1
4-	3	2
6-	6	4
8-	4	4
10-	7	8
12-	12	8
14-	14	11
16-	22	15
18-	12	16
20-	20	21
22-	27	33
24-	28	29
26-	26	33
28-	19	26
30-	9	18
32-	7	8
34-	3	5
36-	2	2
38-	1	0
40-	0	2
	<hr/>	<hr/>
Duration doubtful... Married after menopause	225	248
Widowed before menopause	3	3
	3	4
	<hr/>	<hr/>
	30	25
	<hr/>	<hr/>
	261	280
Mean duration ...	21.62 years. ...	23.06 years.

On this basis the mean duration of the married life before the menopause is found to be 21.62 years for the women in the cancer series, and 23.06 years for those in the control series. This gives 1.44 years in favour of the control series. This result is on parallel lines to the difference in age at marriage in group C of table 22 with which it is comparable. Hence the control series as a whole married earlier, they had the climacteric slightly earlier, and the mean duration of marriage was longer than in the cancer series. It is shown in the next chapter that they had a greater number of children than the women of the cancer series.

TABLE 25.

Showing the total number of pregnancies in the married women in the cessation groups of both series, dead-births occurring after the 28th week of pregnancy being included as children.

Number of children whether born dead or alive.	CANCER SERIES.							CONTROL SERIES.							
	Associated miscarriages, giving the number of women having such number of miscarriages.							Associated miscarriages, giving the number of women having such number of miscarriages.							
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8
0	2	0	1	0	1	1	35	2	1	0	1				4
1	3	2	1	0	0	5	23	2	1	3	0	1			3
2	1	0	1			2	28	1	2	2	0				7
3	3	0	2			3	32	3	1	2	0				6
4	3	0	2	1		8	25	5	3	3	1				12
5	4	0	1	1		5	19	2	2	2	0				4
6	2	1	1	1		5	31	5	1	1	0				6
7	2	2	0	1	1	5	17	3	1	1	0	0	1		6
8	1	3	0	1	1	6	20	6	1	2					9
9	0	0	1	1	2	2	13	1	2						3
10	5	0	0	0		1	7	1	1						2
11	5	1	1			1	10	1	1						2
12	1	0				0	10	0	0	1					2
13	1	1				1	6	0	0	0	1				0
14	1	1				1	0	0	0	0					0
15	0	0				0	3	0	0	1					1
16	0	0				0	1	0	0	0					0
17	0	0				0	1	0	0	0					0
Totals ...	20	12	6	7	1	0	280	32	18	12	3	1	0	0	67

Total number of children = 921
" " miscarriages = 102

Total number of children = 1,392
" " miscarriages = 129

CHAPTER 7.

The Number of Pregnancies among the Cessation Groups in Both Series.

It was important to ascertain the relative fertility of the women of both series. Information was available as to the occurrence of miscarriages as well as the number of dead-births, and the number of live-births.

In the present chapter the dead-births are included under the viable children and the miscarriages are given separately.

Table 25 shows that the control series of women were distinctly more fertile than the women of the cancer series, and in Table 26 the various points are shown comparatively.

TABLE 26.

Comparing the number of pregnancies, etc., in the two series.

	Cancer.	Control.	Difference.
Total number of pregnancies ...	1,023	1,521	+ 498
Total number of miscarriages ...	102	129	+ 27
Total number of miscarriages among women having viable children ...	87	121	+ 34
Total number of viable children ...	921	1,392	+ 471
Average number of pregnancies per married woman ...	3.92	5.43	+ 1.51
Average number of pregnancies per fertile woman ...	4.70	6.11	+ 1.41
Average number of viable children per married woman ...	3.53	4.97	+ 1.44
Average number of children per woman having viable children ...	4.32	5.68	+ 1.36
Average number of miscarriages per married woman ...	0.39	0.46	+ 0.07
Average number of miscarriages per fertile woman ...	0.47	0.52	+ 0.05
Average number of miscarriages per woman having viable children ...	0.41	0.49	+ 0.08
Average number of miscarriages per woman having miscarriages ...	2.17	1.92	- 0.25
Percentage of miscarriages to pregnancies ...	9.97	8.48	- 1.49

The figures differ slightly from those given in the next chapter where the fertility of the two series is dealt with statistically. In that chapter the women who married twice have been taken as two women and those who were widows before the menopause have been disregarded. The divergences are, however, slight, and do not affect the general conclusions in any way.

In Table 26 women who had one or more miscarriages but no viable children have been regarded as fertile, hence the number

of fertile women is obtained by deducting from the total number those women who had neither miscarriage or viable child *i.e.*, who had no pregnancy. It is interesting to note that while the average number of children is higher in the control series, the percentage of miscarriages and of dead-births to the total number of live-births is higher on both counts in the cancer series. If dead-births and miscarriages are regarded as signposts of health it would seem that the general health of the control series throughout reproductive life was better than that of the cancer series. This point is considered further in the next and later chapters.

CHAPTER 8.

Relation of Fertility to the Incidence of Cancer of the Breast.

(Contributed by Dr. Major Greenwood.)

The subject now to be discussed is of great importance from an aetiological point of view. It has long been known (the statistical investigations into official data made at the instance of the Cancer Commission of the Health Committee of the League of Nations have added yet further evidence) that, age for age, unmarried women (with minor and partial exceptions in the earlier age groups) suffer from cancer of the breast at a higher rate than married women. It was suspected that married women of low effective fertility suffered more than married women who had borne many children, but the evidence here was not so complete being based upon hospital data inadequately controlled.

The material now to be discussed is, of course, scanty in comparison with the hundreds of thousands of observations available in a national census or mortuary register, but has certain advantages. Thus in each instance we know the date of menopause and so do not need to affix an average, such as 45 years, to the term of cessation of potential fertility; we have also more exact particulars of pregnancies not ending in the birth of a viable foetus. In this chapter we shall deal only with the question of viable offspring and propose to inquire closely into the differences found.

For the purpose of the study we have 263 observations in the Cancer series and 285 in the Control Series. The numbers of individuals in the two series are slightly smaller because, for this investigation, it seemed right to enter a woman who had married more than once, separately for each marriage. Thus a woman who married at 26 and lost her first husband 10 years later, remarried at 37 and became a widow again at 60 reaching menopause at 46, would appear twice, once as married at 26 with

duration of marriage 10 years, once married at 37 with duration of marriage 9 years.

In Table 27 we show the means and standard deviations of the three variables.

TABLE 27.
Means and standard deviations of variables.

Variables.	CANCER SERIES. No. of observations—263		CONTROL SERIES. No. of observations—285	
	Means.	Standard Deviations.	Means.	Standard Deviations.
Age at marriage ...	26.48 yrs.	6.40	24.98 yrs.	6.07
Number of children	3.48	2.88	5.34	3.68
Duration of marriage	18.56 yrs.	8.43	20.92 yrs.	8.10

Now from Table XII of the *Fertility of Marriage* (Part II volume of the Census Report of England and Wales (1911) we can readily discover the average number of children born for the stated mean ages at marriage and mean durations of marriage. The result is that the English average for the mean age at marriage and duration of the Control series is 4.17 children and for the Cancer series 3.62. In other words, the Cancer series show a gross fertility almost identical with the general average, while the Control series show a fertility some 25 per cent. in excess of the average. This simple confrontation is almost sufficient by itself to show that the Controls were more fertile than the remainder; yet the importance of the matter is such that we have explored it more closely. In the first place, we have treated the two sets of data, the Cancer patients and the Controls, separately, have determined in each the relations subsisting between the three variables, number of children, age at marriage, and duration of marriage and obtained a prediction equation, a multiple regression equation, for estimating the number of children in terms of age at marriage and duration of marriage. The justification of this process is that it has been found by Rae (*See Census of Scotland*, 1911, Vol. III, *Fertility of Marriage*, pp. xxxix, *et seq.*) and by Brown, Greenwood and Wood (*See Eugenics Review*, XVII, 1920, p. 158, *et seq.*) that although the regression of fertility (number of children) on the other variables is not linear, yet that equations of the first degree do graduate the data reasonably well; this conclusion has been found to apply to the present material. Briefly, such an equation, of the first degree in three variables, does adequately summarise the inter-relations of the variables. Having obtained our two equations, we can (1) with the equation deduced from the Cancer series estimate the number of children likely to be associated with the observed mean age at marriage and mean duration in the

Control series and determine whether such prediction differs significantly from the observed mean number of children. (2) In the same way we can estimate the mean size of family in the Cancer series with the equation deduced from the Control series.

The various constants and deduced equations are set out in Table 28:—

TABLE 28.

Correlations and equations for cancer and control series.

Coefficient of Correlation.	CANCER SERIES.	CONTROL SERIES.
Age at marriage and number of children	- .465 ± .033	- .514 ± .029
Age at marriage and duration	- .614 ± .026	- .616 ± .025
Number of children and duration	+ .435 ± .034	+ .423 ± .033

Partial Correlations.	CANCER SERIES.	CONTROL SERIES.
Age at marriage and number of children. (Duration constant.)	- .278 ± .038	- .355 ± .035
Age at marriage and duration. (Number of children constant.)	- .516 ± .031	- .513 ± .029
Number of children and duration. (Age at marriage constant.)	+ .214 ± .040	+ .157 ± .039

Equation for Cancer Series.

Number of children in terms of age at marriage and duration—
 $c = 5.7421 - .1428$ (age in years) + .0821 (Duration in years).

Equation for Control Series.

Number of children in terms of age at marriage and duration.
 $c = 9.3680 - .2477$ (age in years) + .1032 (Duration in years).

Using these equations we find:—(1) The mean of the Controls predicted by the equation for the Cancer series is $3.89 \pm .10$, the observed mean is 5.34 ± 0.15 , the difference 1.45 ± 0.180 . The mean for the Cancer series predicted from the Control series is 4.72 ± 0.13 , the observed mean 3.48 ± 0.12 , the difference 1.24 ± 0.18 . The differences are highly significant, leaving no doubt at all that the fertility of the Cancer series is really less than that of the Control series. But an important objection may be suggested. In the Cancer series were a certain number of women who had symptoms of cancer before the menopause, might not the lowered average fertility of the whole group be due to the presence of a proportion of women whom the disease itself prevented from bearing their adequate number of children?

There is force in this objection. The cases, 54 in number, in the Cancer series where the disease gave symptoms before the menopause, were separately dealt with. The statistical constants are shown in Table 29. They are less fertile than the average of the Cancer series. We therefore excluded them and re-calculated the averages for the remainder of the Cancer series. We found Mean Age at Marriage, 26.67 years, mean Duration of Marriage, 17.34 years. Mean Number of Children 3.54. We then computed from the equation of the Controls the expected number of children for the mean age and mean duration of this select Cancer series. The prediction was 4.55 ± 1.5 the observed value as we have seen was 3.54 ± 0.14 the difference 1.01 ± 201 .

The exclusion of the cases wherein the disease itself may have reduced the child-bearing power has slightly, but only very slightly, reduced the difference, which remains highly significant. The women who ultimately developed cancer bore, when proper allowance is made for age at marriage and duration of marriage, 22 per cent. fewer children than the Controls.

TABLE 29.

Cancer series in which the onset of cancer was observed before the menopause.

Number of observations = 54. Variables.	Means.	Standard Deviations.
Age at marriage	25.76 yrs.	6.16
Number of children	3.24	2.49
Duration of marriage	23.28 yrs.	7.31

Coefficients of Correlation.	r.
Age at marriage and number of children	- .467 ± .072
Age at marriage and duration	- .825 ± .029
Number of children and duration	+ .482 ± .070

Partial Correlations.	r.
Age at marriage and number of children. (Duration constant.)	- .1406 ± .090
Age at marriage and duration. (Number of children constant.)	- .774 ± .037
Number of children and duration. (Age at marriage constant.)	+ .193 ± .088

The Equation.

No. of children in terms of age and duration—
 $c = 3.1134 - .0882$ (age in years) + .1031 (duration in years).

The reality of the statistical difference may be said to have been conclusively proved. Before discussing the aetiological importance of the result, we shall refer to some possible difficulties. We have not taken into account the age of husband at marriage. The census results (England and Wales) show that for husbands under 25 (wife's age constant) the fertility is higher and for husbands of 45 lower than the general level (*see op. cit.*, p. XX) but between these limits the variation is not very important. Furthermore it is difficult to believe that there would be a sensible difference in the distribution of ages of husband unless, the next objection to note, there is a class distinction between the patients of the two series. It seemed *a priori* possible that the patients of the cancer series might contain a somewhat higher proportion of women of the more prosperous classes, because the treatment of cancer surgically involves greater expense than many of the conditions falling under the control series. The evidence of Chapter 2 of this report makes it probable that the objection is groundless.

Evidently this result should be tested in every possible way before it can be finally accepted at its face value, but provisionally we seem justified in concluding that there is really a fundamental connection between low fertility and tendency to develop cancer of the breast.

The fact, already known, that unmarried women suffered more than married women from cancer of the breast, might *a priori*, be attributed to a number of possible causes, e.g., negative selection (those not marrying being less healthy, a proposition without much statistical justification); greater frequency of industrial employment; deprivation of the various physiological and psychological sequelae of sexual intercourse. When the difference is found to obtain between married women of greater and less fertility, the issues are narrowed down, virtually, to that of child-bearing and its sequelae or *remoter* antecedents. We say *remoter* antecedents, because the question whether those who are *naturally* less fertile may not be on that account, more liable to cancer must be discussed. The immediate antecedents, viz., conjugal intercourse can be excluded. There may be, and is, difference of opinion as to the effect upon fertility of deliberate attempts to prevent conception, but it is not probable that coitus is less frequently practised in the less than in the more fertile working class families. Waiving for the moment the question of *natural* fertility, we have only to consider the direct consequences of pregnancy as establishing a difference. It will be shown in the next chapter that there is no very striking difference between the habits of lactation of the two groups, certainly no difference so striking as between the fertility rates. We seem therefore forced to conclude that the infrequency with which the mammary gland passes through the very complex stages associated with pregnancy is of importance. In other words that cancer may be a case of aberrant proliferation due to, or at least associated with, failure to adopt a rhythm appropriate to the organ. (*cf.* Part V.)

But, unless we can show, as we cannot from this material, that the relative infrequency of pregnancy in the Cancer series is due to contraception, it remains *possible* that we have to deal with some innate difference, a tendency to develop cancer, and an inability to bear children, both being signs of some innate peculiarity. We may note here that cancer of the uterus has increased in absolute frequency less than a third as fast as cancer of the breast. Indeed, if one pays attention to the age distribution, the rate of mortality for cancer of the uterus is definitely decreasing, as is shown in the following table:

	1901-10	1911-20
All ages (crude) ...	224	209
0		0
10		1
25	13	16
30		59
35		152
40	314	307
45		495
50	715	668
55		785
60		856
65		906
70	1,071	886
75		902
80	942	681
85	782	563

During this period also the birth rate has continued to fall.

It is known that the rate of mortality from cancer of the uterus is, when due allowance has been made for age differences, generally higher among married women and widows than among unmarried women. Clinical statistics make it probable that the disadvantage of the married women is wholly due to the consequences of a first pregnancy, *i.e.*, that the real difference is between the whole class of women who have borne one or more children and that of women who have not borne children. Indeed there is some reason to think that women who have borne two or more children are less subject to cancer of the cervix uteri than women who have borne only once.*

The contrast between the evolution in time of the rates of cancer of the breast and of the uterus is most easily explained by the decline of the birth-rate, although the explanation is not wholly free from difficulty.

What is needed is an extension of the comparison to other countries, if possible to classes wherein "birth control," effective or not, has not been widely practised.

We think then that an aetiological factor of importance has now been fully demonstrated; whether it is a direct factor, or whether it be correlated with something more deeply seated, cannot be established by this enquiry.

* For a discussion of this matter see Vol. I. of the Report of the Cancer Commission (League of Nations), pp. 23-5.

CHAPTER 9.

On the Nature of the Confinements of the Women,

The incidence of deadbirths and miscarriages has been dealt with in Chapter 7, and comparison made between the two series.

It seemed desirable to ascertain whether normal labours were more or less frequent among the women in the cessation groups of either series. The nature of the confinements was therefore taken out for both. The necessary information was given in the replies in the schedules.

The results have been divided into three classes,

1. Normal labours.
2. Instrumental labours.
3. Abnormal labours.

Under this last heading are included only cases where it was definitely stated that the labour was unduly prolonged or that some complication supervened other than the need for instrumental aid. Nothing under 24 hours for a first child was taken as abnormal, and in fact most of those included lasted from 2-3 days. No regard has been paid to *post partum* complications of any kind.

The deadbirths are shown separately in both series, and have been deducted from the total number of children in stating the livebirths. Any recorded abnormality in the delivery is noted at the lower part of the tables. Tables 30 and 31 show the results obtained.

The percentage of normal labours is, as a whole, somewhat higher in the control than in the cancer series. This, however, is probably in large part, if not entirely, accounted for by the greater relative number of first children in the cancer series, since the abnormal labours with or without instrumental aid are commonest for the first or second children in the family. The number of first children are found to be 23.1 per cent. of all the children in the cancer series and to be 17.6 per cent. of all children in the control series.

The proportion of deadbirths is higher in the cancer series than in the control series. This does not necessarily imply any serious divergence between the groups. It has been shown in chapter 2 that, if the children who died very shortly after birth be added to the deadbirths, the percentages of such births to the total pregnancies do not differ greatly for the two series.

The difference, 1.41 ± 0.21 , is small but significant with respect to its probable error.

TABLE 30.
Showing (A) the number of children in the family and (B) the nature of the confinements among the women of the "cessation group" in the cancer series.

A.	Number of viable children in each family.	Number of women who bore such number of viable children.	B.				Percentage of live births with normal delivery.	
			Nature of Delivery.			Total.		
			Normal.	Forceps.	Abnormal.	Deadbirths.*		
1	29	Total No. of 1st children	157	44	6	6	213	73.7
2	33	" 2nd "	156	20	3	5	184	84.8
3	34	" 3rd "	138	10	1	2	151	91.4
4	33	" 4th "	105	5	1	6	117	90.0
5	21	" 5th "	70	5	0	9	84	84.5
6	16	" 6th "	54	2	0	7	63	88.8
7	14	" 7th "	39	3	0	5	47	87.2
8	20	" 8th "	28	1	1	3	33	84.8
9	5	" 9th "	12	1	0	0	13	Remaining figures too small for reliable percentages.
10	5	" 10th "	8	0	0	0	8	
11	1	" 11th "	3	0	0	0	3	
12	0	" 12th "	1	0	0	1	2	
13	1	" 13th "	1	0	0	1	2	
14	1	" 14th "	0	0	0	1	1	
		Totals	772	91	12	46	921	83.8

* Among the deadbirths were three forceps and one abnormal delivery
Average number of children per parous married woman = 4.32.
Percentage of deadbirths = 5 per cent. of total.

TABLE 31.
Showing (A) the number of children in the family and (B) the nature of the confinements among the women of the "cessation group" in the control series.

A.		B.							Percentage of live births with normal delivery.
Number of viable children in each family.	Number of women who bore such number of viable children.	Nature of Delivery.			Abnormal*	Deadbirths.†	Totals.		
		Normal.	Forceps.	Cesarean.					
1	23	191	31	16	7	245	77.9		
2	28	197	14	7	4	222	88.7		
3	32	175	11	7	1	194	90.2		
4	25	143	5	6	8	162	88.3		
5	19	125	5	5	2	137	91.2		
6	31	96	7	3	12	118	81.3		
7	17	74	5	1	7	87	85.0		
8	20	60	6	1	3	70	85.7		
9	13	43	4	2	1	50	86.0		
10	7	36	1	0	0	37	Remaining figures too small for reliable percent-ages.		
11	10	28	1	0	1	30			
12	10	14	1	1	4	20			
13	6	8	2	0	0	10			
14	0	3	1	0	0	4			
15	3	3	1	0	0	4			
16	0	0	1	0	0	1			
17	1	0	1	0	0	1			
	Totals	1,196	97	49	50	1,392	85.9		

* Includes one Cesarean section. † Among these were three forceps and four abnormal deliveries.
Average number of children per parous married woman = 5.7.
Percentage of deadbirths = 3.59 per cent. of total.

CHAPTER 10.

The Frequency and Duration of Lactation.

It has frequently been suggested that improper lactation, whether for too long or for too short a period, was perhaps a predisposing cause of cancer of the breast. In order to elucidate this point the duration of lactation was noted in every case, and it is remarkable that the data are almost complete. The duration of lactation seemed to be a point which was readily remembered by the women. It is likely that the duration given was not always accurate to a few weeks, but this degree of accuracy is amply sufficient for the present purpose. It was somewhat surprising to find the large numbers of children who were fed for over a year, especially in the control series.

Tables 32 and 33 show the results obtained for each series.

TABLE 32.

Showing the frequency and the duration of lactation in the women of the cancer series.

Position of child in family.	Duration of Lactation.							Total.	
	0. Not fed.	1. Fed 0-3 mnths.	2. Fed 4-6 mnths.	3. Fed 7-9 mnths.	4. Fed 10-12 mnths.	5. Fed over 1 yr.	6. Fed over 2 yrs.		Period doubtful.
1st	32	25	6	35	77	26	6	0	207
2nd	29	15	6	28	73	24	3	1	179
3rd	22	7	3	22	60	27	5	3	149
4th	12	6	4	14	51	16	6	2	111
5th	9	5	3	9	33	13	3	0	75
6th	9	2	1	3	26	13	2	0	56
7th	7	2	1	1	20	9	2	0	42
8th	4	0	0	1	17	8	0	0	30
9th	2	0	0	0	6	5	0	0	13
10th	1	0	0	0	4	3	0	0	8
11th	0	1	0	0	1	1	0	0	3
12th	0	0	0	0	1	0	0	0	1
13th	0	0	0	0	1	0	0	0	1
14th	0	0	0	0	0	0	0	0	0
Deadbirths	127	63	24	113	370	145	27	6	875
Percentage of total, deducting deadbirths and doubtful cases..	14.6	7.2	2.8	13.0	42.6	16.7	3.1		46
									921

In class 6 were—1 fed 5 years.
4 " 4 "
1 " 3 "
21 " 2-3 years.

TABLE 33.

Showing the frequency and duration of lactation in the women of the control series.

Position of child in family.	Duration of Lactation.								Total.
	0. Not fed.	1. Fed 0-3 mnths.	2. Fed 4-6 mnths.	3. Fed 7-9 mnths.	4. Fed 10-12 mnths.	5. Fed over 1 yr.	6. Fed over 2 yrs.	Period doubtful.	
1st ..	18	33	14	29	75	67	0	2	238
2nd ..	15	25	11	28	74	66	1	0	218
3rd ..	16	19	12	20	63	60	2	1	193
4th ..	11	16	12	15	41	58	1	0	164
5th ..	13	13	8	11	38	52	0	0	135
6th ..	7	11	5	6	36	41	0	0	108
7th ..	6	9	2	4	25	33	0	1	80
8th ..	4	6	5	3	19	30	0	0	67
9th ..	4	4	2	2	21	16	0	0	49
10th ..	2	4	1	2	17	11	0	0	37
11th ..	0	4	1	2	12	8	0	1	28
12th ..	0	3	2	2	4	6	0	0	17
13th ..	1	2	0	2	3	2	0	0	10
14th ..	1	0	0	1	0	2	0	0	14
15th ..	1	0	0	1	1	1	0	0	4
16th ..	0	0	0	1	0	0	0	0	1
17th ..	0	0	0	1	0	0	0	0	1
Dead-births	99	149	75	128	429	453	4	5	1,342
	50								50
	149								1,392
Percentages on total excluding dead-births and doubtfuls.	7.4	11.1	5.6	9.6	32.1	33.9	0.3		

In class 6 were 4 fed for over 2 years; 1 fed for over 4 years.

It has been customary to regard lactation for more than nine months as constituting some degree of over-lactation, while any period below six months was regarded as under-lactation. This view has been based on consideration of the interests of the child rather than those of the mother. The child having acquired some teeth requires a more varied dietary after the ninth month, and it has been assumed, perhaps erroneously, that so long as suckling continued little else than the breast would be offered to the child. The eruption of the teeth, with the resulting possible biting of the nipple, does not appear to act as a deterrent.

It seems clear from the tables that lactation for a period up to two years cannot be considered as having any detrimental effect on the breast itself, since the breasts of the women in the control series were healthy. It is shown later that there were in all 31 women in the control series who had had breast trouble at

one-time or another. But of these 31 only one woman of those belonging to the cessation groups suckled her children for more than one year, and that woman developed tuberculosis of the breast. She had fed six children for nearly two years each. Of the other women who do not fall into the cessation group only one who had had breast trouble had fed one child for 21 months. There can therefore be no ground for supposing that prolonged lactation up to from 1-2 years has any detrimental effect on the breast.

If now we pass to the extremes of the tables it is noticeable that the cancer series shows both a higher percentage for non-lactation and for excessively prolonged lactation. The percentage for non-lactation is just over twice as high as it is in the control series. If the children who died almost immediately after birth be deducted the difference is even greater. It is shown later that deformities of the breast are more numerous in the cancer series than they are in the control. But they are numerically infrequent and do not account for any large part of the non-lactation. In a few isolated cases it is stated that the mother was exhausted after a bad confinement and did not suckle on the doctor's advice. For the most part it seems that the non-lactation in both series was chiefly due to a disinclination on the part of the mother.

At the other extreme of the series, namely suckling over 2 years, we find that ten times as high a percentage of women in the cancer series as in the control continued the lactation for over two years, a divergence unlikely to be an effect of mere random sampling.

It may therefore be concluded

- (1) that lactation for any period from 6 months to 2 years cannot be shown to have any detrimental effect on the breast in relation to the later development of cancer,
- (2) That such relationship as there may be between cancer of the breast and lactation would appear to be related either to absence of or to excessive lactation. This latter may perhaps be associated with some degree of injury produced by the strain of suckling older and heavier children.

The probable error has been worked out for the extremes in both series. The difference for the non-lactation cases is 7.2 ± 1.4 and for the excessive lactation 2.8 ± 1.6 , which suggests that the divergences are of definite significance. These questions are considered from a different aspect in Part V.

On Unilateral Lactation.

Certain authors dealing with antecedent histories of cases of cancer of the breast have pointed out that there were cases in which the women had fed a number of children entirely upon the breast which was afterwards affected with cancer.

The present material offered an opportunity to investigate

this further. In the schedule questions were set dealing with the breast used in each lactation. The question was answered in nearly every case, and it has therefore been possible to obtain information as to the detrimental effect or otherwise of unilateral lactation.

Transient mastitis and cracked nipples* do not seem to have had any appreciable deterrent effect upon breast feeding, and in these cases generally both breasts were used if lactation was practised. It is with puerperal mastitis with abscess formation and with deformities that the practice of using only one breast occurs with any frequency. In both these classes of cases recourse was not infrequently had to unilateral lactation.

For the present purpose it is unnecessary to separate the cancer and the control series. It will suffice to take out all the cases of unilateral feeding and to divide them into those cases where it was practised with the breast which afterwards developed cancer and those where no cancer developed. The data have been entered in the appropriate tables (Part III. Appendices 1-4 and 1A-4A) in every case where the information showed that unilateral lactation had been practised for the complete feeding of one or more children.

The results are shown in Table 34.

TABLE 34.

Showing the number of children fed by unilateral lactation.

Number of Children.	After Puerperal Mastitis. Cancer developed.		Owing to Deformity. Cancer developed.	
	Yes.	No.	Yes.	No.
1	2	5	0	1
2	0	3	0	5
3	0	0	1	1
4	0	2	0	2
5	2	1	2	0
6	0	0	0	0
7	0	0	0	1
8	0	0	1	0
9	0	0	0	0
10	0	2	0	1
12	0	1	0	0
	4	14	4	11

Unilateral Lactation was continued up to two years in one instance only. In the other instances it varied in duration from

* For details of these and of puerperal mastitis with abscess, the reader is referred to Part III.

four months to 14 months. In the majority of the cases the duration was from 9-12 months. The above table supplies no reason for believing that unilateral lactation predisposes to cancer of the breast.

Summary of Part II.

The following conclusions may be drawn from the data examined in Chapters 3-10 inclusive.

- (1) Certain minor differences are found between the history of menstruation in the two series. These are, however, insufficient to be regarded as forming any real divergencies between the two series.
- (2) The fertility of the cancer patients is definitely less than that of the control patients. This is a real divergence since it persists after taking into consideration such features as might in themselves tend to produce this condition.
- (3) Any connection between cancer of the breast and lactation lies in the absence of function or in the excessive use of the breast. Unilateral lactation does not appear to have any untoward influence in causing cancer of the breast so used.

PART III.

A Consideration and Comparison of the Family and Life-Histories (other than Reproductive) of the Women in Both Series.

The questions in the schedule quoted on p. 4 include many points relative to the general life-histories of the women. It was thought possible that the occupation of the patients might throw some light which would elucidate the increased mortality among widows and single women. This, as has been shown already in Chapter 2, has not proved to be the case, and the information as to occupation has been of value only in considering the probable social status of the women concerned.

The reproductive life-histories have been considered in detail in Part II.

There remain for consideration here, the family history for cancer, the previous general health of the patient, and any previous local breast trouble.

When the replies in the schedules came to be examined it was found that the data upon the first and last of these matters were full, and were suitable for use in the present report. The replies on the previous general health did not however, afford any information of value. Many of the women in both series had had no previous illnesses and others had suffered from a variety of complaints more or less all their lives. The data on this aspect have been left out as they showed no point of importance.

The family history for cancer is considered first, the histories of previous breast trouble being taken later.

CHAPTER 11.

The Family History for Cancer.

Much has been written upon the question of the inheritance of a tendency to cancer, but, so far as can be ascertained, it has been studied, for the human species, on cancer patients only. The present investigation afforded an opportunity of an extended inquiry into the occurrence of cancer in the families of non-cancerous women as well.

The problem is far from simple. In the first place few people seem to have accurate knowledge of the cause of death in relations

more remote than their parents. No real difference in this respect was observed in the women of the varied social classes represented among the patients forming the population for the present inquiry. There were women in all classes who were well aware of the causes of death in their grandparents, but these were the exceptions. Generally the cause of death of one or two of the grandparents was known: sometimes there was a vague knowledge that "they lived to a good age" but in very many instances the causes of death of the grandparents was quite unknown.

Apart from this difficulty it is doubtful how far the information, if available, would be of value. As soon as the immediate parents of the patient are passed the ramifications of relationships from the four grandparents renders possible the entrance into the family of hereditary tendencies from other families which it would be impossible to trace out. It was thought that a knowledge of the incidence of cancer among the brothers and sisters of the women might produce additional evidence which would be of assistance. Careful inquiry was made in all cases into the health of the brothers and sisters of the patients and the information in the schedules is fairly extensive. It is, however, too incomplete to offer reliable information. Some of the relations had gone to other countries while others are at great distances from the present abode of the patient. The brothers and sisters have drifted apart by force of circumstances and it is hardly known to one of them whether the other is alive or dead. If known to be dead the cause of death may not have been mentioned in the letter conveying the information, and, the cause of death being comparatively immaterial, no inquiry had been made by the relative. Further in a great many instances the brothers or sisters were still young at the time of the inquiry and deductions made on the assumption that they were free of cancerous tendencies might well be entirely erroneous.

For these reasons it was decided to concentrate attention on the causes of death of the parents only.

Table 35 shows the results of the investigation in actual numbers and Table 36 gives the percentages. Under the heading "probable cancer" are included cases of death from "intestinal obstruction," "stoppage," "tumour" of any part, "internal growth" and similar terms, which, while not excluding other causes, are commonly associated with cancer.

TABLE 35.

Showing the causes of death in the parents of the women of both cancer and control series.

Cause of Death.	Age at death.				
	Under 40.	40-60.	Over 60.	Un-known.	Total.
<i>Fathers. Cancer Cases.</i>					
Cancer	1	12	18	2	33
Probable cancer	0	5	8	0	13
Others—not cancer	29	106	210	18	363
Cause unknown	4	13	15	13	45
Still alive	0	5	49	0	54
	34	141	300	33	508
<i>Fathers. Control Cases.</i>					
Cancer	0	8	16	0	24
Probable cancer	0	2	2	0	4
Others—not cancer	31	119	198	14	362
Cause unknown	2	14	13	30	59
Still alive	0	5	54	1	60
	33	148	283	45	509
<i>Mothers. Cancer Series.</i>					
Cancer	2	18	25	1	46
Probable cancer	0	7	9	1	17
Others—not cancer	28	80	205	11	322
Cause unknown	4	7	18	7	36
Still alive	0	10	75	2	87
	32	122	332	22	508
<i>Mothers. Control Series.</i>					
Cancer	1	13	21	0	35
Probable cancer	0	2	3	0	5
Others—not cancer	30	94	224	1	349
Causes unknown	3	11	14	16	44
Still alive	0	4	71	1	76
	34	124	333	18	509
<i>All Parents. Cancer Series.</i>					
Cancer	3	30	43	3	79
Probable Cancer	0	12	17	1	30
Others—not cancer	55	186	415	29	685
Cause unknown	8	20	33	20	81
Still alive	0	15	124	2	141
	66	257	632	55	1,016
<i>All Parents. Control Series.</i>					
Cancer	1	21	37	0	59
Probable cancer	0	4	5	0	9
Others—not cancer	61	213	422	15	711
Cause unknown	5	25	27	46	103
Still alive	0	9	125	2	136
	67	272	616	63	1,018

TABLE 36.

Showing the percentages of deaths from cancer among the parents of the women of both cancer and control series, excluding and including those deaths from probable cancer.

	CANCER SERIES.		CONTROL SERIES.	
	Cancer only.	Cancer plus probable cancer.	Cancer only.	Cancer plus probable cancer.
A.				
1. Percentage on all fathers	6.5	9.05	4.7	5.5
2. Percentage on dead fathers	7.3	10.1	5.3	6.2
3. Percentage on fathers dying of known cause	8.07	11.2	6.2	7.2
4. Percentage as for 3 but over 40 years only	8.4	11.9	6.7	7.8
B.				
1. Percentage on all mothers	9.05	12.4	6.9	7.9
2. Percentage on dead mothers	10.9	14.9	8.1	9.2
3. Percentage on mothers dying of known cause	11.9	16.2	9.0	10.3
4. Percentage as for 3 but over 40 years only	12.3	17.1	9.5	10.9
C.				
1. Percentage on all parents	7.7	10.7	5.8	6.7
2. Percentage on all dead parents	9.02	12.4	6.7	7.7
3. Percentage on parents dying of known cause	9.9	13.9	7.5	8.7
4. Percentage as for 3 but over 40 years only	10.3	14.4	8.1	9.3

The probable errors of the percentages for A.4, B.4, and C.4, are found to be:—

	Cancer only.	Cancer plus probable cancer.
A.4 diff. =	1.7 ± 1.94 ...	4.1 ± 2.18
B.4 diff. =	2.8 ± 2.33 ...	6.2 ± 2.59
C.4 diff. =	2.2 ± 1.51 ...	5.1 ± 1.69

The differences for "cancer only" are not significant, but there appears to be a small real difference if the "probable" cases are added.

The percentage among the cancer patients are consistently somewhat higher than in the control series, but the differences are moderate in degree. It seems that the deaths from cancer are slightly higher among the mothers than among the fathers. This may, perhaps, be in part accounted for by the fact that there

are fewer unknown causes of death among mothers than among fathers. It may also be a small though real difference.

The figures as given here hardly support any theory of well-marked hereditary tendencies. It should, however, be mentioned that there are in the series a few instances where a high proportion of the members of a family fell victims to cancer. There appear to be some families, in which for reasons not certain at present, cancer plays havoc with the members, and there is slight evidence in some instances that it attacks the same organs. Although the families are not numerous their histories make a profound impression upon the mind. The figures in Tables 35 and 36 by no means exclude at any rate some degree of hereditary tendency.

It seems desirable to indicate the limitations of the data available in the present inquiry somewhat more fully, and to point out that they are not of a nature either to prove or to disprove the inheritability of cancer.

Slye (Journ. of Cancer Research, 1922, VII., 107 *et seq.*) insists on the absolute inheritability of cancerous and non-cancerous tendencies in mice in conformity with the Mendelian laws. She also points out, quite justly, that inherited characteristics cannot be demonstrated in animals whose ancestry in regard to the biological property under investigation is unknown.

But this is the position in an inquiry such as the present one—the characteristics of the stock are almost unknown. Owing to the absence of any deliberate biological selection in mating among the human species, as well as to the lack of knowledge of the cause of the deaths of relatives more remote than parents, it is impossible to trace effectively by the method adopted here, the presence or absence of the working of the laws of inheritance.

Slye (Journ. of Cancer Research, 1921, VI. 139) says, "The human strain has never been even partially analysed and no right conclusions regarding heredity can be drawn except from analysed strains." And (Journ. of Cancer Research, 1922, VII, 107.) "The heterozygotes in the human cancer problem have been the individuals who have blinded the reader of cancer statistics to the fact of the inheritability of human cancer, hiding (as they do) the recessive (cancer) behind the dominant appearance, which is appearance only."

This is not the place to discuss the biological justification of Slye's hypothesis, and in any case we have no means of ascertaining whether the parents of the women in either the cancer or the control series were or were not "dominants" (non-cancerous) or "heterozygotes" (mixed cancerous and non-cancerous), or "recessives" (cancerous).

It has already been mentioned that some families show a high mortality from cancer among its members, although all do not succumb to the disease. These might possibly be accounted for in theory on the supposition that there had been a mating tending

to produce pure recessives. There is, however, no proof or disproof of such a proposition.

The schedule also provided for information as to the occurrence of tuberculosis in the families of the women of both series. The same criticisms as have been already made apply here, and need not be repeated. As a matter of interest the figures were taken out, and are shown in Table 37. The lesion was pulmonary in all cases, where the site of the disease was stated.

TABLE 37.

Showing the number of parents dying of phthisis in both series.

	CANCER SERIES.		CONTROL SERIES.	
	Fathers.	Mothers.	Fathers.	Mothers.
Under 40... ..	10	5	11	11
40 to 60	19	14	14	10
Over 60	2	3	2	2
Age Unknown	1	1	0	0
	32	23	27	23

CHAPTER 12.

Previous Breast Troubles in the Patients of Both Series.

A number of questions on the occurrence of previous breast troubles appear in the schedules. These were designed primarily to ascertain such divergences in incidence as there might be between the women in the two series. It seemed possible that if any marked difference was found it might afford some indication for the causes of the development of cancer, or if there proved to be no divergence, it might then be assumed that the kind of trouble under consideration had little or no relation to the subsequent development of the growth.

Three main groups of antecedent trouble can be distinguished in both series:—

- (1) Those associated with lactation.
- (2) Developmental or functional errors.
- (3) Injuries of various kinds.

The groups are not entirely independent since certain women suffered from troubles in more than one group. A further number had some definite pathological condition in addition to one or other of the above conditions. The pathological conditions are dealt with in Part V.

The first and third groups need further division and three sub-groups have been taken in each of these. Thus under group (1) we have:

- (a) Acute suppurative mastitis associated with lactation.
- (b) Acute non-suppurative mastitis, or "transient mastitis."
- (c) The condition commonly termed "cracked nipples."

Under group (3) the injuries have been sub-divided into:

- (a) Injury associated with damage to the tissues as exemplified by the occurrence of bruising.
- (b) History of injury when either no bruising was looked for or none occurred, and
- (c) Repeated slight injuries occurring over a number of years.

All the above—in all seven—varieties of troubles occurred also among the women of the control series so that it is necessary to consider the incidence among both cancerous and non-cancerous patients.

It was recognised at the outset that, in the event of any divergence between the two series showing a higher incidence among the cancer series, objections might fairly be raised on psychological grounds. It is evident that a woman who has suffered from a trouble so serious as to require the removal of the breast and the surrounding tissues will be likely to search in her memory for some antecedent causative agent, or event.

The main error, if it arises, will be among the cancer patients. It will scarcely be contended that the control patients—cases taken almost at random and without warning—will have been likely to exaggerate some antecedent breast trouble, unless it were among those few control cases who were suffering from some non-cancerous breast condition. While therefore there may be a slight increase of the previous breast troubles in the cancer series there may also be a small reduction in the control series, owing to the lack of recollection. It is shown in Table 40, p. 81, that the mean interval stated to have elapsed between the injury and the detection of the growth is less than in the other antecedent breast troubles: hence the recollection of the patients should as a whole be more accurate.

It is not contended that some degree of error may not be present especially among certain of the troubles, but the strict precautions which were taken both in the form of the questions and in the elimination of doubtful statements have, it is believed, made the data substantially correct. The details of the precautions taken in relation to each group are given in dealing with the group concerned. In the first instance, tables were prepared setting out a number of the points relating to each case which fell under one or other of the above headings. Certain difficulties at once appeared which must be mentioned.

It was found that among the cancer patients (the position evidently does not arise among the control patients) there were

some in whom the growth had developed later, in the breast which had not been affected by any previous trouble, while the one affected had remained free of growth. Again, in other cases both breasts had been affected by the trouble concerned but only one had become cancerous. In the control series there were a number of women who had had both breasts affected. Evidently some method had to be devised which would take account of these matters.

Other points also required consideration apart from the actual antecedent trouble itself. Among them were the interval which had elapsed between the trouble and the growth, the family history of the patient, the civil state and so forth.

Further there was the difficulty already briefly referred to, arising from the fact that certain women had suffered from more than one variety of antecedent trouble. Thus among the cancer patients there were 34 where the breast had been affected by two different kinds of trouble, and 4 cases with three different kinds of trouble. Among the control patients there were 15 with two and three with three different kinds of trouble.

After repeated unsuccessful attempts to devise a simple method of showing the relationship of these various matters to one another it was decided to give, first of all, a statement showing the incidence of the troubles as a whole without regard to the number of women but having regard to the breast affected. This is shown in Table 38.

TABLE 38.

Showing the number of instances of the occurrence of the various antecedent breast troubles mentioned above.

Nature of Trouble.	No. of cases in CANCER SERIES.				No. of cases in CONTROL SERIES.		
	Same side as Cancer	Both Breasts	Opposite Breast to Cancer	Total	One side	Both Breasts	Total
1. Acute suppurative mastitis	20	5	12	37	44	5	49
2. Acute non-suppurative mastitis	18	5	3	26	9	0	9
3. Cracked nipples	6	8	2	16	14	1	15
4. Deformity or abnormality	20	10	4	34	2	10	12
5. Injury with bruising	41	0	2	43	9	1	10
6. Injury but no known bruising	95	0	0	95	18	0	18
7. Repeated slight injury	41	0	0	41	5	0	5
Totals	241	28	23	292	101	17	118

In order to find the total number of women affected in each series we must deduct $34 + 8 = 42$ from the total of 292 in the cancer series, to allow for those having two or three troubles: also $15 + 6 = 21$ should be deducted from the total in the control series.

CANCER SERIES. CONTROL SERIES.

Hence there were:—

Women with breast trouble	$292 - 42 = 250$	$118 - 21 = 97$
Total women	508	509
Percentage having breast trouble...	$= 49.2$	$= 19.1$

Table 38 while interesting in itself does not offer any accurate estimate of the relative frequency of the incidence of the various troubles in the two series. There are two reasons for this. In the first place it does not afford a method of allowing either for those cases where more than one trouble fell upon the same breast, or where the breast affected later with cancer was not the one affected with the antecedent trouble. In the second place it does not offer an exact comparison of numbers of women seeing that only the women who had had children can fall for consideration under any of the first three sub-divisions which are concerned only with lactation. The presentment is therefore inexact.

It has not been found possible to devise a simple method which would meet all three points of difficulty just mentioned. But one has been devised which meets the two most important ones, namely the numbers of the women and the affection of the opposite or of both breasts. The occurrence of more than one antecedent trouble has been allowed to stand and the numbers dealt with are therefore, as already explained, slightly too high in both series, namely, there are 42 more troubles than breasts affected in the cancer series and 21 more troubles than breasts affected in the control series.

The resulting error is however, insufficient to affect the general deductions by the method about to be described.

The method which seemed to meet the other difficulties satisfactorily has been arrived at by taking breasts and not women into consideration. All the women of both series are considered together and the breasts divided into four main groups for each of the antecedent troubles named above.

These four groups are:—

- A.—Trouble positive and cancer positive.
- B.—Trouble positive and cancer negative.
- C.—Trouble negative and cancer positive.
- D.—Trouble negative and cancer negative.

The following schema shows the method of calculation.

Trouble under consideration.	Cancer positive	Cancer negative.	—
Positive ...	A	B	Then— $\frac{A \times 100}{A + B} =$ Percentage of breasts affected which became cancerous.
Negative ...	C	D	$\frac{C \times 100}{C + D} =$ Percentage of breasts not affected which became cancerous.
	A + C	B + D	

This schema is used below for each variety of trouble in order as given above.

GROUP (1).

Troubles associated with lactation.

It seems hardly likely that any appreciable error arises in this group over the antecedent histories of the patients of either of the series. The questions put were detailed and the answers largely unequivocal. In very few cases was there any hesitation on the part of the woman as to the occurrence of any of these troubles. She nearly always remembered at once both the nature of the trouble and the lactation with which it was associated.

Further the fact that in the cancer series there are a number of instances in which the breast which was not cancerous was stated to have been the one affected suggests that the statements were accurate.

In making comparison of the incidence in relation to the subsequent development of cancer in the cases of this group, it is necessary to take account of the number of women available for comparison in the two series.

Among the 508 women in the cancer series,

116 were single and
59 were married but had no children

hence 175 must be excluded from the possibility of any lactation troubles.

There remain therefore 333 women or 666 breasts for consideration.

Among the 509 women in the *control series*,

87 were single and
53 were married but had no children

hence 140 must be excluded from the possibility of
lactation troubles.

There remain therefore 369 women or 738 breasts for
consideration.

These numbers hold throughout the whole group, through
all three sub-groups. These can now be taken separately and
considered in accordance with the schema on p. 67 and using the
figures of Table 38.

SUB-GROUP (A).

Acute suppurative mastitis associated with lactation.

In almost all cases the abscess occurred in the early days
of lactation, so that for the sake of brevity the term puerperal
mastitis may be used, it being expressly understood that there
was an abscess in all cases. No case in which there might have
been the slightest doubt of the occurrence of an abscess was placed
in this division. That is, there must have been a definite state-
ment that the abscess has either been opened by a doctor, or that
it had burst and discharged itself either spontaneously or after
treatment at home. If there was any doubt at all the case was
placed under the next group of transient mastitis. In fact there
was only one case where there was any doubt at all, the answers
being perfectly clear in all other cases.

If we now apply the schema we get the following figures for
puerperal mastitis.

1. *Cancer Series*.—Abscess same side as cancer 20 cases.
- Abscess both sides 5 "
- Abscess on opposite side .. 12 "

Hence there were 42 breasts affected with puerperal mastitis,
of which 25 were afterwards affected with cancer, and 17 were
not.

But there were in all 333 cancerous breasts under consideration
(as well as 333 non-cancerous ones among the cancer patients)
so that there were 333-25 breasts or 308 breasts which developed
cancer without having been affected by puerperal mastitis.

And there were 333-17 or 316 breasts which had a negative
history for both cancer and puerperal mastitis.

2. *Control Series*.—Abscess on one side .. 44 cases.
- Abscess on both sides .. 5 "

Hence there were 54 breasts affected with puerperal mastitis

which did not develop cancer, and 738-54 breasts or 684 which were
negative to both cancer and puerperal mastitis.

We have therefore that A equals 25.

B ,, 17 + 54 or 71.

C ,, 308

and D ,, 316 + 684 or 1,000.

The schema therefore stands:—

Puerperal Mastitis.	Cancer Positive.	Cancer Negative.	Totals.	—
Positive	25	71	96	or 26.0 per cent. became cancerous.
Negative	308	1,000	1,308	or 23.5 per cent. became cancerous.
Totals	333	1,071	1,404	

The percentage of breasts having suffered from puerperal
mastitis before the onset of cancer is scarcely greater than those
which had not so suffered. The figures would be approximately
equal if 10 more breasts which did not become cancerous had
suffered from puerperal mastitis. It is admitted that there may
be slight error in the histories but all things considered it seems
unlikely that there is any marked difference between the number
of breasts which became cancerous with and without previous
puerperal mastitis. In other words there is no evidence to support
a view that previous puerperal mastitis has any relation to
the subsequent development of cancer.

It was thought possible that the presence of a persistent nodule
in the scar for some time after the abscess might have an effect.
The figures were taken out for both the series, with entirely
negative results. The same remark applies to the question of
subsequent use of the same breast for feeding.

Full details of all the cases in both series are given in the appen-
dices. Appendix 1 contains those for the cancer series and
Appendix 1A for the control series.

SUB-GROUP (B).

Acute non-suppurative mastitis associated with lactation, or transient mastitis.

Adopting the same process as for puerperal mastitis the figures
for this sub-group become

- Cancer Series*.—Breast affected on same side 18
- ,, ,, on both sides 5
- ,, ,, on opposite side 3

Control Series.—Breast of one side 9
 „ of both sides 0

Hence we have A equals 23 (31-8).

B „ 8 + 9 or 17.
 C „ 333-23 or 310.
 D „ 333-8 (or 325) + 738-9 (or 729) or
 together 1,054.

The schema becomes :—

Transient Mastitis—	Cancer positive.	Cancer negative.	Totals.	—
Positive	23	17	40	or 57.5 per cent. became cancerous.
Negative	310	1,054	1,364	or 22.7 per cent. became cancerous.
Totals	333	1,071	1,404	

The difference is found to be 34.8 ± 7.9 which is many times beyond the limit of probable error.

Hence the proportion of breasts which became cancerous after having suffered from transient mastitis is more than twice as great as that which became cancerous not having so suffered.

Here again we must consider the possibility of error in the histories. It is far from unlikely that some minor cases of this trouble may have escaped the memory of the women concerned. This is more probable among the control patients although there is no evidence whatever in support of this in either series. Supposing, however, that there had been lapses of memory on the part of the control patients it is interesting to see to what extent it would need to have taken place in order to equalise the figures. It is found that 61 women would need to have forgotten its occurrence in order to render the percentages equal.

This is a figure which can hardly be regarded as falling within the errors of an investigation like the present which has been carefully carried out, and on analogous lines for both series.

It seems hardly possible to deny some relationship between the previous occurrence of transient mastitis and the subsequent incidence of cancer. Details of the cases for both series are given in Appendices 2 and 2A respectively. Reference to those notes suggests that, in the cancer series especially, the trouble (although acute at first) was often prolonged and that after the subsidence of the acute inflammation a further period

of some weeks or longer elapsed before the breast became again even apparently normal. Involution appears to have been always slow and perhaps not always complete even after a long time (cp. Part V.).

The notes on the puerperal mastitis cases on the other hand suggest that as a whole the abscess having finished discharging, healing was usually satisfactory even though there might have been a small residual nodule in the scar. In the transient cases there is often a history of nodules remaining in the breast tissue itself.

It is possible that one is here dealing with a different kind of attack from the frankly suppurative attack of puerperal mastitis with abscess. The data offer no information on this point which is also somewhat outside the matter immediately under consideration, but is referred to again in Part V.

If reference be made to the appendices relating to this trouble, it will be seen that there are five cases in the cancer series in which injury was noted at some period after the attack of transient mastitis, and one case in which there was already a lump in the breast which had been there for 11 years before the attack. Also one case in each series had a deformity of the nipple. In view of figures given later on these points it seemed necessary to calculate the percentages, leaving out of consideration all these cases entirely. If this is done the percentages become 53.3 and 23 per cent. which does not alter the general position.

Efforts were made to ascertain whether there was a relation between the use of the breast in a later lactation and cancer. The numbers are small, and in order to make any comparison it is necessary to divide them into several classes so that the figures become so divided as to be entirely meaningless. So far as anything whatever was shewn the results were negative as to any effect of later lactation.

SUB-GROUP (c).

Cracked Nipples.

It seemed possible that a lesion of the skin of the nipple might be the means of admitting some irritant and might cause an inflammatory or irritating condition which would lead to a later development of cancer in the affected breast. Hence the instances of cracked nipples were taken out in the same way as for the attacks of mastitis. Actually the number of attacks recorded in the notes is smaller than might be anticipated. It is possible that minor attacks were not remembered, although the pain and discomfort probably helps to keep the memory of the occurrence in the patient's mind.

Only two of the cases in the cancer series were associated with inflammatory conditions—one with an abscess and one without. In the control series two cases were associated with abscess formation. Details are given in Appendices 3 and 3A.

Applying the figures in Table 38 and making the schema we get

A equals 24-10 or 14.
 B ,, 10 + 16 or 26.
 C ,, 333-14 or 319.
 D ,, (333-10) or 333 + (738-16) or 722=1,045.

Cracked Nipples.	Cancer positive.	Cancer negative.	Totals.	—
Positive	14	26	40	or 35.0 per cent. became cancerous.
Negative	319	1,045	1,364	or 23.4 per cent. became cancerous
Totals	333	1,071	1,404	

Difference = 11.6 ± 7.6.

The divergence between the subsequent development of cancer in breasts which had and which had not been affected with cracked nipples is not very large, and not statistically significant.

As a whole the data given for the three groups of troubles associated with lactation suggest that there is no association between either previous puerperal mastitis with abscess formation or cracked nipples and the subsequent development of cancer. But as shown by the method adopted here, there is a definite association between attacks of non-suppurative mastitis associated with lactation in which involution may have been slow or imperfect and cancer.

It might be considered that in dealing with matters relating to lactation the number of children, *i.e.* the possible total number of lactations, should be considered rather than the number of breasts. But this adds appreciably to the difficulties of assessing the incidence in relation to cancer. Some of the women had several attacks of trouble during their lactations but the relationship to the subsequent development or not of cancer can evidently only be assessed on the fact of attack; the cancer having supervened it is impossible to say whether it was due to a single attack or to its repetition.

The general prevalence of attacks of puerperal mastitis among the population concerned in this investigation can be ascertained by taking the total number of attacks of acute mastitis and the total number of pregnancies.

In this case seeing that the number of abscesses are taken on all the women and not merely on those who had passed the menopause it is necessary to know also the number of total pregnancies

among all the women in the two series. This number has been found, and the number of abscesses taken out from Appendices 1 and 1A.

We get then:—1,337 children born to all the married women in the cancer series, and
 1,905 to those in the control series.

Also 42 total abscesses in the cancer series, and 49 in the control.*

Hence the incidence of puerperal mastitis in the cancer series was 3.1 per cent. and in the control series 2.6 per cent. The general incidence as shown on the combined figure is 2.8 per cent. The figure is between that of 6 per cent. given by Winkel (*Die Pathologie und Therapie des Wochenbettes*, Berlin 1878) and by Whitridge Williams (*Obstetrics*, 1906, p. 811), who considers 1 per cent. a reasonable figure. There is perhaps some difference in the class of cases concerned. There may be less mastitis in hospital practice from which Whitridge Williams' figures may be taken. The present figures are mixed but probably the majority of the confinements took place at home and a considerable proportion of the abscesses did not receive any medical treatment whatever.

The incidence of non-suppurative mastitis worked out on the same basis gives 2.8 per cent. as the figure for the cancer series and 0.6 per cent. for the control series.

GROUP (2).

Structural and functional abnormalities of the breast.

The details of all such cases occurring in either series are given in Appendices 4 and 4A respectively. In this group all the women in both series require to be included, although by including the single and childless married women it is probable that some degree of error is introduced. Later considerations seem to indicate that the error is not great. It is evident from the notes that a few of the abnormalities were discovered only at the first lactation, so that doubtless a few more would have been discovered had all the women passed through this phase. This applies more, perhaps, to the women of the control series. Case No. 14 in Appendix 4, where the abnormality was first discovered on pathological examination, may be regarded as exceptional.

Abnormalities of function have been included as being quite as likely to be associated with the subsequent development of cancer as abnormalities of structure. They are infrequent in the present material, numbering five in the cancer series and one only in the control series.

* Simultaneous attacks on both breasts have been counted as one, but each repeated attack has been counted separately.

For this group we have 1,016 breasts in the cancer series—508 cancerous and 508 non-cancerous.

In the control series we have 1,018 breasts all non-cancerous.

Applying the schema and the data in Table 38 we have :

Cancer Series.—Same side abnormal .. 20 cases.
 Both sides ,, .. 10 ,,
 Opposite side ,, .. 4 ,,
Control Series.—One side abnormal .. 2 cases.
 Both sides ,, .. 10 ,,

Hence A equals 30.

B ,, 14 + 22 = 36.

C ,, 508 - 30 or 478.

D ,, (508 - 14) + (1,018 - 22) or 1,490.

and the schema stands as below :—

Structural or functional abnormality	Cancer positive.	Cancer negative.	Total.	
Positive ...	30	36	66	or 45.45 per cent. became cancerous.
Negative ...	478	1,490	1,968	or 24.29 per cent. became cancerous.*
	508	1,526	2,034	

The difference is found to be 21.16 ± 6.19 , and is probably significant.

It is shown in Appendix 4 that histories of injury to the breast afterwards affected with cancer occur in 6 instances and that, in addition, one was affected with transient mastitis. The association of this last with cancer was shown to be closer than either of the other troubles connected with lactation. It is also shown below that there is probably a close association between injury and the subsequent development of cancer. If for the moment we suppose that these factors had a closer association with cancer than the abnormality we may omit those seven cases and regard them as lacking in abnormality. There is, however, still a considerable divergence, although it is reduced. The percentages become respectively 39.0 and 24.6.

Taking the figures in the schema it is found that some 56 more cases of abnormality among the non-cancerous breasts would be required, to equalise the percentages. Although there are, as

* If the functional abnormalities be excluded the percentages become 43.9 and 24.3 respectively.

already indicated, some sources of systematic error in the data, it seems unlikely that they account for this discrepancy. About 400 of the control cases were examined either by the observers or by some member of the staff of the hospitals concerned. In order to make the numbers equal it would mean that in the 100 not examined there must have been either 28 cases of bi-lateral or 56 cases of unilateral abnormality, which is an unlikely supposition.

Another method of ascertaining the possible degree of the error is to take out the figures on the same basis as for lactation, omitting entirely all single or childless married women.

There are five single women with abnormalities on one side in the cancer series and none in the controls. If these be omitted and the breasts reckoned as for the lactation troubles we get :

A equals 25
 B ,, 37
 C ,, 308
 D ,, 1,034

and the percentages become 40.3 and 23.0 respectively.

Deformity or structural abnormality.	Cancer positive.	Cancer negative.	Total	—
Positive ...	25	37	62	or 40.3 per cent. became cancerous.
Negative ...	308	1,034	1,342	or 23.0 per cent. became cancerous.
	333	1,071	1,404	

Difference = 17.3 ± 6.33 .

These scarcely differ in degree of divergence from the original ones.

It is probable, therefore, that there is an association between the presence of some structural or functional abnormality and the subsequent development of cancer.

GROUP (3).

Antecedent injuries to the breast.

Great care has been exercised in sifting the material which is considered in this group. It appeared not unlikely that patients suffering from cancer of the breast are liable to imagine as a result of deliberation that they have had an injury to the breast. It is difficult for anyone to remember accurately at short notice, and

even without any haste memory is admittedly often defective. But there are certain outstanding points which are usually remembered and on which it is unlikely that there would be much inaccuracy.

In taking the histories of antecedent breast injury the occurrence of bruising was carefully inquired into. It is necessary to assume that there is no deliberate intention to make false statements on the part of the patient, and that information of a simple kind not likely to have been dwelt upon by the patient would probably be stated correctly. It was considered that if the injury had been at all severe there would have been bruising as shown by discoloration of the skin. Further, the patients were unlikely to have devoted special thought to the presence or absence of discoloration, so that the reply would probably be reasonably reliable. In fact, it appeared that the patients had rarely attributed any importance to this point. Many who gave a history of injury said that they had never thought of looking for discoloration although nearly all had felt the spot which was painful after the injury. Hence it is believed that the cases in which a definite discoloration of the skin was noticed may be taken as genuine instances of injury.

It was accordingly decided to divide the histories of definite injury into two classes—those with and those without bruising. Further, there were a number of instances in which there was a history of repeated slight injury extending over many years. In all, therefore, three sub-groups of injuries:—

1. Those in which there was a definite history of injury with bruising.
2. Those in which there was a history of injury, but in which either no bruising had been looked for or none had been seen.
3. Cases of repeated slight injury.

There were also a considerable number of histories where the details were lacking or were indefinite; a further small number also in which the history of a rather vague injury to the breast not affected was noted. For the most part these were not held to be sufficiently reliable for inclusion except in two cases of injury to the opposite breast with bruising. There was no history of bruising in any of the cases omitted.

Care was also taken to ascertain whether a lump was already present at the time of the injury, and if not at what period afterwards the lump was first felt. All instances in which a lump was felt at the time of injury have been taken as negative to injury. Any lump felt was regarded as cancerous and the injury was neglected. With these stringent precautions it is believed that the cases of injury with bruising are in fact histories of antecedent injury to the breast.

SUB-GROUP (A).

Histories of injury with bruising.

We may at once proceed to work out the schema with the aid of the figures given in Table 38. We then get:—

Cancer Series.—Injury to same side as growth .. 41 cases.
 Injury to opposite side as growth .. 2 „

Control Series.—Injury to one side 9 cases.
 „ both „ 1 „

Whence A equals 41

B „ 13

C „ 508-41 or 467

D „ (508-2) + (1,018-11)=1,513.

and the schema becomes

Injury with bruising.	Cancer positive.	Cancer negative.	Totals.	—
Positive	41	13	54	or 75.9 per cent. became cancerous.
Negative	467	1,513	1,980	or 23.6 per cent. became cancerous.
Totals	508	1,526	2,034	

The difference= 52.3 ± 5.90 .

The divergences shown between the two sets of figures is far greater than its probable error, and it seems apparent that it denotes a definite association between injury and the subsequent development of cancer of the breast. (The subject is considered further in Part V.).

SUB-GROUP (B).

Injury without bruising—either absent or not looked for.

It is clearly under this heading that the greatest error might be expected, hence the sifting has been very severe, all doubtful cases having been omitted. Before proceeding to a consideration of these cases it is necessary to say a word upon those falling into the control series. The position is considered in Part V. but cannot be omitted entirely here. Among the 18 cases of injury in

the control series (Appendix 6A) there are 8 cases in which a lump developed and which was attributed to the injury by the patient. All these lumps were operated upon and the findings are of interest.

In three cases the clinical diagnosis was cancer, and the complete operation was performed.

- 1 case was found to be tuberculous.
- 1 was said to be a cyst.
- 1 was "believed to be non-malignant."

In one the nature of the operation was doubtful and there is no note as to the clinical diagnosis. There was at least an amputation of the breast and the operation may have been complete. The *Pathological Report* showed "much hyperplasia of the epithelium."

In one the breast and axillary contents were removed. *Path. Rept.* gave "chronic mastitis" with inflammatory changes in the axillary glands.

In one there was "amputation of the mamma." *Path. Rept.* "fibro-adenoma." The opposite breast developed a lump five years later which was also stated to be "fibro-adenoma."

In two cases the lump was removed elsewhere some years previously to the interview but was stated in each case by the patient to have been a cyst. One of these patients was in hospital for the removal of an ovarian cyst and the other had had a hysterectomy for "chronic metritis" and also had a lipoma removed from the abdominal wall.

Details of these cases are given in Appendix 8, and the references to the numbers in that appendix are given in Appendix 6A.

It does not appear that whole sections of the breast were cut in any of the cases and the pathological report is lacking entirely in two of them. Seeing that six of the cases were in hospital for the removal of the lump at the time of the interview no later history is known. Hence it does not seem reasonable to exclude altogether the possibility of cancer. It was however, decided to accept the pathological report as the criterion for the differentiation of cancerous and non-cancerous lumps in the breast; these have therefore been placed in the control series. They are of considerable interest as indicating that there is also an association between injury and the development of the various forms of "chronic mastitis," and of tubercle.

Taking the schema and the figures in Table 38 we get:—

Cancer Series. Injury to one side 95 cases
Control Series. Injury to one side 18 cases

Hence A equals 95.
 B " 18.
 C " 508-95 or 413.
 D " 508+(1,018-18)=1,508.

and the schema becomes

Injury without Bruising.	Cancer positive.	Cancer negative.	Totals.	—
Positive	95	18	113	or 84.1 per cent. became cancerous.
Negative	413	1,508	1,921	or 21.5 per cent. became cancerous.
Totals	508	1,526	2,034	

The difference = 62.6 ± 3.57 .

The percentages here are scarcely more divergent than in the previous schema where it was believed that error had been rendered negligible. Hence it seems probable that the error here is small and that there is a close association here also between the injury and the subsequent development of cancer.

SUB-GROUP (c).

Repeated slight injury.

Here again all doubtful cases have been omitted and only the histories which appeared definite allowed to stand. The nature of the injuries is given in Appendices 7 and 7A.

By the same procedure as before we get:—

A equals 40.
 B " 5
 C " 508-40 or 468.
 D " 508+(1,018-5) or 1,521.

Hence

Repeated Slight Injury.	Cancer positive.	Cancer negative.	Totals.	—
Positive	41	5	46	or 89.1 per cent. became cancerous.
Negative	467	1,521	1,988	or 23.5 per cent. became cancerous.
Totals	508	1,526	2,034	

Difference = 65.6 ± 4.7 .

The divergence here is somewhat greater than in the cases of injury with bruising. There the cases which became cancerous

after injury were $3\frac{1}{2}$ times as numerous as those which became cancerous without injury, while here the proportion is $3\frac{1}{2}$ almost exactly. It is not intended by this remark to suggest that the figures denote a numerical relationship between the antecedent trouble and the subsequent development of cancer. It is however, believed that the degree of divergence affords an indication of the magnitude of this tendency.

The percentages obtained in this chapter are summarised in Table 39, further comment on them being reserved till Part V. of this report.

TABLE 39.

Giving a summary of the percentages of breasts which became cancerous following some antecedent trouble as compared with those which became cancerous without any such history.

Nature of Antecedent Trouble.	Percentage with Previous Trouble.	Percentage without Previous Trouble.
Suppurative puerperal mastitis	26.0	23.5
Transient (non-suppurative) mastitis	57.5	22.7
Cracked nipples	35.0	23.4
Structural or functional abnormality	45.45	24.3
Injury with bruising	75.9	23.6
Injury without known bruising	84.1	21.5
Repeated slight injury ...	89.1	23.5

The possible relations of some of the above troubles to the pathological findings is discussed in Part V.

The Civil State of the Women.

A point which it appeared might be of interest in the histories of antecedent troubles was that of the *civil state* of the women. This has therefore been taken out for each class of injury. There is no object in taking out the civil state for any of the other classes since there are no single women in the first three lactation classes and the information as to the occurrence of abnormalities in single women is believed to be slightly incomplete. The percentages for the three classes added together are as follows:

—	Married.	Widowed.	Single.
Percentage for cases now considered	54.2	23.5	22.3
Percentage for whole cancer series... ..	57.5	19.7	22.8

The divergencies are small and probably without significance. It may however be mentioned that the number of single women is rather higher among the cases of repeated slight injury than in the other classes. The civil state has been shown for this class of cases in the appendices concerned (7 and 7A). Among the cancer cases there are 12 single women out of 41 making a percentage of 29.3 which is definitely greater than the general percentage of single women in the series.

It is possible that single women are rather less careful in respect of constant injury to the breast than are married women. The figures here given are too few to do more than suggest that this may be a possibility.

The Mean Interval which had elapsed between the Occurrence of the Trouble and the development of the growth.

It seemed advisable to investigate the interval which had elapsed between the occurrence of the trouble and the appearance of the growth. In the first place it seemed that certain classes might show a very different interval from others, as is the case. Also in the control series it was desirable to take out the interval between the trouble and the date of the interview so as to see whether the control cases were really an effective control in this respect.

This has been done and the results are shown in Table 40.

TABLE 40.

Showing the mean intervals which had elapsed between the trouble and the growth (or the interview in the control series).

Nature of Trouble.	CANCER SERIES. Mean No. of Years.	CONTROL SERIES. Mean No. of Years.
Puerperal mastitis	22.0	25.5
Transient mastitis	17.2	18.9
Cracked nipples	18.4	25.5
Injury with bruising	6.75	14.0
Injury without bruising ...	4.4	12.0

The mean duration is very much less in the cases of injury than in any other class.

Further the table shows that the control series is an effective control seeing that the mean intervals are in each instance longer than those of the cancer series.

Reference has already been made to the *occurrence of more than one antecedent trouble* in the same breast. The exact details are given in the appendices (1-7) which relate to this section of the report. It seemed of interest however, to set out in tabular

form the associated troubles in both series. This is shown in Table 41.

TABLE 41.

Showing the associated troubles in cases where more than one was experienced in the same breast. [The figure at the point where the vertical and horizontal columns meet shows the number of cases having the associated troubles concerned.]

A. CANCER CASES.

	Puerperal Mastitis	Transient Mastitis	Cracked Nipple	Deformity or Abnormality	Injuries	Total
Puerperal Mastitis	—	1	0	2	9 ¹	12
Transient Mastitis	1	—	0	1	5	7
Cracked Nipple	0	0	—	1	3	4
Deformity, etc.	3	1	1	—	6 ²	11
	4	3	1	4	23	34

¹ Three of these women also had a cracked nipple.

² One of these women also had transient mastitis.

B. CONTROL CASES.

	Puerperal Mastitis	Transient Mastitis	Cracked Nipple	Deformity, etc.	Total
Puerperal Mastitis	—	0	1	1	4 ³
Transient Mastitis	0	—	0	1	0
Cracked Nipple	0	0	—	1	3
Deformity, etc.	2 ⁴	1	0	—	1
	2	1	1	3	8

³ One of these women also had a deformity.

⁴ Each of these women had also had a cracked nipple.

The Family History for Cancer.

It seemed also advisable to take out the deaths from cancer among the parents of the patients concerned in the present chapter. It is not believed that it is of great importance since the information obtained is insufficient, as has been explained above.

If the tendency to cancer is hereditary then it seems reasonably certain that there must be a wide dispersion of heterozygotes among the general population and the patients under consideration are a mixed and quite random sample of dominants, heterozygotes and recessives. The figures, for what they may be worth, are shown in Table 42.

TABLE 42.

Showing the number of parents of the patients concerned in this part of the report who died of cancer.

Nature of Antecedent Trouble.	CANCER SERIES.			CONTROL SERIES.		
	Number of Parents who died of cancer.	Total number of Parents.	Percentage of all.	Parents dying of cancer.	Total Parents.	Percentage of Total.
Puerperal Mastitis	8	74	10.8	10	98	10.1
Transient Mastitis	3	52	5.8	1	18	5.5
Cracked Nipples	4	32	12.5	2	30	6.7
Deformity or abnormality	8	68	11.8	3	24	12.5
Injury with bruising	10	86	11.6	2	20	10.0
Injury without known bruising	15	190	7.9	2	36	5.5
Repeated Injury	10	82	12.2	1	10	10.0
	58	584	9.9	21	236	8.9
Deduct three who occurred twice	3	6	—	3	6	—
	55	578	9.5	18	230	7.8

Among the women were three in each series who had one parent who died of cancer and who themselves had more than one trouble so that these appear twice in the table. It seems best to leave them in the general table and to deduct them from the final total. It will be seen that the figures are small and the percentages for that reason unreliable. The final results show less divergence than those which are shown in Tables 35 and 36 for the whole series.

Summary of Part III.

The following conclusions may be drawn from the data examined in this part of the report.

1. That no important hereditary tendency to cancer is shown by the data, but it may be questioned whether the material is suitable for its demonstration, if it exists.
2. That a relationship can be shown between the nature of the antecedent breast troubles and the supervention of cancer.
3. That the closest relationship appears to exist between injury and cancer, the next closest associations being furnished by structural and functional abnormalities, and transient inflammatory conditions which last seem frequently to lead to delayed involution after lactation.
4. The intervals which had elapsed since the trouble are considered, and it is shown (a) that the control cases have a longer mean interval than the cancer patients, and (b) that the shortest mean intervals occur between injuries and the development of the growth.

PART IV.

In this part of the report a study is made of the conditions under which patients present themselves for operation, *e.g.*, the stage of the disease at which surgical aid is sought and the method of making application for treatment.

The object was to set out such data as are offered by the present material on these points. The figures are not applicable without reserve to the country as a whole and are in part only applicable to hospital patients in general. The reasons for this are considered as they arise in the following chapters.

Many of the points are interdependent and it was not easy to decide the order in which they should be presented. On the whole it seemed best to set them out, as far as may be in the order in which they would occur in the history of each patient. The marked exception to this is in Chapter 13, which clearly does not occur in relation to the patient at all. It was felt, however, that many readers would wish to know definitely that the cases under consideration were really cancer as confirmed by pathological investigation.

The control series of patients evidently are not concerned in this part of the inquiry.

CHAPTER 13.

The Pathological Confirmation of the Clinical Diagnosis.

The nature of the cancer as stated in the pathological notes was taken out, primarily to show that the cases were genuine cases of cancer; but also to show the types of cancer as a part of the routine examination of the material.

The type of cancer was stated in a high proportion of the cases, and no difficulty was encountered in the classification. The same method was adopted as in an earlier report* on cancer of the breast. The chief classes there used were:

- Spheroidal-celled—mainly fibrous,
- " " cellular.
- Columnar-celled and adeno-carcinomata.

In order to show rather more fully the types found in the present investigation the less frequent types have also been included. The whole is shown in Table 43.

* Cancer of the Breast and its Surgical Treatment. Ministry of Health Reports on Public Health and Medical Subjects No. 28.

TABLE 43.

Showing the types of carcinoma found in the cases under consideration.

Types of Cancer.	No. of Cases.
Spheroidal-celled (mainly fibrous)	160
Spheroidal-celled (mainly cellular)	145
"Carcinoma" type not stated	99
Columnar-celled	15
Adeno-carcinoma	16
Colloid cancer	6
Paget's disease	3
Mixed carcinoma	5
Sarcoma	3
No pathological report available	56
	508

The 56 cases in which no report was available include the inoperable cases, those upon whom a palliative operation was performed (where no pathological investigation was made), those where the primary operation had been performed elsewhere, nine cases in the practice of an eminent surgeon, without pathological report, but in which the diagnosis may be taken as correct, and lastly, a few cases in which the clinical notes were missing, or the historian had failed to make an entry of the pathological report in the notes.

In none of these, however, did the clinical condition of the patient leave any serious room for doubt of the correctness of the diagnosis.

Expressed in percentages the figures are :

Spheroidal-celled carcinoma (mainly fibrous) ...	35.4 per cent.
Spheroidal-celled carcinoma (mainly cellular) ...	32.1 " "
Type not stated	21.9 " "
Columnar-celled and adeno-carcinomata ...	6.8 " "
Others	3.8 " "
	100.0*

Certain of the pathological reports contain additional information of great interest which is dealt with fully in Part V. For the moment, however, it is desired merely to show that the clinical diagnosis was confirmed, and that the cases are really cancer.

* These figures are roughly similar to those obtained from the literature (cp. Ministry of Health Report on P.H. and Medical Subjects No. 28), where on 2,947 cases the spheroidal-celled (mainly fibrous) were 29.4 per cent. of the total, spheroidal-celled (mainly cellular), 58.6 per cent. and columnar-celled 12.0 per cent.

CHAPTER 14.

The Symptoms complained of by the Patients.

All writers on cancer of the breast make reference to the symptoms complained of by the patients. A summary of the more detailed statements made or of data collected was given in a previous report.* The available information was not very conclusive and it seems doubtful whether any investigation will provide positive results which might be of real value diagnostically.

The method employed in the present investigation offers certain advantages over the clinical notes commonly used for an account of the symptoms. On the other hand it has drawbacks. It is reasonably certain that the inquiries made by the various observers—all of whom were experienced workers—will have been more accurately and more carefully made than is practicable in the ordinary routine of hospital work. The disadvantages lie in the facts that in the first place a longer interval had elapsed from the commencement of the disease; and, apart from the question of recurrences the patient had been relieved of her trouble and her memory of her symptoms was perhaps getting hazy. This is especially the case with the older women whose general recollection of their own life-histories was often found to be indistinct. Further, the patients when asked to attend at the hospital did not know that they were to be questioned as to their past clinical history, and might perhaps have been able to give more details had they had time for reflection, though it does not necessarily follow that the results would have been more accurate.

Anyone in the middle or later years of life who has tried to recall suddenly the details of events even so short a time back as one year will realise the liability to error which is incurred if details are attempted. Broad facts are generally remembered more accurately.

It is probable that the facts elicited from the patients are accurate so far as they go, but there is evidence of some lack of recollection of fine points. In spite however of these disadvantages it seems doubtful whether any other method of investigation would lead to better results.

A careful examination of the replies given in the questionnaire showed that if all descriptions of pain were classified together as "pain" it was possible to show the symptoms without an undue number of headings. Those taken are shown in Table 44. The pain has been described by individual patients under a number of terms—"shooting, dragging, jaggling, burning, stinging, pricking, clutching, dull, and one or two others. The terms

* Reports on Public Health and Medical Subjects No. 28, Ministry of Health, London, 1924, pp. 80, *et seq.*

"shooting, burning and stinging" are the most common, pricking being far from uncommon, the rest being infrequent.

No apparent association seemed traceable between the terms used and any particular stage or phase of the disease.

Some explanation of the precise manner in which the headings of the table have been used is required.

Under the heading "lump in the breast" have been included a number of cases with slightly different attributes. In the great majority of cases the patient merely complained of "a lump", without further qualification. In these cases it is not certain that there never had been any pain associated with it especially in the earlier or more remote stages of the disease. It merely means that the patient may not have remembered it or may have considered it so slight as to be unworthy of mention. Others again made the definite statement that at no time had there been any pain whatever either in the breast or the arm. A further number of patients stated that they had a lump which had begun to grow, either slowly or rapidly. Many of these women unfortunately allowed months to elapse before the increasing size of the growth induced them to apply for treatment. It is in fact probable that the majority of cases falling under this heading came for treatment because the lump was growing, even if they did not mention the fact.

A few patients came to hospital under pressure from some relation or friend who was aware of the danger lurking in a lump in the breast. In a few instances the patients had seen some relation die of cancer of the breast and were well aware of the results of delay in seeking treatment. Yet, even here, only one or two sought advice on first feeling the lump, the rest delayed for a number of months before applying for advice.

Under the next heading "a lump and some pain later" are included for the most part cases where the growth has ceased to be local. It is shown later that about one-third of them were still in the local stage of the disease. The third heading—"Pain as first or only symptom" requires some explanation. In all cases the patient was clear that the first thing she noticed was the pain. There is no reason to doubt the accuracy of the statement. There is, however, considerable doubt whether pain was the first *recognisable* as well as the first *recognised* abnormality. Many of the women stated that they had never felt a growth at all, which probably means that they had never made any attempt to find one. Others again felt the growth much later, when in some instances, but not in all, the growth was already of fair size. Others again who complained even of long-standing pain in the arm or shoulder or even breast had either never examined the breast or had not done so until a very little while before attending hospital. The discovery of a fair-sized, or even large, lump induced them to seek treatment.

In some cases where the pain was of long duration, sometimes years before the growth was felt, there can hardly be any doubt

that it was really the first symptom and that it did precede the presence of the lump. The data are presented as the facts appeared to the patient.

The above notes render it likely that pain occurs in the early stages of the disease as well as in the later ones, not perhaps in the same person, but as a symptom which varies in the time of its onset. When pain is sufficiently intense to draw the patient's attention to it, and the growth is either not palpable or very small, it is possible that the condition is pre-cancerous. The pain occurring later in the disease is due presumably to the pressure upon or the infiltration of one or more nerves or to the distension of tissues by the growth.

The heading "Lump and some pain" is believed to include cases which cannot be placed in other categories for lack of definite information. In some instances there are attacks of pain at intervals throughout the disease, and it is certain that the patients often meant *attacks* of pain, and not continuous pain. Some of these would probably have been assigned to one or other of the two antecedent classes in the table had the patient been able to give a more exact account of her symptoms. The relation of the pain to the period of finding the growth is vague.

Discharge from the nipple was noted in two cases after the finding of the lump. In nearly all the instances it was associated with a good deal of pain. As a whole it appears to be an early symptom. In several of the cases quoted the discharge was of long standing. Only one of the patients who had discharge from the nipple was stated to have Paget's disease, and one to have a duct carcinoma.

The symptoms denoted by the later headings in the tables suggest relatively late stages of the disease. Yet in none of these did the patient complain of a lump, and apart from a few doubtful cases it seems that the presence of a growth was not known to the patient when applying for treatment.

Those "found accidentally" were discovered either by a private doctor or at a hospital in the course of routine examination when the patient attended for some other complaint.

TABLE 44.
Showing the Symptoms complained of by the patients in the Cancer Series.

Symptoms complained of.	Married.		Widowed.		Single.		Total.	
	No. of Cases.	Per cent.	No. of Cases.	Per cent.	No. of Cases.	Per cent.	No. of Cases.	Per cent.
A lump in the breast	113	39.4	39	39.0	44	37.9	196	39.0
A lump, with pain later	50	17.3	16	16.0	17	14.7	83	16.5
Pain as first or only symptom	50	17.3	21	21.0	18	15.5	89	17.7
Lump and some pain	29	10.1	13	13.0	15	13.0	57	11.3
Discharge from the nipple	22	7.6	5	5.0	10	8.6	37	7.4
Retraction of the nipple	8		0		3		11	
Hardness or shrinkage of the breast	4		3		5		12	
Weakness of arm	4		0		1		5	
Discoloration of skin	2	8.3	0	5.0	0	10.3	2	
Itching, ulcer of nipple, etc.	3		1		2		6	
Found accidentally	3		1		1		5	
No Notes	288	100.0	99	100.0*	116	100.0	503	100.0
	4		1		0		5	
	292		100		116		508	

* The single case with no notes is included in the percentages.

Table 44 shows the numbers and the percentages of those who complained of the symptoms already described. As a matter of interest the women have been separated according to their civil state. It was thought possible that the symptoms might present themselves among single women slightly differently from those among the married and widowed women. A consideration of the table would not appear to lend any support to this belief. There are slight divergences, but these appear more particularly among the widowed women. They are, however, small and are probably of no significance whatever.

It might be suggested in view of the preponderance of early pain that widows sought treatment in the early stages of the disease. It is shown later, in dealing with the clinical findings, that this is not the case.

Perhaps the point of most significance which emerges from the table is the high proportion of cases which are associated with pain at one stage or another. In all 45.5 per cent. of cases complained of pain of whom 17.7 per cent. felt pain before the lump. Even allowing for the defects in the memories of the patients and for their neglect to feel for the lump, it seems not unlikely that pain in the early stages is rather more common than has often been supposed. This point may be worthy of note in connection with the diagnosis of cancer of the breast. It suggests that where pain is complained of the case should be kept under observation while such treatment should be given as may conduce to its removal. Attention should not be relaxed until either the pain has subsided leaving a normal breast, or until operative measures have been decided upon.

There is reason to believe that the pain which is felt early in the disease is probably of a more intermittent character than that which comes on later. It seems clear that it is the persistent nature of the pain which finally drives the patient to seek for relief, often when it is already too late to hope for more than a temporary benefit from surgical treatment.

CHAPTER 15.

The Treatment sought by the Patients.

One question in the schedule is concerned with the treatment the patient has received before attending the hospital concerned. There is undoubtedly a feeling, perhaps more prevalent among other nations than ourselves, that women frequently seek advice from unqualified persons for a lump in the breast. These persons retain the women under treatment or advise that no treatment is necessary, valuable time thus being lost. The question was designed to obtain information upon this point.

The replies have been arranged under a few main headings, and are shown tabulated in Table 45. The vast majority of the women came direct to the hospital without even seeking advice from their own doctor. It is possible that among this class there may be a few who did consult their doctor, but being sent up directly to the hospital have omitted to mention the point. It is not believed, however, that these form a large class. Under the second heading "sent up by the doctor" are those who consulted their doctor and were told to attend hospital without delay, which many of them did. Some delayed, however.

TABLE 45.

Showing the nature of the treatment sought by the patients in the cancer series.

Nature of Treatment.	Married.	Widowed.	Single.	Totals.
Hospital direct	224 (76.6%)	77 (77%)	96 (82.8%)	397 (79.1%)
Sent up by doctor	31	11	11	53 (10.56%)
Treated by doctor	9	3	4	16 (3.18%)
Watched by doctor or told did not matter ...	12	4	4	20 (4.0%)
Went to herbalist for treatment...	1	0	0	1
Had homœopathic treatment ...	2	0	0	2
Treated herself ...	6	2	1	9
Showed lump to midwife ...	1	0	0	1
Treated as out-patient at a hospital ...	3	0	0	3
	289	97	116	502
No note ...	3	3	0	6
	292	100	116	508

The periods of treatment (so far as noted) by doctors were :

(1) Married : 2 weeks, 6 months, 6 months, "some months," 1 year, 2 years.

(2) Widowed : 4, 5 and 9 months.

(3) Single : 1 month, 5 months and 2 of uncertain duration.

The herbalist treated the patient concerned for 10 months.

The homœopathic treatment was continued for 3 weeks and 3 months respectively.

The most striking impression given by the figures in the table is the great number who went direct to the hospital for aid. It suggests that the majority of those concerned were well aware

that they had some condition which required more specialised treatment than could be given by a private doctor. It will be shown later that a lamentably large number of patients applied for treatment at late stages of the disease, and after the growth had been noticed for prolonged periods. This also suggests that they realised it was probably not a small matter or they would have most probably consulted their own doctor and asked for medicine for it. It may be argued that the reason they did not consult their own doctor was that they were not in many instances suffering any pain. It is not believed that this is the explanation. Many of the women strongly suspected before coming to hospital that they were suffering from cancer, and many of them applied direct to the cancer hospital for that very reason.

The practice of some hospitals of concealing from the patient that she has got cancer may answer when the patient is relieved entirely of her trouble, and has no recurrence, but it was found to be bitterly resented later when there was a recurrence, and the true nature of the case became evident.

The public is still largely ignorant of the immense importance of early operation in cancer of the breast, and many of the women who suffer from cancer regard themselves as doomed in any case. That this opinion was held by the patient was forcibly impressed upon certain of the observers who took a large number of the histories of the patients after operation. It appears also to be the view of several experienced members of the nursing profession who were consulted informally upon this point.

The next largest class are those who consulted their own doctor before attending hospital. A few consulted two doctors, and one even sought advice from four different practitioners in order to be sure that the advice was the same. As all four urged her to apply to hospital without delay she did so.

In sixteen instances the patient was kept under treatment by her doctor; the periods of such treatment are given for 12 cases below the figures in Table 45. The patients were not always aware of the doctor's opinion as to the nature of their trouble. A few believed that the doctor thought it was "connected with the change of life." One said that she was told it was "clotted milk." Most were presumably believed to be "chronic mastitis."

The women themselves believed that the doctor "thought he could disperse it." The treatment stated to have been given varied. It consisted in the case of a single woman of a belladonna plaster, in others it was ointment, or fomentations, iodine preparations, or massage with oil. Some of those who were "watched" without any treatment were told to return if the lump should begin to grow. Two of them did not apparently wait for this to happen, but after deliberation attended hospital, without waiting for further developments. One patient on coming to hospital stated that she had never been examined by her doctor who had treated her for a considerable time. She was considered to have reached an inoperable state when seen at

hospital. Another patient who went to her doctor complaining of the swelling of her arm stated that no treatment was ordered, nor was she advised to attend hospital. Three other women were treated for varying but prolonged periods for rheumatism and neuritis, and one was told that she had heart disease, and was treated for this. The herbal, as also the homœopathic, treatment seems to have consisted of tablets. The treatment undertaken by the patients themselves consisted varyingly of ointments, rubbing with oil, fomentations, or iodine, sometimes continued for as long as several months.

The patient who showed the lump to the midwife was a young pregnant woman, and the midwife was the one she had engaged for her confinement. The midwife is stated to have said that it did not matter at all unless it began to grow. This occurred soon after the confinement and the patient attended a hospital. In three instances the women attended at an out-patient department of the hospitals concerned, treatment being given apparently owing to an error in diagnosis. One had fomentations for a fortnight, another had lotions for six months and a third was treated for gastric trouble for "some months."

Errors of diagnosis or an expectant treatment are deeply regrettable in cases of cancer of the breast. If all these be added there are 39 women seen by legally qualified practitioners in whom the growth was either not diagnosed or was incorrectly diagnosed. This is about 7.7 per cent. of all cases or roughly one in every 13. If only the cases known to have been seen by practitioners apart from the hospital are considered then the figure becomes 39 out of 92, that is roughly 3 out of every 7. It is probable that the experience gained by private doctors in cancer of the breast is very small and may only amount to one or two cases in the year. Older practitioners especially perhaps do not realise the advantages offered nowadays by the complete operation especially if undertaken at an early stage of the disease.

It must, however, be emphasised also that in the great mass of instances, namely, approximately 80 per cent. of all cases, the women came direct to hospital so that the responsibility for the delay rested upon the patient, and not upon the doctor.

It is satisfactory to be able to state that in only two out of the whole number of cases does there appear to have been any appreciable delay in admission to hospital. Most of the women were admitted within two or three days after attending as out-patients, and ten days constituted an unusually prolonged delay. The two cases referred to where there was delay are somewhat special. In one there had been an incomplete operation based on a clinical diagnosis of "chronic mastitis." The pathological report showed that the growth was malignant. The first operation had taken place at the end of July, and the patient was not re-admitted until well on in September. In the other case the patient had attended a suburban hospital where she had been promised admission. As she heard nothing for a few weeks, she

attended a well-known hospital in London, and was at once admitted. The satisfactory arrangements for admission of cases of cancer of the breast were demonstrated incidentally in the course of another investigation undertaken for a different purpose in London in the year 1922.

The position shown in Table 45 might lead to the supposition that as the majority of women attended hospital direct and were admitted without delay, there was not much cause for anxiety on the question of treatment. It must be remembered, however, that the present investigation is not a general one, but deals only with that section of cancer patients who *did* attend hospital either directly or later, and who were subsequently both able and willing to attend for a further interview.

The inquiry made by the Ministry of Health and already referred to showed that certainly not more than one-half of the women computed to be suffering from cancer of the breast in London, made any application for hospital treatment. The figures obtained were not sufficiently complete to enable a precise computation to be made. It is, however, likely that 50 per cent. is a good deal too high, and that 30 to 40 per cent. more accurately represents the true position. There is no information available as to the treatment which the others may have received. It is impossible to state whether they were under private doctors, or homœopaths or herbalists or whether they sought the advice of chemists or midwives. Any statement on these points can only be the merest conjecture and without value.

On this point it may not be without interest to note a sidelight on the subject arising out of the present investigation. In obtaining the family histories for cancer it was rare to find any indication that parents who had died of cancer had received any operative treatment. One woman stated that her father had been operated upon twelve years before for cancer and was quite well, and one or two others had sisters or other relations who had been operated upon, some of whom had subsequently died of cancer, but others were still alive and well. As a whole, however, it was impossible not to be struck with the attitude adopted, especially in reference to the past generation, which suggested that having got cancer they had to die of it. Out of 138 parents who had died of cancer 55 were under 60 years of age at the time of death so that it was not entirely a question of age rendering operation unsafe or unsuitable.

It seems abundantly clear that existing facilities for the surgical treatment of cancer of the breast—the only reliable one for this form of cancer at the present time—are not taken advantage of in the way that they should be, and that numbers of women die of this disease without any effort having been made to prolong life. It might be considered more accurate to state that they had made no effort to get their own lives prolonged, but they require to be instructed that the effort is very well worth making, especially at an early stage.

CHAPTER 16.

The Alleged Duration of the Disease before Operation.

There is no definite time relation between the stage and the duration of the disease in cancer of the breast. Evidence as to the mean natural duration of the disease was published by Lazarus-Barlow.* The average duration of life in cases where the disease ran a natural course, that is without operation, was found to be approximately $3\frac{1}{2}$ years.

It is not possible to make any reliable computation as to the mean time which elapses before the growth ceases to be local, that is to say when the lymphatic glands become invaded. On p. 74 of the report referred to above, a table is given showing such data on the subject as were obtainable in the literature. The average figures given by different authors vary from 7-46 months to 15 months while one author found that the average time at which the glands were certainly invaded was 17 months. The figures are, however, of little value since it is generally recognised that some cases run a relatively rapid course while others take a very slow one.

In the present investigation every effort was made to obtain accurate information as to the time during which the patient had been aware of the growth, that is, had felt the lump. In the table given below the periods over which pain was felt, when that was the first symptom, have not been included. The patients' statements have been taken as to the time they first became aware of the growth, whatever its size when it was first discovered. This means that the actual duration of the lump exceeded the alleged duration in a fair number of cases.

The impression gained from a study of the details given in the notes, which are too long to reproduce in full here, is that the real duration was often longer than the alleged one. It can hardly be doubted that the figures given in the table show a minimal duration, and the real average would be considerably longer, though how much longer cannot be even hazarded.

* B. M. J., 1924, ii.

TABLE 46.

Showing the intervals stated to have elapsed between noticing the growth and the date of operation.

Period.	No. of Patients.
0-2 weeks	43
2-4 "	30
1-3 months	86
4-6 "	94
7-12 "	61
1-2 years	69
2-3 "	45
3-4 "	27
4-5 "	13
5-7 "	13
8-10 "	8
Over 10 years (= 12, 16, 18, 19, 21, 23, 24, 31, 32, 35 years)	10
Period uncertain	499
	9
	508

	Yr.	Mths.	Wks.	Days.
Average interval for all cases (499 cases) =	1	8	2	2
Average interval for cases under 10 years ... (489 cases) =	1	3	2	0
Average interval for cases under 5 years ... (468 cases) =	1	0	1	3

Thirteen weeks have been reckoned as three months.

The information having been obtained carefully it may be taken as representing the patient's own impression accurately. Where as in a few instances the patient could get no nearer than a "few weeks" or a "few months" the entry has been made under "1 to 3 months" and "7 to 12 months" respectively. In the majority of cases, however, the dates were clearly given so far as the patient was aware of them.

The figures when first worked up seemed hardly credible. It was astonishing to find the long periods which patients had allowed to elapse before seeking aid. It has been shown in the preceding chapter that there was no delay in admission to hospital save in the 39 cases treated by practitioners or watched by them, so that the delay was on the part of the patient, save in a few cases.

In the first instance the mean age to the nearest year between observation of the growth and operation was taken out and the difference proved to be 1.37 years or 1 year and 5 months approximately for all cases. This was regarded as so long that it was decided to take out the duration again, using exactly the time alleged by the patient so far as was possible without an undue number of headings, with the object of securing greater accuracy.

These are shown in the table and give even longer intervals than those obtained by the cruder method, the average duration

for all cases being 1 year and 8 months instead of 1 year and 5 months.

It must further be pointed out that these patients were to some extent selected samples of cancer patients. A fair number of the women (for details see Chapters 17 and 19) had been operated upon some years before at an early stage of the disease, and were the survivors from among a much larger number many of whom had already succumbed to the disease. It is possible that the average alleged duration of the disease if taken from a consecutive series of women would be longer than even the one given in Table 46.

As a matter of interest it was decided to take separately the alleged duration of the growth for those women who had been operated upon within three years at the time of the interview. It was believed that by doing this a fairer picture might be obtained of the average run of patients suffering from cancer of the breast as they present themselves at hospital. Evidently there is also a considerable fallacy here since many advanced cases operated upon within this period will certainly have died.

In order to eliminate the cases of especially long duration, on the ground that in such cases there may be some doubt of initial malignancy all those giving a history of more than four years' growth before operation were left out of the table.

The number of such women *alive under 3 years* is 312, and the number of cases for *the whole series* with growths of alleged duration of less than 4 years is 455.

Table 47 shows the alleged duration in the women alive under 3 years after operation.

TABLE 47.

Showing the alleged duration of the disease before operation in those women who were operated upon within three years of the time of interview including those who were in an inoperable condition or still in hospital after operation. All cases of growth of more than 4 years' alleged duration are omitted.

Duration of the Disease.	No. of Women.
0-2 weeks	28
3-4 "	18
2-3 months	74
4-6 "	54
7-12 "	56
1-2 years	44
2-3 "	30
3-4 "	8
	312

The mean duration in these cases is 42.4 weeks or just under 10 months.

The mean duration for the 455 cases of less than 4 years' duration of Table 46, *i.e.* of the whole series, is 48.1 weeks or just over 11 months.

There is not a great deal of difference either way and it would seem that the figures for the whole series may not be far removed from the figure for an average sample of the hospital population. It should be pointed out that the women who come up at once on finding the growth and of whom a larger proportion survive than of the others, would need to be present in very large numbers in order to alter materially the mean figure when the majority allow many months to elapse before making application for treatment.

The figures show a regrettable state of affairs and confirmation is unfortunately received from information obtained from other sources. The Medical Officers of Health for the County of London and for 12 of the largest towns in England and Wales made careful inquiry into the time which had elapsed before seeking treatment among those women who had died of cancer of the breast during the year 1923. The information was necessarily obtained from the relatives who could of course only give the period at which the patient had mentioned that she had felt a lump, which is not at all necessarily the same as the date at which she herself first felt it. Hence the duration here given is probably too short.

The following figures were obtained:—

	Interval between observation of growth and consultation.	Interval between consultation and operation.	Total Interval.
London	274 cases 13.6 months.	186 cases. 5.9 months.	19.5 months.
13 towns (including London)	735 cases 15 months.	488 cases 5.1 mths.	20.1 months.

It is not possible to compare these figures and those obtained in the course of the present inquiry. But they supplement the latter and again emphasise the urgent importance of impressing upon the women of this country the danger of neglecting a lump in the breast whether it gives pain or not.

CHAPTER 17.

The Clinical Condition of the Patients at the Time of Operation.

An account is given in the introduction of the method of collecting the material used in the present inquiry. From that account it will be appreciated that the patients here under consideration represent only an unknown proportion of those who were

still alive, while those who were dead do not come into the investigation at all.

Hence the material is suitable only for a study of the clinical conditions of the patients immediately concerned and cannot be used for an estimate of end results of operation.

At first in the questionnaire only a general heading was provided for an abstract of the clinical notes and for notes of post-operative conditions, detailed instructions being furnished to the observers as to the points to be especially noted. Later the questionnaire was amplified and the following questions were printed on the forms and were filled in by the observers so far as the information required was available. It may be stated that the data required were forthcoming in nearly all cases—32 not being utilisable for this purpose.

- Was growth adherent to (a) skin, (b) deep fascia ?
- Was growth ulcerated ?
- Were any enlarged glands palpable in axilla ? Or elsewhere ?
- Date and nature of operation.
- Was the case considered inoperable ?
- Any evidence of cancer in other parts of the body ?
(Ovaries and uterus especially).
- Any special notes, including post-operative state.
- Pathologist's report.

Under the pathologist's report, additional information was obtained, both as to the diagnosis and also as to the invasion or otherwise of the axillary glands. The pathological findings, as regards type of growth, etc., will be considered in a later section. Notes on the microscopical condition of the glands have been used in this section to assist in the classification of the stage of the disease.

The classification used was that of Steintal, which had already been found suitable in a previous report*. The classes are:

- Class I. Where the glands of the axilla are either not infected or barely so, and when the tumour is either not adherent to the skin, or only slightly so.
- Class II. Includes all other cases except those having special signs commonly indicative of an advanced stage of the disease.
- Class III. Includes cases where the tumour was definitely stated to be adherent to the deep tissues and to the skin, together with enlarged axillary glands and perhaps also enlarged supra-clavicular glands.

The information was sufficiently detailed to enable 476 out of the 508 patients to be classified. It has already been explained that there is no doubt of the diagnosis of cancer for the primary growth. It was less easy to assess the condition of the axillary

* Reports on Public Health and Medical Subjects. No. 28.

glands. The pathological reports were lacking in 209 instances and were divergent from the clinical in a further 25 instances.

Therefore in respect of the freedom or invasion of the axillary glands there was:—

Clinical and pathological agreement in	..	242 cases.
Clinical data only in	..	209 cases.
Disagreement between the two data in	..	25 cases.
		476

Where microscopical data were lacking it was evidently necessary to classify on the clinical data only. Where there was disagreement the microscopical findings were regarded as overruling the clinical. The glands in the neighbourhood of a cancerous growth are often enlarged without being invaded, and conversely are often invaded without being palpable through the skin.

No difficulty was experienced in relation to Classes I and II where the decision is based on the freedom or invasion of the glands and of the skin. Class III, however, presented a little uncertainty. In the present series there were 27 cases which did not fall naturally into any of the above definitions. They were cases where the growth was adherent both to the skin (which was ulcerated in a few instances) and to the deep fascia, but there was no enlargement of the axillary glands. In 9 out of the 27 cases the pathological report also gave a negative finding and in 18 there was no pathological report available, but the clinical notes stated that no glands were palpable in the axilla. Seeing that it was not possible to place them in any existing class it was decided to keep them separate as Class IV, but it is probable that a more appropriate method would be to term them Class Ia., seeing that the glands of the axilla are not involved.

Table 48 is based on the above definition.

TABLE 48.

Showing the condition of the patients at the time of application for treatment.

NOTE.—C = clinical findings in relation to glandular invasion.
M = microscopical findings in relation to glandular invasion. The signs + and - denote invasion and freedom respectively.

	Class I. Number of cases.	Class II. Number of cases.	Class III. Number of cases.	Class IV. Number of cases.	Total cases.
C. and M. agree ...	80	93	60	9	242
C. only available ...	80	46	48	18	192
C. + M - ...	9	6	4*	0	13
C. - M. + ...	0	7	5	0	12
Inoperable ...	—	—	15	—	15
Sarcomata ...	0	0	2†	0	2
	169	146	134	27	476
Data insufficient ...					32
					508
Percentage of cases classifiable ...	35.5	30.7	28.0	5.8	100.0

The percentage of persons who present themselves for treatment in the early stages of the disease is most unsatisfactory. Little more than a third of surviving patients were in Class I. on admission, and in view of the method of collecting the material it cannot be doubted that the actual proportion of all women coming to operation as Class I. cases is much less than a third.

The only figures here which may be regarded as giving some idea of the average position on admission are those dealing with patients who were still in hospital at the time of the interview. Of these there were 59 who had recently been operated upon, 2 were awaiting operation, and 15 were considered inoperable at the time of application for treatment.

Nearly all of these last appear to have been admitted for further examination except in one case where the patient had been deemed inoperable four years earlier and referred to the X-ray department, where she was interviewed for the present purpose. Of the 59 operated patients 4 were definitely stated to be palliative operations and the condition of others suggested that no great success was likely to be obtained with operation. Only those cases where it was definitely stated in the clinical notes that the

* These cases have been placed in Class III, although the microscope gave a negative finding for the glands as opposed to the clinical one, because no cases have been placed in Class IV. if either the clinical or the pathological report (if available) gave a positive answer for enlargement or invasion.

† In the two sarcoma cases the growth was adherent both to skin and deep fascia so that they were placed in Class III.

operation was palliative, have, however, been placed in this category.

Of the patients in hospital there were

Inoperable or palliative ..	19 women, or 25.0 per cent.
In Class I	11 " " 14.3 " "
In Class II	18 " " 23.7 " "
In Class III	22 " " 29.0 " "
In Class IV	6 " " 8.0 " "

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The number is too small to be statistically trustworthy, but the "prima facie" inference is very distressing. No figures hitherto published in any country appear to be available showing the proportion of all cases of cancer of the breast which are already deemed inoperable on application for treatment. There is therefore no basis for comparison of the figures just given.

Reference has been made in Chapter 10 to the demonstration of a possible relationship between symptoms and the stage of the disease. Table 49 shows the data which are available on this point.

TABLE 49.

Showing the stage of the disease at operation in relation to the symptoms complained of.

Symptoms.	All Civil States. Stage at Operation.			Class IV.	?	Total.
	Class I.	Class II.	Class III.			
Lump in the breast ...	72	51	45	10	18	196
Lump with pain later ...	24	27	24	4	4	83
Pain as first or only symptom	33	21	31	3	1	89
Lump and some pain ...	14	25	12	2	4	57
Discharge from nipple ...	15	11	8	3	0	37
Retraction of nipple ...	5	2	3	1	0	11
Hardness or } of breast Shrinkage	2	3	5	2	0	12
Weakness of arm ...	0	1	2	2	0	5
Discoloration of skin ...	1	1	0	0	0	2
Itching, soreness of nipple, etc.	2	2	2	0	0	6
Found accidentally ...	1	2	2	0	0	5
	169	146	134	27	27	503
No Note	—	—	—	—	—	5
						508
<i>Married.</i> Number ...	100	99	65	11	13	288
Percentage ...	34.7	34.4	22.5	3.9	4.5	and 4 no note.
<i>Widowed.</i> Number ...	30	22	32	7	8	99
Percentage ...	30.3	22.2	32.3	7.1	8.1	and 1 no note.
<i>Single.</i> Number ...	39	25	37	0	6	116
Percentage ...	33.6	21.5	31.9	7.9	5.1	

The figures have been taken out separately for the several civil states. These are, however, not shown in detail here as the figures, when taken separately, were in many cases so small as to be unreliable. If anything can be deduced from the first part of the table it would be that in a fair number of cases pain drives patients to hospital at an early stage of the disease, and that discharge from the nipple is on the whole an early symptom. It is probably an earlier symptom than is shown in the table since the patients in some cases endured the discharge for prolonged periods. It was of course only after the lapse of these periods that the clinical notes were made.

The general percentage of the civil states given towards the end of the table is of some interest. It shows that on the whole, the married women seek aid at an earlier stage of the disease than do the widows or single women. For the most part, the married women in the series are of an age when they no longer have young children at home and can attend hospital fairly easily. The widows are on the average older than the women in the other groups and the delay in attending hospital is probably partly due to this fact and also to the fact that many of them were earning their livelihood. The great majority of the single women have been shown to have been earning their livelihood. Either they were keeping house for some relation or they were wage-earners. Also it seems likely that unmarried women seek advice on any breast trouble less readily than those who have been married and have had children.

CHAPTER 18.

On the Method of Operation Employed.

In view of the more favourable end results shown* to be obtained by the modern or complete operation it seemed desirable to ascertain the method of operation employed in the cases now under review.

The same general method of classification was adopted as in an earlier report* although here a further sub-division has been made as a matter of interest.

Under method A are included the removal of either a part or the whole of the breast, with or without an attempt to clear the axilla, leaving the muscles or the fascia.

Under method B is included the amputation of the breast, removal of the sternal part of pectoralis major and the clearance of the axilla so far as this can be done without removing pectoralis minor or its fascia.

Under method C there is a removal of the breast, both pectorals

* Reports on Public Health and Medical Subjects, No. 28.

(usually leaving the clavicular portion of the pectoralis major) together with a clearance of the axillary contents and of the neighbouring fascia. A set of cases are included in this method where the notes explained that the fascia both covering and deep to pectoralis minor was completely removed together with neighbouring fascia and glands although the muscle itself was not removed.

In 37 instances the notes did not provide information as to the nature of the operation, or gave data which were insufficient to classify the case, e.g., it was ascertained that in one hospital "amputation of the breast" might mean either method A or method C according to the surgeon operating. Unless the method could be clearly established by other means these cases were not included.

The following figures show the nature of the operation performed:—

Method A ...	...	...	...	...	...	64 cases.
Method B ...	...	...	...	...	...	61 "
Method C ...	...	...	...	...	...	311 "
Special cases ...	...	...	...	...	...	20 "
Inoperables ...	...	...	...	...	...	15 "
Not classifiable ...	...	...	...	...	...	37 "

508

A few of the cases in class A were advanced and the operation was presumably chiefly palliative. The notes do not however, indicate accurately whether the method of operation was one of election or of necessity.

CHAPTER 19.

On the Known Duration of Life after Operation.

It seemed advisable to tabulate the periods of time which had elapsed since the operation had been carried out, seeing that this is related both to the stage of the disease at the time of operation, and also to the method of operation employed.

The following table—Table 50—shows the number of patients classified according to condition at operation, in relation to the period since the operation. In this table the patients are merely taken as being alive at the given period, quite apart from their physical condition. This is dealt with later.

It should be noted that the figures under each class are somewhat less numerically than those in table 48. This is due to the fact that in some instances the notes do not show the interval with sufficient accuracy to be given here. In some the date of the operation was doubtful and in a few others the date of the interview was not recorded. For the most part these were in patients whose operation was apparently of recent date so that a

difference of a few months was material for classification. On the other hand a few of the 32 cases not classified in Table 48 could have been classified for Table 50. It seemed however, simpler to omit them all seeing that their number is not large.

The figures are subject to the limitations already set out above. So far as they can be taken for the purpose they support the evidence in regard to the favourable effect of early operation, seeing that it is among this class that there are the greatest number of survivors.

TABLE 50.

Showing the number of cases in the several classes at the time of operation.

Period since operation.	Classes.				Total.
	I.	II.	III.	IV.	
0-6 Months ...	26	19	12	4	61
7-12 " ...	20	21	22 + 1 Sarcoma	1	65
1-2 Years ...	30	47	28	6	111
2-3 " ...	18	5	8	1	32
3-4 " ...	8	10	5	5	28
4-5 " ...	12	7	2	1	22
5-6 " ...	11	3	5	1	20
6-7 " ...	9	5	2	0	16
7-8 " ...	10	3	1	1	15
8-9 " ...	10	0	0	0	10
9-10 " ...	3	4	0	2	9
Over 10 years ...	2	2	2	1	7
Still in hospital ...	159	126	87 + 1 Sarcoma	23	396
Inoperable ...	8	17	26 + 1 Sarcoma	5	57
Not utilisable ...	—	—	—	—	15
	—	—	—	—	40
	167	143	113 + 2 Sarcoma.	28	508

CHAPTER 20.

The Condition of the Patients at the time of the Present Investigation.

Notes were made by the several observers of the general condition of the patients interviewed who were examined by a member of the staff of the hospital when they came for the purpose now under consideration. The information is believed to be quite reliable and complete. In order to avoid undue complications in presenting the data, the patients have been grouped into three main periods of time, namely 0-3 years, 3-5 years, and over 5 years since the operation. Table 51 shows the classification of the stage of the disease, the nature of the operation performed, and the absence or presence of any recurrence. Again for the sake of simplicity no distinction has been made in Table 51 between local recurrences and metastases. This is dealt with in Table 52 and is of considerable surgical interest.

The percentages are based upon figures too small to justify any general deductions. All that can be said is that with the incomplete operation there is a high frequency of recurrences which is especially marked among cases in an advanced stage of the disease at operation. This again agrees with the facts brought forward on a larger scale in the report already referred to.

TABLE 51.
Showing the condition of the patient at the time of interview in relation to the method of operation.

	Under 3 years.			From 3-5 years.			Over 5 years.			Totals.		
	Recurrence		Alive and well.	Recurrence		Alive and well.	Recurrence		Alive and well.	Recurrence		Per cent.
	Nos.	Per cent.		Nos.	Per cent.		Nos.	Per cent.		Nos.	Per cent.	
Operation A.— Class I ...	2	14.3	0	0.0	5	0.0	0	0.0	17	2	10.5	
" " II ...	5	64.3	1	0.0	3	0.0	1	25.0	9	10	52.6	
" " III ...	4	63.6	1	0.0	0	0.0	1	100.0	5	8	61.5	
" " IV ...	0	0.0	0	0.0	0	0.0	0	0.0	0	0	0.0	
Operation B.— Class I ...	15	6.3	1	0.0	3	0.0	0	0.0	19	1	5.0	
" " II ...	14	22.2	4	0.0	1	0.0	1	50.0	19	5	20.8	
" " III ...	6	14.3	1	0.0	2	0.0	0	0.0	9	1	10.0	
" " IV ...	1	0.0	1	0.0	1	0.0	0	0.0	3	0	0.0	
Operation C.— Class I ...	49	15.5	17	10.5	28	10.5	3	9.7	94	14	13.0	
" " II ...	46	18.0	9	18.3	10	18.3	1	9.1	65	13	16.6	
" " III ...	27	48.1	5	0.0	4	0.0	3	42.9	36	27	43.8	
" " IV ...	9	25.0	3	40.0	3	40.0	1	25.0	16	6	28.6	
Percentage of all recurrences ...	188	27.2	43	12.3	60	15.5	11	12.6	291	87	23.0	

CHAPTER 21.

On the Site of the Recurrences found and other points related to them.

In Table 52 is set out the site of the recurrences, and the period after operation at which they were discovered by the investigators. In a number of cases the statements were not positive. These have been entered with a query, but it seems probable that they are for the most part at any rate, real recurrences.

While the nature of the material does not admit of any general deductions it is seen that out of a total of 87 recurrences or metastases, 30, or 34.5 per cent. occurred in the first year, 42, or 48.4 per cent. in the 1-3rd years so that in all out of the whole number no less than 82.9 per cent. were found within the first three years after operation.

Only 17.1 per cent. of all recurrences or metastases were found in patients who had already survived more than three years since operation.

It must of course, be assumed that a large number of those operated upon contemporaneously, had already died of the disease, and therefore do not enter into the present series.

It may also be noted in Table 52 that there was only one case of a metastasis among patients operated upon by method A, whereas with operation C, 16 out of 60, or 26.6 per cent., were metastases. These occurred among patients of whom at the time of operation, 2 were in stage I, 2 in stage II, and the rest, or 12, were in stage III. In one of the A cases, there was some evidence of metastases in the abdomen, as well as a definite local recurrence, but in the 16 cases of method C, no patient showed any evidence of local recurrence.

These figures support the view advanced in another report* that the present extended operation shows a relatively larger proportion of metastases whose presence is probably more readily detected by the absence of the local recurrences, which occur with the less extensive operative methods. The data in Table 52 suggest that fewer local or regional recurrences, as a whole, occur with method C, since 26.6 per cent. of the total figures are metastases, which were presumably already in position at the time of the operation.

Operations however extensive cannot remedy the position as soon as deposits of cells outside the area of operation have been laid down. As it is impossible to say at what date after its commencement a growth ceases to be local, and as it is equally impossible to be certain in which direction the spread of the cells has

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- (3) That owing to the long mean interval found to have elapsed between the observation of the growth by the patient and her application for treatment at a hospital at least two-thirds (and probably a higher proportion) of women suffering from cancer of the breast seek aid at a stage of the disease when the chances of prolonged relief are already greatly reduced or even negligible.

In short, there is revealed, in various aspects, a story of apathy leading to loss of opportunity of relief. It is deplorable to contemplate the number of lives which must have been brought to an untimely end, a high proportion of which might have been spared for prolonged periods if only surgical aid had been sought without delay on the discovery of the growth.

PART V.

Other Points—Chiefly Pathological—arising out of the material.

The schedule has been shown to contain a place for pathological data. In the main it was intended to obtain information confirmatory of the clinical diagnosis of cancer—a detailed pathological inquiry was not proposed, nor has one been made.

In working up the material however, it was found that in some instances the pathological report contained information of great interest, and it was felt that this aspect should be studied further. The material offered certain advantages and also some disadvantages. The chief advantage lies in the fact that the reports were not designed for a special purpose. They were prepared in the course of the routine pathological work such as is undertaken in any large general hospital. They were not intended for use in relation to any particular pathological inquiry. There are reports from all the co-operating hospitals and no one will impugn the competency of the pathologists concerned. It may therefore be assumed that the reports are correct and are unbiassed in any direction.

Disadvantages arise, however, due to the very fact which produces the advantages. First, numerically the reports in which any detailed information is given are distressingly few. In a great many cases the only note is "carcinoma" or "scirrhus" or "spheroidal-celled carcinoma." How far this brevity is due to the historian of the clinical notes and how far to the pathological departments cannot be determined. In a proportion of cases at any rate it is due to the former, because in several instances further inquiry at the pathological departments has produced more detailed information.

The pathological reports will evidently be chiefly found among the cancer patients—some are however, available, among the control cases, for reasons which must be explained. It has been stated in the introduction that the control cases were to be free of cancer in any part of the body, but it was decided not to exclude any other class of case. In the course of the inquiry there was found to be a certain number of women who were either, then in hospital for some non-cancerous breast trouble or who had given a history of some previous manifestation of "chronic mastitis." Of the former there were seven cases in which the clinical diagnosis was cancer but in which the pathological report stated that the growth was not malignant but hyperplastic; in one case the report stated that it was tuberculous.

It is generally admitted that a correct clinical diagnosis of cancer of the breast is not always possible in the early stages of the disease. This is amply borne out by the divergencies between the pathological reports and the clinical diagnosis in the present material.

It was decided to accept the pathological reports as affording the criterion of malignancy or of non-malignancy. Hence the seven cases mentioned above as having been diagnosed clinically as cancer but in which the diagnosis was not confirmed microscopically, have been placed among the control cases. A further four in which the pathological report suggested that they were border-line cases were thrown out altogether from both series.

A second disadvantage arises out of the method of obtaining the material. The primary object of the pathological examination in the first instance is to make a diagnosis for the clinician. Many pathologists only cut a section of the growth itself and do not subject the surrounding tissue to microscopical or indeed to any examination. Hence, often nothing is known of the condition of the rest of the breast. It is only in early or border-line cases that notes are at all frequently found on the general microscopical picture. But even here there is considerable risk of error. A section of one piece of a doubtfully carcinomatous breast or axillary gland, if it should prove to be free from cancer, only means that the particular piece cut is not cancerous. Unless sections of the whole breast or gland are cut and a fair number of them mounted and examined it is impossible to say definitely that the breast or the gland is non-cancerous.

It is believed that no whole sections were cut in any of the cases occurring in the present material. Hence although the cases reported non-malignant by the pathologists are included in the control series it is not impossible that a small cancerous focus may have escaped attention. In the absence of a complete microscopical examination the only criterion of value must be the after-history.

This however, is not always obtainable and is of no value for the present point if the operation was a complete one for cancer, or, if all the diseased tissue was removed. In either of these events the correctness of the diagnosis cannot be established with certainty by the after-history.

It is evident therefore that the material is incomplete on the pathological side and does not admit of statistical comparison either as to the incidence of non-malignant growths in the control series, or as to the general condition of the breast tissue among the cancer patients.

The available material has been united for consideration, the series from which the case is taken being indicated. The data are too scanty to prove any points by direct weight of evidence. But the information although scattered and of small mass, tends towards similar conclusions. Hence it was deemed advisable to set it out together with such information as could be obtained from the existing literature. No attempt has been made to offer a complete summary of either the physiological or pathological literature of the breast but only that of such points as appeared to be directly relevant.

The material dealt with in this part of the report is that which

has been accumulated during the present inquiry; it is concerned exclusively with cases in which a lump was discovered in the breast. The conditions of pain, tenderness, or soreness of the breast relating to menstruation or to the menopause are not included in the cases considered, although reference is made to them. It is appreciated that lumps in the breast may be due to tubercle, syphilis and actinomycosis. But these are all comparatively rare, and except for the first mentioned do not occur at all in the series. It is somewhat remarkable that among the 509 control cases there are no less than three cases of tuberculosis of the breast. Two of these followed injury to the breast, one of the patients having suffered from tubercular osteo-myelitis as a girl. The father of this last patient died of phthisis, and there was a family history of cancer in the other two women. One of the cases of tubercle with a family history of cancer was believed to be cancer and the surgeon performed the radical operation. The clinical diagnosis of the third case appears to have been doubtful. The cases are of general clinical interest and are mentioned here partly on that account and partly as exemplifying the remark that tuberculosis is not regarded as a common cause of a lump in the breast.

The common causes of lumps in the breast are undoubtedly

- (a) Some manifestation of hyperplasia of the mammary tissues commonly termed "chronic mastitis," and
- (b) Cancer.

It may be assumed that the former is the commoner of the two, but no data are available. A rough measure of the incidence of cancer is given by the mortality rates, but as "chronic mastitis" in itself is not a fatal disease it is impossible to assess its frequency.

It is not known to what extent women with mammary lumps apply for treatment, nor the number of those who do apply.

Difficulty in dealing with these groups arises from the fact that it is often impossible to make a clinical differential diagnosis, while pathologists note also a "pre-cancerous" condition. The literature upon the border-line cases is not voluminous and there appears to be some divergence of view—expressed rather verbally, than in writing—upon this aspect. The present report does not purport to be a pathological investigation but rather to set out the data, leaving it to those better qualified to judge, to form their own opinions.

Neither the clinical nor the pathological picture of hyperplasia or "chronic mastitis" is lacking in variety. The phases have been studied by many writers and are well-known. It is very generally if not universally admitted that widely diverse as the manifestations may be, all are due to a similar cause of which little or nothing is known. A common feature of all forms is the occurrence of cysts as also of hyperplasia both of the glandular epithelium, and of the supporting structures. Further, since it has been assumed that the hyperplasia was inflammatory in origin the terms chronic cystic mastitis, and chronic interstitial

mastitis occur frequently in the literature according to the prominence in the microscopic picture of the overgrowth of the one or other tissue.

Bloodgood, one of the leading writers on this point, gives no less than ten varieties.*

Of recent years researches into the pathological side have been published by Lenthal Cheatle in this country, and by Bertels, Lukowsky and Sebening, elsewhere.†

Lenthal Cheatle considers that the term "chronic mastitis" is a misnomer, since it implies inflammatory changes which do not in fact occur. This appears also to be the view of the foreign writers. Although certain cases show some infiltration by lymphocytes this is not necessarily a part of the condition but may be present simultaneously. (Cheatle *loc. cit.*, 1925).

The chief points of difference between the authors mentioned arises in their views as to the order in which the events occur. There is general agreement as to the final result, but Cheatle—with whom Sebening apparently agrees independently—believes that the hyperplasia of the epithelium precedes that of the supporting tissues, this last hypertrophying in response to the overgrowth of epithelium.‡

- * 1. Single or multiple cysts in chronic cystic mastitis.
2. Chronic cystic mastitis without large cysts.
3. The blue-domed cyst.
4. The cyst of the galactocoele type.
5. The multiple blue-domed cysts in one or both breasts.
6. The nonencapsulated adenomatous areas.
7. The nonencapsulated area of chronic cystic mastitis, containing one or more minute cysts, or one or more dilated ducts or both.
8. The diffuse dilatation of the ducts, chiefly in the nipple zone, rarely in the breast outside this zone.
9. The nonencapsulated cystic adenoma.
10. The diffuse nonencapsulated cystic adenoma known in the literature as Schimmelbusch's or Reclus' disease, or senile parenchymatous atrophy (Bloodgood).

(See Bloodgood "The Pathology of Chronic Cystic Mastitis of the female breast, with special consideration of the blue-domed cyst." *Arch. of Surgery*, 1921, III p. 445.

† Bertels.—*Über die Mastitis chronica (cystica) und ihren Übergang in Carcinom.* *Deut. Zeit. f. Chir.* 1913. cxxiv. 9.

Cheatle, Lenthal.—Cysts, and primary cancer in cysts of the Breast. *Brit. Journ. of Surg.* 1921. viii. 527.

Cheatle, Lenthal.—Benign and Malignant changes in the duct epithelium of the Breast. *Brit. Journ. of Surg.* 1921. viii. 285.

Cheatle, Lenthal.—"Chronic Mastitis" as a term: Its fallacy and the danger of its clinical signs. *Brit. Med. Journ.* 1925. I. 1.

Lukowsky.—*Über die diffuse fibromatose der Mamma und ihren Übergang in Karzinom.* *Deut. Zeit. f. Chir.* 1921. clxvii. 81.

Sebening.—*Zur Physiologie und Pathologie der Brustdrüse.* *Arch. f. klin. Chir.* 1925. cxxxiv. 464.

‡ No attempt is made here to consider separately the hyperplasia of the different elements of the supporting tissue as a whole. Cheatle makes detailed distinctions in the overgrowth both as to position and nature. The term "supporting tissues" covers both fibrous and elastic tissue. It is used throughout this part of the report as a general means of distinguishing between the glandular and the other elements in the breast.

Bertels and Lukowsky on the other hand regard the hyperplasia of the supporting tissues as the primary occurrence, the epithelial hyperplasia being the response to that of the supporting structures. In order of time the authors are, Bertels, Cheatle, Lukowsky and Sebening. The foreign writers do not quote Cheatle, who equally does not quote them, so that it may be taken that the findings are mutually independent. All these authors took sections of the whole breast, whenever it was at all possible to obtain the tissue. All are agreed that it is only by this means that a correct diagnosis or correct hypothesis can be reached.

By taking sections of the whole breast, Cheatle has been able to show that the small cysts which are almost constantly found in all sections of a case of hyperplasia, are in fact, different parts of the same duct or ducts which have become dilated, and he has traced them through succeeding sections. He believes that the epithelial hyperplasia, started probably by some irritant, is of papillomatous type, and causes distension of the whole of the duct or ducts concerned. In response to this distension there is a proliferation of the surrounding tissues, which causes the duct to be nipped at one or more points thus forming cysts. Bertels and Lukowsky reach precisely the same final picture, but believe that the process is reversed, the cyst being formed by the hyperplasia of the supporting tissues whereby the duct is nipped at one or more places with the formation of cysts, and consequent hyperplasia of the glandular epithelium.

Dieckmann (of whose work more is said later) studied a number of breasts from women with prolonged amenorrhoea due to constitutional disturbances. He noted that in some cases there may be a dilatation of the terminal ducts either local or extending along a large part of the duct; also that changes occur in the glandular epithelium in which the surrounding tissue may take part and which resemble certain pathological formations. In one instance at least, the cystic dilatation contained papillomatous growths resembling those described by Cheatle.

All the writers agree that cysts of one size or another are practically always found and that fibro-adenomata are only a variant arising in the course of the hyperplasia of the tissues concerned. Cheatle (1913), finds that unsuspected but often small fibro-adenomata are present in a large proportion of all cancerous breasts examined by him.

With this brief survey of this aspect of the literature we may now ask whether it is not possible to find out if there are any conditions which might correspond to early phases of hyperplasia, and so lead to some idea as to its possible origin, and also, whether there may be any further developments of a well-established hyperplasia. It will be convenient to consider the possible early phases first of all.

As we are not concerned here with material outside that obtained for the purpose of the present inquiry, we may begin by considering such cases as suggested that the hyperplasia if it

existed, must have been transitory. It is well known clinically that there are cases of mammary lumps, usually if not always associated with pain and tenderness, which yield to such simple treatment as strapping or some other form of support to the breast or to medicaments or may even disappear spontaneously. These are commonly regarded as "chronic mastitis" of a mild and transitory type. In the present material there are three such cases among the cancer series and three also in the control series; in one of these last, there is some doubt as to whether a lump was actually felt. These cases are given in detail under the heading of Table 53. It is perhaps noteworthy that all these cases in both series are from the Nightingale Hospital, where the patients as a whole may be regarded as being of higher education than at a general hospital and probably more observant of minor departures from the normal.

TABLE 53.

Notes of the cancer cases with previous but transient lump and tenderness in the breast.

1. Married. Aged 40 ... No profession. Catamenia at 15. Regular at 21 days. Breasts always painful and tender during the periods. At age of 26 lumps appeared in both breasts—the left was much worse than the right. Treated with iodine and bandages. After 4-5 years the lumps disappeared and the tenderness cleared.
At age of 38 a swelling, following a blow a month before accompanied with pain, appeared in the left breast, and patient was operated upon a few months later—a complete Halsted's operation being performed. The pathological report was "carcinoma of breast."
Two years later patient attended complaining of a burning pain in the right breast but nothing abnormal could be detected. There was no sign of recurrence on the left side.
2. Widow. Age 68 ... Catamenia at 18½; menopause at 49. At age of 48 a small lump appeared in the left breast which disappeared after treatment with belladonna. Twenty years later a lump came up near the same spot as before. Later, patient sought advice and cancer was diagnosed. There were enlarged glands in the axilla and the pathological report was "scirrhus of breast."
3. Spinster. Age 57 ... Catamenia at 12; menopause at 51. Always pain in breasts before periods and tenderness in them.
At 45 noticed a small "cyst" in the left breast which disappeared gradually without treatment. At 52 or just after the menopause the left breast became tender, and after four years a lump appeared. A year later patient sought advice and was operated upon. Pathological report "scirrhus of breast."

Notes of the control cases with previous lumps in the breast.

4. Married. Age 54 ... Catamenia at 14. Menopause at 52.
Always discomfort and throbbing in the breasts at the beginning of the periods. At 42 "tenderness and lumps" in both breasts, which were treated by strapping and got quite well. No subsequent trouble. In hospital for retinitis.
5. Widow. Age 46 ... Catamenia at 12½. Not yet reached menopause. Tenderness in breasts before periods. Also when breast feeding. Three children all breast fed for short periods.
At 42 tenderness and thickening of right breast, which disappeared without treatment.
Breast found normal on examination at time of interview. Mother's mother died of cancer, and father's father of "obstruction."
6. Widow. Age 47 ... Catamenia at 14. Menopause not yet reached. No pain or discomfort in breasts at the periods. At 37 noticed pain and tenderness in the left breast, but did not feel any actual lump. Treated it herself by rubbing with oil; cleared up completely.
Had cracked nipples with first child born in 1895 when patient was 18.
This patient was in hospital for hæmorrhoids.

In addition to the above there was one control patient married, aged 39, who was in hospital for appendicitis whose breasts were stated to be "shrunken and nodular," but the patient did not apparently make any complaint. Also another in hospital for intestinal stasis who complained of occasional aching of the breasts. Both grandparents on the father's side had died of cancer. This patient was a single woman.

The comparatively easy or spontaneous disappearance of the disorder in these cases suggests that it is probably not very far removed from the physiological condition of the breast. As a result of experience Cheatle states that lumps which are painful only at menstruation can be regarded as harmless. There is no information as to the relation of the pain in the lump to the onset of menstruation in the three women who had not yet reached the menopause.

In view of these cases it was decided to search the literature in order to see if there was any information as to the microscopical appearances found in such cases.

It seems to have been assumed until comparatively recently that the only periodic changes undergone by the mammary gland were those occurring in connection with pregnancy and lactation. In 1922, Rosenberg* published a paper on the subject of men-

* ROSENBERG.—Über menstruelle, durch das Corpus Luteum bedingte Mammaveränderungen. Frankfurter Zeit.f.Pathol. 1922, xxvii. 466.

strual changes in the gland, and he was followed in 1924 by Polano* and in this year (1925) by Sebening† and Dieckmann‡.

There is some divergence of view among these authors as to the histological changes connected with the phases of menstruation. All, however, are agreed that changes do take place in the gland which are related to the phases of the menstrual cycle. This is not the place to enter into a detailed histological survey of the changes found by the several authors, but a general description of the more important appearances found is necessary. Fundamentally the mature breast consists of downgrowths of epithelium, which have the character of ducts and acini, embedded in a supporting tissue. The three first-named authors believe that the chief changes occurring in relation to the menstrual cycle are in the epithelium, with subsidiary ones in the supporting tissue, while Dieckmann believes that certain changes take place in both, but the changes described by him are not the same as those described by the other authors.

Rosenburg obtained his material from the *post-mortem* room and examined the ovaries as well as the breasts. He regarded the changes he described as dependent upon the formation of the corpus luteum, and considered that they occurred in harmony with the growth and regression of that structure. He stated that there were no acini at all at the intermenstrual period—the breasts consisted of ducts lined with epithelium and supporting structure. At the time of ovulation and the beginning of the formation of the corpus luteum, budding outwards appeared in the walls of the ducts and a rapid multiplication of epithelial cells took place, giving rise to large numbers of small lobules of glandular tissue which are outgrowths from the ducts. At their highest development these lobules are of some size and appear to be surrounded by a capsule—"membrana propria"—which is a part of the supporting tissues and very well-marked on microscopical examination. Failing impregnation, when the corpus luteum retrogresses, these lobules also retrogress and, according to Rosenburg, the regression is complete and the glandular lobules disappear during the post-menstrual period.

Polano and Sebening agree generally with the findings of Rosenburg, but neither author considers that the regression is as complete as is suggested by Rosenburg. Their material was obtained from living persons during operation. Polano obtained from eight different women, who were being operated upon for some other trouble, their consent to the removal of a small piece of breast tissue while the operation was in progress. He thus obtained eleven pieces, one woman having three operations.

* POLANO.—Untersuchungen über die cyclischen Veränderungen der weiblichen Brustdrüse während der Geschlechtsreife. Zeit.f.Geb.u.Gyn. 1924. lxxxvii. 363.

† SEBENING.—Zur Physiologie und Pathologie der Brustdrüse. Arch. f.klin.Chir. 1925. cxxxiv. 464.

‡ DIECKMANN.—Über die Histologie der Brustdrüse bei gestörten und ungestörten Menstruations. Virchow's, Arch. 1925, cclvi. 321.

From this woman a small piece was removed at the intermenstrual, menstrual and post-menstrual periods, but little or no change was found from the intermenstrual picture. In the others the regression was not found to be complete. Sebening also obtained pieces of tissue, but from the healthy portion of breasts which were being operated upon for the removal of a small painful lump. In some instances he was able to examine the whole breast. He was able to use eleven pieces in all out of a larger number. The breasts were non-cancerous, and he says that he found cancerous breasts of no use for the purpose, as the changes surrounding the growth were always extensive and may have been there previously. Sebening confirmed Polano's view that the regression was not complete after menstruation.

Dieckmann, who, like Rosenburg, studied *post-mortem* material, believes that a different interpretation should be put on Rosenburg's and on Polano's findings. He took out the ages of Rosenburg's cases and showed that as a whole those women in whom Rosenburg found no acini were younger than those in whom they were present. He regards the former as being breasts of infantile type which had not yet developed their lobules. He believes the development of the lobules to be relatively slow and to occur at varying ages, and not necessarily with the onset of menstruation. Normally the lobules, once present, do not retrogress with the menstrual cycle. In cases of amenorrhoea and presumably with the onset of the climacteric the lobules undergo a gradual atrophy which may take many months to complete. In such cases the final picture may approximate closely to the infantile type. The changes described by Dieckmann are quite distinct for each menstrual cycle, but they differ from those believed to occur by the other authors. He finds that the epithelium of the glandular lobules is two-layered, and during the pre-menstrual period the outer layer of cells becomes vacuolated (Läppchenedem). In the post-menstruum the intra-lobular supporting tissue becomes oedematous, with a gradual disappearance of the oedema of the glandular part. At the intermenstrual period the oedema has disappeared.

Berka, 1911, pointed out that there were certain divergences of structure between the intra-lobular and the inter-lobular supporting structures. The details of the intra-lobular tissue are also described by Dieckmann at some length and form part of his view of the menstrual cyclical changes. So long as the menstrual changes proceed regularly there is no formation of elastic fibres in the stroma of the breast of young persons. With prolonged amenorrhoea this may appear, as also in older women.

Rosenburg thought that his views accounted for the distension of the mammary gland which occurs in many women in the pre-menstrual period. But Dieckmann's views appear to offer a simpler explanation. It is certainly easier to attribute the distension and sense of fulness to the oedema described by Dieckmann, which disappears in any case after the onset of menstrua-

tion. The distension complained of is relieved during the first day of the monthly period, or at latest on the second day, which accords much better with changes in the fluid content of the structures than with the disappearance of glandular tissue.

It is evident that the breast takes part in the menstrual cycle and is likely to be affected by any irregularity in it, but the precise physiological details of the process are still unknown. It is likely that in many women the distension is insufficient to cause any attention to be drawn to the state of the breasts during menstruation. In others in whom the distension is carried somewhat further or in whom some temporary irregularity may admit of the oedema-producing factor acting over a longer interval, the distension may be very troublesome. This also would account for the painful breasts at the menopause complained of by some of the women in the present enquiry (see Part II.) which are difficult to account for on Rosenberg's views.

In general it may be taken that the breast undergoes changes with each monthly cycle, but that their precise nature is not yet definitely agreed, and that these changes form a part of the general cyclical change connected with sexual maturity. This will suffice for the moment and we may return to a consideration of the painful lumps in the breast which seem remediable by the simplest measures.

It has been stated above that Sebening obtained his material from women who were being operated upon for small painful lumps in the breast. He examined these lumps microscopically. On section they were found to resemble the glandular lobules believed by him to form the hypertrophic pre-menstrual changes. He regards the painful lumps as due to chronic proliferation of one glandular sector or single glandular lobule which for some reason has not retrogressed with the others. In two of his cases which were apparently similar in type to those operated upon, the condition was relieved by compresses and support to the breast. All the patients complained that the lumps were more painful at the menstrual periods. In some cases the pectoral or axillary glands were enlarged and tender.

In all his cases the lump was in the outer and upper quadrant of the breast, admittedly the commonest site for the development of cancer. Sebening thinks that occupation may have some relation to the trouble, but it must be confessed that his reasons are somewhat unconvincing.

Glass* both in 1922 and 1923 published notes of cases (in all 16) of painful lumps and tenderness of the breasts. There were ordinarily two or three lumps of varying sizes in each breast concerned, which felt like fibro-adenomata. The degree of pain varied, but was found by him to be commonly worse at the intermenstrual period. Eleven of the cases occurred in young married

* GLASS.—Weitere Beobachtungen über das Krankheitsbild der subakuten Mastitis mit Knotenbildung in der Mamma. Deut. Med. Wochens. 1923, xlix. 275.

women. In all except one the condition yielded to treatment by strapping. All had soft enlarged pectoral glands. The patient whose condition did not yield to strapping was operated upon, the three largest nodules being removed. The clinical diagnosis was—chronic mastitis or carcinoma. The pathological report said "Localised hypertrophy of individual glandular lobules (Drüsenläppchen), without much disturbance of general structure. It is not at present a cystic mastitis." The other nodules disappeared spontaneously after the removal of the largest ones.

It seems reasonably certain that some abnormal process related to the menstrual cycle had been occurring in one or more glandular lobules of the breasts affected. It is of no value to put forward hypotheses to account for these cases. The whole material is scanty and further investigation is clearly necessary. The material is difficult to obtain on other than a small scale, but the investigations once started will surely be continued.

Insufficient, irregular or delayed involution after lactation is a commonplace of medicine and requires no evidence to be brought forward for its proof. The magnitude of the changes during pregnancy and lactation removes them from any kind of comparison with those during the menstrual cycle, whatever the precise nature of those changes may ultimately be proved to be.

Berka*, 1911, published the results of a detailed research into 46 breasts (mostly obtained from the *post-mortem* room) in various stages, and from women of various ages. He studied chiefly the relationship between the stroma and the glandular tissue, and not the detailed histological changes in the glandular epithelium. He was not concerned with the menstrual changes. Among his specimens were several in the stage of regression after lactation. He divides these into two groups:—

- (a) those which return almost or even entirely to the virginal picture, and
- (b) those in which the regression is clearly incomplete.

In the former he sometimes found a few dilated ducts which, however, he also found in some of the virginal glands examined. He concludes that with considerable intervals between the lactations the regression was the most complete. This presumably denotes that regression after lactation is slower than is supposed, and that when the interval between the lactations is insufficient for regression there is more likelihood of incomplete involution. He considers that the elastic tissue of the gland ordinarily increases in amount with advancing years, and that apart from the question of age, its increase is a mark of decreasing functional capacity of the organ. The chief places for elastic tissue are round the ducts, the vessels, and in the fibrous tissue, but it is not ordinarily found in the glandular lobules of young people. Cheatele (1925) says "the elastica is mainly limited to the ducts and only

* BERKA.—Die Brustdrüsen verschiedener Altersstufen und während der Schwangerschaft. Frankfurter. Zeit. f. Pathol. 1911, viii. 203.

occasionally surrounds acini; more rarely it surrounds a lobule.** (cp. also Dieckmann above).

It is not difficult to see that an excess of elastic tissue may tend to produce areas of incomplete or of delayed involution owing to compression of one or more glandular lobules.

From this point of view it is of interest to note that there was a history of delayed involution in a number of the cases of previous transient mastitis connected with lactation among the women of the cancer series. (See Appendix 2.)

It is evident that permanent involution occurs at the menopause. Berka found that in many senile breasts the picture was similar to that of the virgin breasts except that there was a marked excess of the elastic and supporting structures over the glandular elements. He also found epithelial overgrowths in apparently physiologically involuting breasts, which closely resembled that found in "chronic mastitis" or in cancer. Sebening in one of his cases—a woman of 49—found that the terminal acini of the gland—clearly one undergoing senile atrophy—were becoming pressed apart by the growth between them of connective tissue. As a result of this a number of small cysts were beginning to form especially near the terminal acini. These presented a picture similar to one of early chronic mastitis. It may be noted that in several of the cases quoted in Table 53 the women were approaching the menopause, or had just reached it, and the trouble may have been similar to that described by Sebening.

It appears, therefore, that abnormalities in involution can occur in relation to menstruation, to lactation and to senile involution. That in senile involution the overgrowth of the supporting and elastic tissues is of importance and that small cysts may be found in apparently normal breasts of women of varying ages—chiefly in the terminal ducts.

The occurrence of cysts in the course of senile involution appears to be generally recognised by pathologists in this country—there are several general references to cysts in senile breasts among the cases quoted in detail in Appendices 8-12—but no comprehensive study of this point appears to have been published at all recently in this country or elsewhere except those quoted already.

The material collected for the present inquiry now requires further consideration. On careful analysis it was found that there were many instances of difficulty in differential diagnosis between early cases of cancer and of "chronic mastitis." Further, the pathological report often stated that there was either hyperplasia or "chronic mastitis" in cancerous breasts when no indication of previous breast trouble was given clinically.

Sampson Handley† refers to this particular point and quotes

* Both these authors point out independently that there is a difference between the intra- and inter-lobular connective tissue and the general supporting tissue of the organ.

† Choyce's System of Surgery. 1923. Vol. III. Article, The Breast, 53.

other authors showing that pathologically "chronic mastitis" is far from uncommon in cancerous breasts, but that the clinical histories of previous breast trouble do not always suggest that this has been complained of by the patient.*

The differential diagnosis of early cancer from "chronic mastitis" is admittedly difficult and may be impossible even for an experienced surgeon owing to the similarity of signs. Moreover, the difficulty arises only in early cases of cancer, namely, precisely in those in which it is of the utmost importance that a correct diagnosis should be made.

The cases of the present material have been divided into 5 groups, the first 2 among the control cases and the last 3 among the cancer cases; full details of the cases are given in the appendices quoted.

Control Series:—

Group I. contains 17 cases of "chronic mastitis" or hyperplasia occurring among the women of the control series. Appendix 8.

Group II. contains 7 cases diagnosed clinically as cancer, but stated to be non-malignant on pathological examination. Also control cases. Appendix 9.

Cancer Series:—

Group III. Cases in which the clinical diagnosis was either uncertain or non-malignant, the cases being found to be malignant on pathological examination. This group is divided into two sub-divisions:

A.—28 cases in which the nature of the lump believed to be due to hyperplasia was either not mentioned or where it was believed to be a fibro-adenoma.

B.—19 cases in which the lump was cystic, but was found to be malignant.

47 cases in all. Appendix 10, A and B.

Group IV. contains 5 cases of hyperplasia in which cancer developed after a long interval. Appendix 11.

Group V. 35 cases in which the pathological report gave "chronic mastitis" or hyperplasia in a cancerous breast but in which there was no complaint made by the patient suggestive of this condition. Appendix 12.

We have therefore—

24 cases of known antecedent hyperplasia among the control cases;

47 cases of doubtful or erroneous diagnosis as between cancer and "chronic mastitis" all being cancerous.

5 cases of primary hyperplasia which afterwards developed cancer.

35 cases in which the chronic mastitis was associated with or probably preceded the carcinoma.

From the practical aspect the difficulty of differential diagnosis is well illustrated. The 19 cases of cyst proving to be cancerous are of special interest—they leave no room for doubt that cysts

* McCarty (Collected Papers of the Mayo Clinic, 1915, xii. 918) found chronic mastitic changes in all of 967 cancerous breasts. (18659).

are by no means always innocent, but may become cancerous. Fortunately for the patients concerned the diagnosis of cancer was made, and in the majority of instances a complete operation was undertaken, without delay. But it is well known that cutting into a cancerous focus decreases the patient's chances of life. In the event, therefore, of the wound made in the course of the local removal of the lump cutting into the cancerous focus the patient is in a parlous state. The mental worry and annoyance of a second operation has also to be taken into consideration.

We have then a total of 111 cases of hyperplasia. Of these 24 were not malignant and 87 were malignant. A perusal of the clinical and pathological notes in the appendices concerned makes it difficult to believe that there is not a very close association between chronic mastitis and cancer. It is not easy to see how any more precise proof can be obtained. The five cases in Appendix 11, although few, are difficult to overlook. If there is a transition from hyperplasia to cancer in one case it is probable that it occurs in others—it could hardly be regarded as being a special phenomenon, but as an example of a definite pathological process. Among these five cases there are no less than three of cysts and one of a discharge from the nipple, which was found later to have an intra-canalicular papilloma with carcinoma. The obvious supposition is that these were all initially cases of "chronic mastitis" or hyperplasia in which the first operation removed a part of the disease, and in which the remaining part subsequently underwent cancerous changes.

These cases are analogous to the well-known cases of very long duration. In the present series there are histories of a lump in the breast up to 35 years' duration. The literature contains many of them, and they must be well known to any surgeon of experience. In view of the data available it is likely that these are originally cases of hyperplasia of which for some cause a proportion become cancerous after a long interval. Also it is probable that many women carry lumps many years, and do not die of anything associated with them.

An absolute and direct proof as to the transition from hyperplasia can hardly be forthcoming. By the removal of the tissue for examination, whose subsequent course it is desired to know, the experiment is automatically closed. The position can only be judged by indirect evidence from various sources. Another such source is offered in the literature.

The investigators evidently have to take early cases of cancer or those which belong to the "borderline" type already mentioned, *i.e.*, fall between two limiting types. What, then, in terms of microscopic anatomy, are the definitions of these limiting types? Evidently the limits are given by aggregations of cells which either (*a*) have broken through into tissues to which they do not belong, or (*b*) have not done so.

Although the amount of literature dealing with this subject is small, the authors are unanimous upon the main points. Thus Bertels and Lukowsky on the continent and Cheatle in this country describe and figure almost identical preparations.

All the authors deal with the hyperplasia of the glandular epithelium, and of the supporting tissues, although they do not all agree as to the order of their appearance.

All the authors figure sections in which a definite change has commenced in the glandular epithelium while still within the ducts. The cells have taken on an appearance of unorganised growth, resembling that of cancer cells, while still within their proper boundaries; other adjacent parts of the section show an ordinary picture of hyperplasia.

Lukowsky considers that these cells have become destructive, and that it is merely a question of time before they penetrate the adjacent tissues and a cancerous process is begun. Both Bertels and Lukowsky hold that the process of transition from chronic hyperplasia to cancer sufficiently describes the course of events in some cases of cancer, but do not consider that the description applies to all cases.

In view of the evidence from various sources just quoted it seems reasonably certain that (1) conditions similar to those of chronic mastitis arise in relation to abnormal conditions of involution, whether associated with menstruation, lactation or senile involution,* (2) that cases of hyperplasia of tissue or "chronic mastitis" may become cancerous.

The cases quoted in the Appendices 8 to 12 now require some further consideration. It may be mentioned that the detailed pathological reports are too few as a whole to enable any association to be established between the troubles dealt with in Part III. and the pathological conditions. But it is of interest to study the antecedent histories of the cases in the appendices in which pathological data are available.

The *civil state* of the women has been taken out, and the number and nature of their antecedent breast troubles. It has been shown in Part III. that there is no reason to associate puerperal mastitis with cancer, and three cases of this—one in the control series, one in the cancer series and one in the pathological set of cancer cases—have been disregarded in taking out the data.

The results obtained are shown in Table 54. The numbers are small, especially in the control cases, but if they can be relied upon they suggest that antecedent troubles have as a whole a closer association with non-malignant cases than they have with malignant ones.

In this event it would seem probable that the association with cancer considered in Part III. is in effect rather an association with hyperplasia than with cancer. Such a factor might well be a family tendency to early degeneration of the breast, or possibly there was already some hyperplasia present at the time of the trouble concerned, which, being superposed on the already dis-

* Of these it may be presumed that menstruation is the most important, since cancer of the breast preponderates in single women. In this connection it has already been shown in this report that among married women the less fertile are, as a whole, more affected with cancer than are the more fertile ones.

TABLE 54.

Showing the relative frequency of the occurrence of certain factors in the 109 cases.

	Cases in Appendices 8 and 9 "chronic mastitis" 24 cases.		Cases in Appendices 10 and 11. Cancerous with hyperplasia. 50 cases.		Cases in Appendix 12. Cancerous and hyperplastic. 35 cases.		Total 109 cases.
	No. concerned.	Per cent. of total.	No. concerned.	Per cent. of total.	No. concerned.	Per cent. of total.	
1. No. of single women	7	37.5	20	40.0	7	20.0	
2. Previous Injury ...	10	41.7	12	26.0	9	25.7	
3. Total antecedent troubles other than puerperal mastitis ...	13	54.1	17	34.0	11	31.4	
4. Any two in either 2, 3 ...	4	16.6	14	28.0	7	20.0	

A striking feature is the high percentage of single women.*

ordered breast caused the break through into the surrounding tissue.

Earlier in this part of the report grounds were advanced for supposing that delayed or inadequate involution might be a source of mammary trouble, and it was shown that there was a great resemblance in certain cases to the microscopical picture of "chronic mastitis." The importance of the supporting tissue has been referred to and it will be remembered that opinions differ as to whether the glandular or the fibrous or elastic hyperplasia occurs first. A consideration of the minor departures from the normal as exhibited in the painful lumps, which proved to be glandular lobules, suggests that there is a continuous interaction between the glandular and the supporting structures. It would seem that this must be the case throughout the whole of the physiological life of the organ. Any disturbance of the balance from some undue growth of either glandular epithelium or supporting structure may be followed by a localised delay in the adjustment of the balance. If the balance is not restored a dilatation of the ducts with the formation of cysts may result; or glandular

* Keynes (Brit. Journ. of Surg., 1923, xi. 89) found chronic mastitic changes to be commoner in single women, but he does not give the numbers upon which this statement is based.

lobules may be nipped by the surrounding tissues. Also with the onset of senility, either premature or timely, the excess of fibrous or elastic tissue which results may tend to delay involution either after lactation or perhaps in relation to any of the phases of the mammary cycle. The involution of the gland appears to depend rather upon the condition of the gland itself than on the age of the woman.

The pathological report in case 16 of Appendix 8 in a woman of 39 is suggestive of a senility of the organ out of ordinary relation to the age of the woman. One of the pre-cancerous cases referred to earlier but not quoted in any appendix is of the same order, and is of interest.

Married. Age 43. Mother died of cancer of the breast. Lump noticed about three weeks. *Clinical Notes.* "No adhesions—no glands." *Operation.* Apparently only excision of nodule, but no data. Case entered as cancer in the records. *Path. Rept.* "A nodule removed from the breast. Microscopic section. This was mammary tissue showing chronic fibrosis with cyst formation and proliferation in certain areas of the glandular epithelium. The case should be kept under strict observation." There is no evidence that the patient was seen until she was requested to attend in connection with the present investigation—seven years later. She attended and was found to have no further breast trouble.

On general physiological grounds it seems probable that the interplay of development between the two types of tissue is aided in its regularity by the changes undergone by the gland in pregnancy and lactation. During the natural and extensive development of the breast then occurring the glandular elements gain at the expense of the supporting tissues and possibly in this way tend to ward off that impending increase of these latter which must occur as the gland becomes senile. It is idle to suppose that the changes in the gland in relation to menstruation constitute an adequate functioning of the gland; this occurs only with pregnancy and lactation. On this basis repeated pregnancy and lactation would prolong the life of the gland and, equally, absence of this stimulus may tend to an undue early senility. It is not improbable that if lactation be prolonged up to a point of exhaustion of the glandular epithelium, this may be unable to maintain its ascendancy and the supporting tissues will begin to overcome the exhausted glandular tissue, leading to the incomplete involution and involution cysts found by Berka.

One case in the cancer series, not yet quoted in detail, is very suggestive of this condition of inadequate or delayed involution.

Married. 58. Five children were fed for 2 months each at the breast. The right breast, now affected, never gave as much milk as the left. In the last two lactations, 19 and 21 years respectively before operation for cancer, the right breast remained "knotty" long after the left had gone back to normal. During the last 12 years, before operation, there has been a "tumour" and a tenderness developed in the lower hemisphere on the right breast.

Clinical notes.—The breast was fixed to the chest wall, but no glands were palpable in the axilla. *Operation.*—Complete for cancer. *Path. Rept.*—The nipple is retracted and the skin of the areola is eczematous,

On section a scirrhus cancer is seen in the nipple region, involving the ducts as they radiate from the nipple. Microscopically the tumour presents the characters of a scirrhus cancer with extension along the line of the ducts. The associated glands show malignant involvement.

It seems possible that as injury may produce an increase in the fibrous tissue it may disturb the balance and tend to a hypertrophy of the supporting structures, causing a condition of "chronic mastitis." The work of Maximow (Virchow's Arch. 1925, cclvi. 813), just published, suggests that damage caused to a duct by an injury may be an important factor in the production of cancer.

The tendency to normality in the human body ordinarily prevents any disturbance, and enables the senile development of the elastic tissue of the gland to proceed evenly with the regression of the now useless glandular epithelium. If the breast never receives the stimulus of pregnancy for which it was designed, after a time the fibrous tissues may gain on the glandular, hence the greater tendency to chronic mastitis shown above in the single women. And hence also the known greater tendency to cancer in single women.

On this last point, from the practical aspect, it is immaterial how many cases of hyperplasia become cancerous. If any do so, no one can say when the condition may supervene which will turn the non-malignant condition into a malignant one. Hence it seems necessary to regard all cases of hyperplasia as potentially malignant although fortunately only a proportion become so.

The data at present available are obviously insufficient to afford a basis for a theory which might account for the development of cancer of the breast. Nevertheless, it is reasonably certain that the continually recurring changes of the menstrual cycle—whatever their precise nature—have an important bearing upon the whole process, since there is evidence of an inverse relationship between fertility and cancer of the breast.

Probably at some period, and for causes at present unknown, one of which, however, may well be injury, one part of the breast does not follow the ordinary cycle of the rest of the tissue. This departure from normality may gradually recede, or may become accentuated, but can hardly fail to be affected by the changes occurring cyclically in the whole of the breast tissue. When accentuated, a condition of hyperplasia may result from the cumulative effect of a constantly recurring stimulus.* The evidence dealing with the passage of hyperplasia to a condition of malignancy, while not absolutely positive, is yet of such a nature as to leave little room for doubt that it does occur.

Evidently much additional knowledge is needed both in regard to the changes undergone by the mammary gland with menstruation, as well as into the precise relationship between hyperplasia and cancer.

*It is possible that the rapid growth of mammary cancer during pregnancy may be analogous to these processes.

GENERAL SUMMARY.

The mass of detailed information upon which the several conclusions reached in this report are based is so large, the details are so intricate and inter-related, and the tables are so numerous that it is difficult, if not impossible, to make a summary at once concise and accurate. As a partial substitute the principal findings have been stated at the ends of the different parts, but it will be convenient to some readers if we attempt here to record in some detail the findings which are justified from the text of the report.

In Part I. we have inquired whether the members of the cancer and the control series were homogeneous in respect of qualities which might affect their comparability. We have shown that in respect of (a) Nationality (p. 8), (b) Age distribution, (c) Civil state, and (d) Social position (see pp. 9 and 10 and Chap. 2. pp.11-21) the series are reasonably homogeneous, and therefore suitable for comparison with respect to the principal objects of the inquiry.

In Part II. such phases of normal sexual activity as can be measured statistically have been compared, with the following results:

Those points which do not show appreciable differences between the two series are:—

- | | |
|--|-------------|
| (a) The age at onset of the catamenia. | } (Chap.3.) |
| (b) The age at cessation of the catamenia. | |
| (c) The total duration of sexual activity. | |
| (d) The disturbances associated with the menstrual cycle. (Chap. 4.) | |
| (e) The disturbances associated with the menopause. (Chap. 5.) | |
| (f) The nature of the confinements, i.e., the percentages of normal and abnormal labours. (Chap. 9.) | |

Differences have, however, been established on the following points:—

- (a) The women of the control series are more fertile than the women of the cancer series, when full allowance has been made for age at marriage and duration of marriage. The difference is of the order of 22 per cent. (See Chapters 7 and 8.)
- (b) Complete failure to suckle and the habit of suckling for a very long period were both more common in the cancer series than in the control series. (Chap. 10.)
- (c) The average age at marriage was lower in the control series. (Chap. 6.)

It has long been known that unmarried women suffer from cancer of the breast at a higher rate than married ones. It is now proved that among married women those who are less fertile are at a disadvantage.

The data do not suffice to determine the rôle played by errors of lactation. We should need to dispose of larger numbers of married but sterile women and of fertile women who did not suckle. It can hardly be doubted that the absence of the normal function of the breast must be of importance in unmarried women. It is possible that the continued recurrence in the breast of the changes which occur with each menstrual cycle (cp. Part V.), without the stimulus due to pregnancy and lactation may be the prejudicial factor, but the data here available are insufficient to establish this.

The number of cases of excessively prolonged lactation is not large, and the data do not afford information which would clearly refer the supervention of cancer to exhaustion of the organ, although this may be a predisposing factor. In cases of prolonged lactation the child may drag heavily on the breast or injure the nipple with its teeth.

In Part III. the occurrence of antecedent troubles of the breast is considered. It is recognised that there are sources of error arising out of personal factors, which are liable to interfere with the accuracy of the data obtained. We have tried to diminish the resultant errors and all data on which there appeared to be any doubt have been rigorously omitted. We cannot, of course, expect to have succeeded completely, but it is difficult to see what further precautions could have been taken if any reliance at all is to be placed on the histories given by the patients.

The number of instances in which there was a history of breast trouble have been classified under the several headings below:—

- (a) Suppurative puerperal mastitis.
- (b) Transient non-suppurative puerperal mastitis.
- (c) Cracked nipples.
- (d) Deformity of structure or abnormality of function.
- (e) Injury with known bruising.
- (f) Injury with no bruising or no noticed bruising.
- (g) Repeated slight injury.

The method adopted is fully described in Chapter 12.

No association is shown between suppurative puerperal mastitis and cancer, and such association as may possibly exist with cracked nipples or with deformities is slight.

The closest association is that with injury, while there is also a fairly high degree of association with transient non-suppurative mastitis.

By association we mean that the condition under notice (*e.g.*, an injury) occurred significantly oftener in the breasts which afterwards became cancerous than in those breasts which remained healthy.

The mean interval which had elapsed between the occurrence of the trouble and the incidence of the growth has been taken out for each of the above forms. In Table 40 it is shown that

the intervals are comparatively short for the cases of injury, but extend over a number of years for all other troubles.

The instances in which there was more than one form of trouble have also been considered, but they are numerically insufficient to enable any deductions to be made from them.

Family History.—The causes of the deaths of the parents were obtained so far as these were known to the patient, and have been analysed statistically. So far as the parents of the patients are concerned (and the data respecting other relations were too unreliable and imperfect to utilise) some association between the alleged occurrence of cancer in the two generations is found, but the nature of the material does not admit of any more precise deductions.

Part IV. deals with the clinical data and the subsequent fate of the patients.

Pathological confirmation of the diagnosis was obtained in about 90 per cent. of all the cases and the clinical history leaves no room for doubt as to the correctness of the diagnosis in the remainder. (Chap. 13.)

The symptoms complained of by the patients were tabulated and are given in detail. The data show the great importance of keeping under observation all cases in which complaint has been made of a pain in the breast, even if no lump is present. (Chap. 14.)

About 80 per cent. of all the women came direct to the hospital concerned, that is they gave no history of having consulted their private doctor before attending hospital. (Chap. 15.)

The mean duration of the disease as given by the patient shows that aid could have been sought at a much earlier stage than was the case. The mean interval which elapsed between observing the growth and applying for treatment was about 10 months for those patients who had survived for three years or less since the date of operation. (Chap. 16.)

The clinical condition of those patients who were in hospital at the time of interview shows that only some 15 per cent. presented themselves for treatment at a stage of the disease at which real hope of prolonged relief or of possible cure can be considered likely.

The figures on this point obtained from the *whole* of the present material cannot be regarded as a sample of the condition on application for treatment at hospital of patients generally who are suffering from cancer of the breast, since the material is somewhat in the nature of a favourably selected sample. (Chap. 17.)

The method of operation is dealt with (Chap. 18) and the condition of the patients at the time of interview. (Chap. 19.)

As a whole the data in this part of the report show that the great majority of women seek surgical aid at a period of the disease when it is frequently too late to effect any extensive prolongation of life.

In Part V., various points—chiefly pathological—are considered.

When cancer is excluded, and probably also when it is included, the commonest cause of a mass in the breast is some form of hyperplasia ("chronic mastitis"). Differential clinical diagnosis of the two conditions may be very difficult or even impossible. This difficulty of diagnosis in the early stages of cancer is well illustrated by the fact that in no less than 47 instances out of 169 early cases (Steinthal's Class I., see p. 106, ch. 19) or 27.8 per cent. there was an error in clinical diagnosis, the case being regarded as non-malignant whereas it was in fact malignant. Some errors of diagnosis also occurred in the opposite sense. (Appendices 8 and 9.) Of the 47 cases, 19 were cysts which proved to be malignant. All the hospitals represented in the inquiry were concerned in these cases.

Hyperplasia and cancer are frequently associated in the same breast. In 35 cases, not included above, the pathological report recorded the presence of hyperplastic changes (chronic mastitis) although no mention of this was found in the clinical records, nor had any complaint been made by the patient. The data on this point are incomplete and it is reasonably certain that if the information on this point were available for all the cancer cases, the total figure would be much higher.

There were in all 111 known cases of hyperplasia in this report: 24 among the control series, and 87 associated with cancer. The 111 patients contained a high percentage of single women.

One of the difficulties in ascertaining the average length of time during which lumps eventually diagnosed as cancer have existed prior to operation is that the mean figure may be invalidated by the inclusion of a small number of cases in which the mass has been present for 10, 20, or even 30 years. These masses may have been hyperplastic in their earlier stages, subsequently becoming clinically malignant.

The original cause of the hyperplasia is as yet unknown, but a certain proportion of cases must be regarded as due to injury.

From the point of view of causation it is important to know:—

(a) Whether this condition may progress to a definite carcinoma.

(b) If so, what form its earlier stages may take.

As regards (a) direct evidence of the passage of a non-malignant hyperplasia of the breast to malignancy is not available and it is difficult to see how such evidence can be secured. It is submitted, however, that a considerable mass of material is presented here, which (together with data from the literature) affords grounds for believing that such a transition does occur, although non-malignant hyperplasia may not have occurred previously in all cases of breast cancer.

As regards (b) it is now known that:—

(i) In cases of prolonged amenorrhœa, and also at the

menopause, microscopical appearances identical with those of "chronic mastitis" are not infrequently found. They presumably arise owing to some departure from the normal process of involution.

- (ii) Incomplete regression after lactation is a well recognised clinical phenomenon, and a number of examples were noted in the present inquiry (See especially Appendices 2 and 2A).
- (iii) Painful masses in the breast which, on the present available published data, occur most commonly in the upper and outer quadrant (the most frequent site of cancer) are usually more painful at menstruation. Some of these disappear with simple treatment, or even without treatment, suggesting that the conditions causing them are not far removed from the normal, but they may be of importance in establishing the train of causation.
- (iv) The incidence of cancer of the breast is greater among single women and among the less fertile married women, *i.e.*, those in whom the gland does not attain full function.
- (v) It has been shown recently that definite histological changes take place in the breast during the normal menstrual cycle, but their nature and significance is not yet established.

It is now suggested that at some period or other and for some reason unknown the cyclical involutionary process at one part of the breast takes an abnormal course resulting in a hyperplasia. This hyperplasia may apparently regress, remain stationary, or progress to a condition of malignancy.

The data collected indicating that hyperplasia may be but one stage in the process of evolution of malignant disease (the earlier phases being those of aberrant involution, the later ones those of more or less frank clinical cancer) are so far of the nature of isolated groups of observations. They are, however, suggestive that the succession of events may be as indicated, though many links in the chain are still missing.

The two attributes of living cells being those of growth and function it seems reasonable to suppose on general pathological grounds that under conditions, as in single and infertile women, where function is suppressed, growth may become exaggerated under repeated cyclical processes, until finally or perhaps as the result of some other disturbing condition the neoplastic "habit" is acquired.

It is clear that further research and field inquiries into the nature of the mammary changes at menstruation, lactation and the menopause, and into the causation, nature and course of "chronic mastitis" are urgently required before further progress can be made on the lines indicated above.

APPENDICES 1 TO 7 INCLUSIVE.

Explanatory Notes.—In these appendices the cancer cases have been separated from the control cases. These last have been set out in precisely similar form, but the appropriate appendices, although bearing the same number, are marked with an A.

Throughout all the appendices reference has been made to any other appendix in which the case may occur again owing to there having been more than one trouble in the breasts; of that particular woman, or if there has been some pathological note requiring record. In the text Ap. stands for appendix and the next figure for the number of the appendix. The figure following the / denotes the number of the case in the appendix, viz., Ap. 1/20 denotes that the reference to some other point about the case will be found in Appendix No. 1 and case No. 20 of that appendix.

APPENDIX 1.

Details of the Cases where there had been Puerperal Mastitis with Abscess Formation among the Women of the Cancer Series.

A. Cases where the abscess and the growth affected the same breast.

No. in table.	Lactation in which abscess occurred.	Years between abscess and growth.	Was healing complete.	Was breast used later.	Children in family.	Remarks.
1	1st ...	43	No; always tender	No ...	2	Right breast (now affected) had been getting smaller and hard for some years previously, and the left only was used after the abscess.
2	1st ...	16	Yes ...	Yes, for both later children	3	Abscess developed about 9 weeks after confinement.
3	1st ...	22	Yes ...	Not attempted	2	Both nipples too small to use. Ap. 4/24.
4	1st ...	46	Yes ...	Yes, for nine others	10	Nil.
5	1st ...	18	No; residuary nodule	No ...	5	The four later children would not take the R. breast which had had the abscess; all were fed on the left only.
6	1st ...	40	Yes ...	Yes ...	6	Abscess 14 days after confinement.
7	1st ...	36	Yes ...	Not attempted	4	Breast was opened 7 times; did not heal for 6 months. Both nipples were devoid of apertures to the ducts. Ap. 4/25.

8	1st ...	16	Yes ...	No ...	2	Abscess one month after confinement. Ap. 12/5.
9	1st ...	27	Yes ...	No ...	6	Five later children fed on opposite breast only, as the milk "ran away" from the one with the abscess.
10	1st ...	20	Yes, but slow	No later child	1	Abscess in "early weeks" after confinement. Found growth when she lit herself against the mangle and felt it.
11	2nd ...	9	No; residual lump	No ...	4	Abscess at about 6 weeks and took about 6 weeks to heal. Ap. 6/15.
12	3rd ...	3	Yes ...	No later child	3	A bad septic condition of the breast arose from an abrasion of the skin which became septic; there were three skin scars. Patient had noticed the lump for 2 years (i.e., since one year after the breast trouble), and the condition was inoperable when she applied for treatment. Nil.
13	3rd ...	18	Yes ...	Yes, and 3 later ones	6	Injury to breast 8 months before. Ap. 6/63.
14	3rd ...	38	Yes ...	Yes ...	5	Second abscess was opened twice; some deformity of breast. Ap. 4/17.
15	Both 3rd and 6th ...	17	Yes ...	Yes, but not well	9	Patient states that the abscess was in the upper part of the breast and the growth commenced below the nipple.
16	4th ...	18	Yes ...	Yes ...	5	Injury to breast one year before noticing lump. Ap. 5/24.
17	4th ...	30	Yes ...	Yes ...	5	12th, 18th and 14th children were still-born.
18	4th ...	18	Yes ...	Yes ...	5	The abscess cleared up in about 14 days, but the nipple began to retract afterwards, and there has been pain in the breast ever since—23 years.
19	5th and 12th ...	16 and 31 years	Yes ...	Yes ...	5	
20	8th ...	24	Yes ...	No later child	14	

B. Cases where both breasts had an abscess and one had cancer.

21	1st ...	10	R. Yes; L. No	See under last column	7	The first five children were hardly fed at all, as feeding seemed difficult. The growth in L. breast was removed two years after the birth of the fifth child. The two later children both born after the patient had cancer were fed for 9 months each on the remaining R. breast, which had healed completely.
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No. in table.	Lactation in which abscess occurred.	Years between abscess and growth.	Was healing complete.	Was breast used later.	Children in family.	Remarks.
22	1st and 2nd	22 and 26 years	Yes ...	No; not attempted	5	Several abscesses each time. Also an indefinite history of injury to the R. breast (now affected) about 1-2 years before noticing growth.
23	1st ...	23 and 25	R. Yes; L. Nodule	No ...	10	Abscess on both sides at 6 months in first lactation and again after 3rd confinement. No attempt to feed was made after the first abscesses. Blow on R. breast, which became cancerous. Ap. 6/50.
24	6th ...	20	Yes ...	Yes, for two lactations	8	Nil. Ap. 10/2.
25	7th ...	One year	Doubtful...	No later child	7	Lactation with last child continued 2 years; this child would not take the left nipple and the R. breast only was used. On weaning, first the left and then the right breast suppurated and burst. Both healed, apparently, but discharge soon began to come from the left nipple, the skin of which "had remained dusky." On applying for treatment the growth was found to be very advanced.

C. Cases where the abscess and the growth occurred in opposite breasts.

26	1st ...	13	Yes ...	Yes ...	3 pregnancies	Abscess in R. breast. Growth in L. Transient mastitis in both breasts following a miscarriage eleven years after the abscess. Both breasts were then very painful for a month or more. Aps. 2/22 and 10/38.
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27	1st ...	23	Yes ...	No ...	1	Abscess in L. Child fed 9 months on R. breast. Growth in R. breast. Ap. 10/19.
28	1st ...	44	Yes ...	No ...	4	Abscess in 1st week of first lactation; no further feeding was attempted.
29	2nd ...	25	Yes ...	Yes ...	3	1st and 3rd children fed on both breasts. 2nd on left only. The abscess was in the R. breast and the growth in L. Ap. 10/46.
30	2nd, 3rd, and 4th	11, 14 and 17 years	Yes ...	No; R. only	5	Abscesses in L. breast each time. This had a small nipple which could not be used, and the R. only was taken by all five children; all fed 9 months. Growth in R. breast. Doubtful injury of affected side. Ap. 4/32.
31	3rd ...	18	Yes ...	Yes ...	4	Abscess in R. Growth in L. breast. The abscess is stated to have arisen as a result of an injury to the breast during lactation, at about the 3rd month. Also a later doubtful injury was mentioned.
32	3rd and 4th	34 and 35	No; nipple remained tender and the opposite site also.	No; nipples too tender	7	First two children fed on both breasts. Abscess R. Growth L.
33	9th ...	12	Yes ...	No later child	9	The abscess scar in the L. breast is exactly symmetrical with the site of present atrophic scirrhus of R. breast, and both are at the points where corset busks had "poked in for many years." Ap. 7/41.
34	5th ...	7 years	Yes ...	Hardly ever used at all	5	There was deformity of the nipple in the R. breast, making it difficult to use for feeding; children therefore fed almost entirely on L. breast. R. breast had an abscess with last lactation. The L. breast sustained an injury and cancer developed in that breast. Aps. 4/34 and 5/20.
35	Uncertain	About 35 years	Yes ...	Yes ...	4	A malignant ovarian cyst was removed about 2 months before operation. Aps. 3/3 and 5/5.
36	3rd ...	7 years	Wound healed	No ...	3	The third child could not be nursed at all. Ap. 6/27.

APPENDIX 1A.

Details of the Cases where there had been Puerperal Mastitis with Abscess Formation among the Women of the Control Series.

4. Cases where one breast only was affected.

No. in table.	Lactation in which abscess occurred.	Years between abscess and interview.	Was healing complete.	Was breast used later.	Children in family.	Remarks.
1	1st	42	Yes	Yes	2	Abscess at 3 months after confinement. Always plenty of milk.
2	1st	41	Yes	Not attempted	2	Abscess at first month. No further attempt at feeding.
3	1st	27	Yes	No	11	All the other children were fed 12-14 months on the L. or opposite breast only, as the babies would not take the R., which had had the abscess.
4	1st	8	Still some thickening	No	2	1st child fed one year on opposite breast only. Second not fed at all.
5	1st	21	Yes	Yes	11	All children fed varying periods on both breasts.
6	1st or 2nd	29 or more	Yes	No	11	All later children fed on opposite breast.
7	1st	32	Yes	Yes	4	1st child weaned. Three later ones fed on both breasts for 2 years.
8	1st	33	Yes	Yes; with shield	5	All except one, who died a few days after birth, fed some months on both breasts.
9	1st	23	Yes	No	12	Said to have no milk, after the first lactation. Injury to L. breast (which had the abscess) before marriage. Ap. 6A/6.

10	1st & 3rd	40 and 46	Yes	Yes	4	All children fed over one year.
11	1st	14	Yes	No	4	1st child weaned when abscess found. Said to have had no milk with later pregnancies, in either breast.
12	1st	43	Yes	Yes; and for same child.	12	Feeding continued in spite of abscess and for ten other children. One not breast fed.
13	1st	35	Yes	Yes; for same child also	3	All 3 children fed 9-12 months.
14	1st	41	Yes	Yes	11	All fed 1-2 months only. Six children died of "wasting" soon after birth.
15	1st	30	Yes	Not allowed to by her doctor	12	All children fed on opposite breast only for periods of from 4 months to 1 year.
16	1st	23	Yes	No	3	Abscess at 10th month of lactation, after cracked nipple; both later children fed on opposite breast. Ap. 3A/10.
17	1st	7	Yes	No later child	1	Abscess on weaning at 7th month.
18	2nd	30	Yes	No later child	2	Between the two pregnancies there were five miscarriages. Ap. 8A/6.
19	2nd	16	Yes	No later child	2	First child not breast fed; 2nd fed 10 months. Abscess on weaning.
20	2nd	25	Yes	Not attempted	6	Second child weaned; no further attempt made to feed with either breast.
21	2nd	28	Yes	Yes	9	Second child fed 4 months only; all the rest fed on both breasts for longer periods.
22	2nd or 3rd	Over 30	Yes	Yes	10	All later children fed for 12-15 months on both breasts.
23	2nd	22	Yes	Yes	8	Abscess apparently after death of child at 6 weeks. Seven other children fed 10-12 months on both breasts.
24	2nd	18	Yes	No	3	Cracked nipples with 1st child. Not fed at all. 2nd and 3rd fed 15 months with opposite breast only. Affected breast had very depressed nipple. Aps. 3A/15 and 4A/10.
25	2nd	29	Yes	Yes	13	The abscess was treated with "cowdung, which dispersed it." All the children were fed 12-15 months.
26	3rd	36	Yes	Yes	12	Nine fed for one year on both breasts, and 3 fed for 10 days only.

APPENDIX IA—continued.

No. in table.	Lactation in which abscess occurred.	Years between abscess and interview.	Was healing complete.	Was breast used later.	Children in family.	Remarks.
27	3rd ...	33	Yes ...	Yes ; also for same child.	4	All children fed on both breasts.
28	4th ...	28	Yes ...	Yes ...	9	Abscess at onset of lactation. Three out of the five later children fed for 15 months on both breasts.
29	4th and 6th ...	11 and 15	No ; residual nodule	Yes ...	7	Nil
30	4th ...	44	Yes ...	Yes ...	8	5th and 6th children not fed at all. 7th and 8th fed 6 months with both breasts. Ap. 6A/11.
31	4th ...	23	Yes ...	Yes ...	6	Abscess with 4th child at 9 months; feeding continued for 14 months, and 4 others fed with both breasts to 14 months. One not fed at all. Opposite breast only used for the last four children.
32	4th and 5th ...	11 and 13	Residual nodule.	No ...	9	Opposite breast only used for last child.
33	5th ...	13	Yes ...	No ...	6	All children fed for varying periods between 3-10 months on both breasts. Ap. 5A/7.
34	5th ...	37	Yes ...	Yes ...	7	First and third not fed at all. Rest all 1½-2 years on both breasts.
35	5th ...	22	Yes ...	Yes ...	6	Abscess on weaning. Last child of all fed on opposite breast only. No milk in the one which had an abscess.
36	6th ...	14	Yes ...	No ...	7	Abscess at end of 1st month of lactation.
37	6th ...	21	Yes ...	Yes ; for same child.	6	6th and 8th children were still-born. Abscess after one of these confinements. All others fed for one year.
38	6th or 8th (not remembered)	Either 37 or 42	Yes ...	Yes ...	11	

39	7th ...	24	Yes ...	Yes ...	8	Six out of the 8 children fed for about a year on both breasts. The seventh child was one of them.
40	7th ...	34	Yes ...	Yes ...	10	All children fed 12-18 months.
41	7th ...	30	Yes ...	Yes ; for same child.	11	Abscess at onset of lactation : 1st three children fed 8 weeks only ; others about a year or more.
42	8th ...	19	Yes ...	Yes ; for same child.	8	All children fed one year.
43	13th ...	23	Yes ...	Yes ...	17	All 17 children fed 8 months on both breasts.
44	? not remembered	14 or more	Yes ...	Yes ...	5	Four were fed on one side only (? which) and the last one both breasts. Data imperfect.
<i>B. Cases where both breasts were affected.</i>						
45	1st ...	31	Yes ; but see under last column.	Yes ...	3	Small superficial abscesses formed on both breasts with 2nd and 3rd lactation. Last child only fed about one month.
46	1st ...	10	Yes ...	Yes ...	2	First 2 children not fed. Abscess about 14 days after confinement. Last 3 children fed 9-12 months on both breasts.
47	1st ...	26	Yes ...	No ...	2	Abscess soon after confinement. Child weaned at one week. The abscesses appear to have been rather superficial and numerous. 2nd child not fed at all.
48	Abscess in R. with 1st and in L. with 2nd	3 and 7	Yes ...	Yes ...	2	Both children fed for a year or more.
49	6th and 7th R. with 6th L. with 7th	8 and 11	Yes ...	No ...	11	History of injury. Five children : the first five were fed for one year on both breasts. Ap. 5A/2.

APPENDIX 2

Details of Cases of Transient Mastitis without Abscess Formation, among the Women of the Cancer Series.

A. Cases where the mastitis and the cancer were in the same breast.

No. in table.	Lactation in which trouble occurred.	Years between trouble and growth.	Was healing complete.	Was breast used later.	Children in family.	Remarks.
1	1st	26	Yes	Yes; did not stop suckling	6	Breast hot, swollen and tender; History of injury to same breast. Ap. 5/2.
2	1st	23	Yes	Yes; for both later children	3	Breast hot, swollen and tender for some days. 1st child not suckled.
3	1st	28	Yes	Yes	3	Continued suckling.
4	1st	19	Yes	Yes	1	Continued suckling. Inflammation chiefly in nipple.
5	1st	10	Yes	Yes; continued feeding	1	Breast became swollen and hard about 3rd month of lactation, and improved by massage, but always remained swollen and harder than the other. Ap. 6/28.
6	1st	19	Yes	Not attempted	2	There was a bad cracked nipple early in lactation after which the breast became inflamed for 4-6 weeks. Feeding was continued with the opposite breast for about 2 months and this was used for about 1 month with next child. No attempt was made later to feed with affected breast. Also history of injury. Aps. 3/4 and 5/9.

7	1st	7	Yes	No	1	Left breast painful for some time after confinement. She also had abscesses in both armpits twice. Growth apparently regarded as non-malignant. Ap. 11/1.
8	1st	21	? See under last column	No later child	1	The trouble occurred at weaning and the breast remained "lumpy" for a long time.
9	1st	20	Doubtful	No; refused by babies	3	Inflammation soon after 1st confinement; breast not used for that one and later two children would not take it.
10	1st	32	Yes, gradually	Yes, for 4 children	5	2nd child fed on left only and 3rd not at all.
11	1st and 2nd	11 and 6 years	Doubtful	Yes	2	Swelling and a "hump" in breast after confinement, gradually disappeared.
12	2nd	13	Yes, apparently	No later child	2	Breast very painful on weaning with both children: first had massage, but finally relieved by belladonna. Breast lumpy for a long while.
13	2nd	5	Yes	No later child	2	Breast swollen, hot and painful for about a week, child weaned soon after, subsided with fomentations. Had a blow on the breast about 3 months before operation, which caused ulceration of existing tumour.
14	2nd	13	Yes	Yes	2	Lactation was stopped when the inflammation started and was not revived.
15	3rd	27	Yes	Yes	5	Acute mastitis without abscess on weaning 2nd child. The 1st child was still-born, so that the inflammation occurred with the 1st lactation. Patient wore high corsets, but no sign of injury.
16	3rd	33	Yes	No other child	4	3rd child died a month after birth. L. breast became hard and painful afterwards.
17	7th	22	Yes	No later child	3	Inflammation after weaning last child. Patient applied "brown paper, treacle and flour to stop the milk." Also history of injury Ap. 6/78.
18	With 10 children	4 years since last	Doubtful	No later child	7	Breast became hard and painful at 6 weeks; child was weaned.
					11	L. nipple very small; children would only take it for a few months after which she fed with R. breast only. L. was inflamed on each occasion on weaning; breast became hard, painful and swollen. Ap. 4/9.

No. in table.	Lactation in which abscess occurred.	Years between abscess and growth.	Was healing complete.	Was breast used later.	Children in family.	Remarks.
19	1st ...	29	Yes ...	Yes; 3 later children	4	<i>B. Cases where there was mastitis in both breasts.</i> Both breasts affected, but R. worse than L. R. bad for a long time and remained lumpy giving rise to frequent discomfort. Also history of injury. Ap. 6/54. Patient had a lump in her R. breast for 11 years before the only pregnancy; therefore a history of 20 years' growth. Both breasts inflamed after confinement. Both breasts painful after each confinement; also lump, but no abscess. Thinks she strained herself nursing sick mother. The third pregnancy terminated in a miscarriage, after which both breasts were very painful and swollen for about a month. Patient also had an abscess with the first lactation in the R. breast, or the opposite one to the breast which developed cancer. Aps. 1/26 and 10/38. After weaning there was trouble with both breasts. Lump developed in each of them, but especially the R., which was afterwards affected with cancer.
20	1st ...	9	See under last column	No other child	1 pre-mature only	
21	1st and 2nd	4	Doubtful...	No later child	2	
22	3rd ...	2	Doubtful...	No later child	3	
23	2nd ...	14	Doubtful...	No later child	2	
24	2nd ...	21	Yes ...	No later child	2	<i>C. Cases where the mastitis was in the opposite breast to the one which became cancerous.</i> Lump developed in axillary tail of L. breast, which gradually subsided with massage. Child was weaned. Cancer developed in the R. breast. Swelling of outer part of L. breast. R. breast never had any secretion and was not used. R. became cancerous. Aps. 4/13 and 12/30. Patient apparently continued feeding the 8th child with both breasts; the 9th and last child, born later, refused to take the R. breast which had not been inflamed and was weaned at 3½ months. Growth felt a few months later.
25	4th ...	18	Yes ...	No later child	4	
26	8th ...	2½	Yes ...	Yes ...	9	

APPENDIX 2A.

Details of Cases of Transient Mastitis without Abscess Formation among the Women of the Control Series.

4. Cases where one breast only was affected.

No. in table.	Lactation in which trouble occurred.	Years between trouble and interview.	Was healing complete.	Was breast used later.	Children in family.	Remarks.
1	1st, 2nd and 3rd	37, 35, and 33 years	Yes	Yes ...	3	Inflammation of L. breast with rise of temperature after each confinement; all three children fed on both breasts, but some supplemental feeding needed first few weeks. All three later children suckled with both breasts.
2	1st ...	24	Yes	Yes, continued suckling	4	
3	1st ...	A few months	Yes	No later child	1	
4	1st ...	6	Yes, but slow	No later child	1	No attempt made to suckle. Patient had flat nipples. Ap. 4A/5. Baby fed one day only. Breast painful about a month. Nodules left for a long time. Two attacks with first child "No milk" for second.
5	1st ...	8	Yes	Not attempted	2	
6	2nd ...	23	Yes	No later child	2	Child weaned when inflammation started at 5th month. All four later children breast fed. Four or five later children were fed 12-15 months on both breasts. Child weaned.
7	2nd ...	38	Yes	Yes ...	6	
8	4th ...	22	Yes	Yes ...	14	
9	4th ...	16	Yes	Yes ...	9	

APPENDIX 3.

Details of Cases of Cracked Nipples among the Women of the Cancer Series.

A. One cracked nipple on same side as later growth.

No. in table.	Total No. of Children	Lactation of cracked nipple.	Years between trouble and growth.	Was breast used later.	Remarks.
1	4	1st ...	32	Yes ...	The first three children were fed for short periods only. The 4th for 9 months. Nipple was painful all through first lactation of 4-5 weeks.
2	1	1st ...	22	No later child	Nipple of affected breast inverted. Ap. 4/2.
3	4	Uncertain ...	About 35 Years	Yes ...	Numerous injuries to breast in youth. Also one later. Abscess in opposite breast at one lactation. Aps. 1/35 and 5/5.
4	2	1st ...	19	No ...	The affected breast was always small, and there was also transient mastitis; also an injury later. Aps. 2/6 and 5/9.
5	7	With 4 children ? which	1 year or rather more	?	Patient fed 4 out of the 7 children; there was a cracked nipple each time, but she could not remember with which. Ap. 10/35.
6	3	All three ...	2 years ...	No later child	This is doubtfully a cracked nipple. There was discomfort in the R. breast on suckling with each child; at the last lactation she "felt as if the whole breast was being dragged out."

B. Both nipples cracked.

7	7	With each lactation	About 7 years since last	No later child	Cracked nipples each time on both sides.
8	3	1st, 2nd and 3rd	19	No later child...	Both nipples badly cracked for 10-14 days with each child.
9	2	Both ...	15	No later child...	Both nipples badly cracked with both children.
10	3	Each time ...	26	No later child...	NIL.
11	5	Nearly every time	27	Yes ...	Also history of conset trouble. Aps. 7/2 and 12/7.
12	4	1st ...	37	No later children suckled	Also history of injury with a tennis ball. Ap. 6/70.
13	4	1st, but no children suckled	7	Not attempted	It is not certain from the notes whether there was not also some associated deformity.
14	1	1st ...	8	For a time only with same child	Was only able to use the breast later affected for 4 months; the other was used 8 months. Both had cracked nipples.

C. Cracked nipple on opposite side to later growth.

15	3	Apparently with all 3	8	No later child...	Cracked nipples, and was never able to feed more than one month. Ap. 7/22.
16	4	... 4th ...	25	No later child...	The cracked nipple was in the L. breast, and the growth developed in the R. one. Ap. 11/4.

APPENDIX 3A.
Details of Cases of Cracked Nipples among the Women of the Control Series.
A. *One nipple cracked.*

No. in table.	Total No. of Children.	Lactation of cracked nipple.	Years between trouble and interview.	Was breast used later.	Remarks.
1	7	1st ...	48	Yes, for all six later children	Continued suckling.
2	2	2nd; 1st still-born	34	No, no other children	Child weaned; suckling too painful to mother.
3	3	1st ...	32	Yes ...	Continued suckling same child with both breasts.
4	3	1st ...	28	Yes ...	Used breast pump or nipple shield and continued feeding.
5	2	1st and 2nd ...	15	No later child...	Slight injury a few months ago. Ap. 6A/10.
6	3	1st, 2nd and 3rd	35, 33 and 30 years	Yes ...	Continued feeding with both children.
7	6	1st ...	29	Yes ...	Continued feeding in each case. Ap. 6A/12.
8	4	1st ...	23	Yes ...	NIL.
9	5	1 all ...	7	Yes ...	Third and fourth children were fed 12 months on both breasts. Second not fed at all.
10	3	1st ...	23	No ...	All children fed 13 months.
11	3	1st, 2nd and 3rd	18, 15 and 10 years	No later child	Abscess after cracked nipple. Ap. 1A/16.
12	3	2nd ...	27	Yes ...	NIL. Ap. 8A/16.
13	6	4th ...	25	Yes ...	Cleared up quickly on removing child from that breast. Aps. 6A/18 and 9A/3.
14	4	4th ...	31	No later child...	Continued suckling.
15	3	1st ...	20	Yes ...	Child apparently weaned after one month.

B. *Both nipples cracked.*

Both nipples cracked. R. breast had abscess with 2nd child, and the nipple of that breast is deformed. Aps. 1A/24 and 4A/10.

APPENDIX 4.
Details of Cases of Deformity or of Abnormality of the Nipple or Breast in the Women of the Cancer Series.
A. *Where the abnormality was on the same side as the growth.*

No. in table.	Total No. of Children.	No. fed on abnormal breast.	No. fed on opposite breast.	Nature of Defect.	Remarks.
1	3	3 but see under last col.	3	L. nipple very small ...	With each lactation a false nipple had to be used for the affected breast at first, which was discarded later. Breast often very painful when suckling.
2	1	1	1	Inverted nipple of R. breast ...	The R. nipple was also badly cracked; patient continued feeding with that breast when the cracks had healed. There were several miscarriages, but no later children. Ap. 3/2.
3	0	0	0	Peculiar rosette shape of L. nipple spread out like a plaque	Same side as growth.
4	2	0	2	R. nipple quite flat ...	No attempt made to use breast affected.
5	2	0	2	Depressed nipple ...	Too depressed for child to get at.
6	0	0	0	Nipple of R. breast quite flat	NIL.
7	0	0	0	L. breast had always been "hard" from girlhood	There was no lump in earlier life and no pain.
8	2	0	2	R. breast became too uncomfortable to bear if suckling was attempted	Apparently no actual deformity to be seen.
9	10	10 in part only; see last col. but one	10	L. nipple small. Babies would only take it a few months	When babies refused L. breast it always became hard and painful; apparently no actual inflammation. Ap. 2/18.

No. in table.	Total No. of Children.	No. fed on abnormal breast.	No. fed on opposite breast.	Nature of Defect.	Remarks.
10	10	0	10	No nipple at all to R. breast ...	Deformed breast and growth.
11	7	0	7	R. nipple retracted, could not be used	R. breast never developed much during pregnancy.
12	3	0	3	No milk whatever in L. breast at any time	Patient did not know of any apparent deformity of the L. breast nor is there any record in the notes, but there was no possibility of using it for suckling. Ap. 12/35.
13	4	0	4	No milk at all in the R. breast	There was swelling of the L. breast when feeding the last child, 20 years before operation, which disappeared under treatment. Apparently inflammatory. The R. (affected) breast also showed hyperplasia. Aps. 2/25 and 12/30.
14	0	0	0	No nipple in L. breast ...	L. nipple appeared to be replaced by a pigmented area, which was not detected as such until examined by the pathologist.
15	4	Hardly at all	4	L. nipple depressed ...	L. breast hardly able to be used.
16	4	0	1	L. nipple retracted ...	R. breast only used for one child, also injury from corsets. Ap. 7/19.
17	9	9	9	Depressed L. nipple ...	Deformity not sufficient to prevent suckling. Patient is a high grade imbecile. Ap. 1/15.
18	6	6 partly	6	R. nipple flat ...	Little milk and suckling difficult with R. breast. Ap. 7/5.
19	3	3 partly	3	L. breast always smaller than R., and had little milk and was used less.	Nil.
20	0	0	0	R. breast much larger than left	An indefinite history of several knocks of the larger breast against furniture while at work,

B. Where both nipples or breasts were abnormal and the growth on one of them.

21	6	0	0	Both nipples so small that child could not take them	Milk ran out of nipples on both sides; efforts to feed with shield unsuccessful.
22	1	0	0	Both nipples retracted	No attempt made to feed.
23	11	0	0	Both nipples completely retracted and invisible	Every effort to feed was unsuccessful.
24	2	1 (a little)	1 (a little)	Both nipples too small for child to suck	1st child fed one month. No attempt with 2nd. Also puerperal mastitis with abscess. Ap. 1/3.
25	4	0	0	Both nipples completely "blind"	Breasts believed to have had milk, but none could get out. Abscess with 1st child. Lasted 6 months. Ap. 1/7.
26	3	0	0	No milk whatever in either breast. Birth-mark on L. breast became sarcomatous	R. breast injured and became carcinomatous. Aps. 6/3 and 12/4.
27	11	0	0	L. breast smaller than R., but no milk in either breast.	L. affected with cancer; also injury with corsets. Ap. 7/28.
28	2	0	0	Both nipples too depressed to use.	Injury to L. (affected) breast. Ap. 5/31.
29	8	0	0	Both nipples invisible with retraction	No milk whatever could be obtained with a pump. History of doubtful injury to L. breast—the one affected.
30	1	0	0	No nipple in either breast. Sister has the same defect.	L. breast which became cancerous had an injury. Aps. 5/38 and 10/28.

C. Cases where the normal breast became cancerous and not the abnormal.

31	8	8	8	L. breast larger than R. and used more for feeding on this account. L. developed cancer.	Nil.
32	5	0	5	The L. nipple is too small to use. R. breast used exclusively for the five children; all fed 9 months.	Three attacks of septic mastitis in L. breast. Rather doubtful history of injury to R. breast, later cancerous. Ap. 1/30.

No. in table.	Total No. of Children.	No. fed on abnormal breast.	No. fed on opposite breast.	Nature of Defect.	Remarks.
33	3	0	3	R. nipple too small for child...	L. breast only used for 3 children. History of injury to L. breast which had growth. Ap. 5/21.
34	5	0	5	Retracted nipple ...	The five children were fed on the L. or opposite breast which had an injury and later became cancerous. There was an abscess in the R. or the abnormal breast. Aps. 1/34 and 5/20.

APPENDIX 4A.

Details of Cases of Deformity or of Abnormality of the Nipple or Breast in the Women of the Control Series.

A. Where only one side was affected, Nos. 1-2.

1	0	0	0	R. nipple retracted ...	No pregnancies at all. Patient had a cyst of the same breast. Ap. 8/15.
2	6	3	5	R. nipple retracted ...	With the aid of a shield the R. breast was used for the 1st three children, but the 4th and 5th were fed on L. only. 6th not fed. Aps. 6A/9 and 9/6.

B. Where both sides were affected, Nos. 3-12.

3	1	0	0	Both nipples retracted ...	No effort made to suckle.
4	5	0	0	Neither breast gave any secretion after any pregnancy	Nil.
5	1	0	0	Both nipples almost flat ...	No attempt made to suckle. Transient mastitis occurred. Ap. 2A/3.
6	3	0	0	Both nipples completely depressed	Plenty of milk in both breasts, but it was impossible to suckle.
7	9	9 (a little)	9 (a little)	Both breasts and nipples very small	Patient fed each child for a little time; never more than 2-3 weeks as this was as long as was possible.
8	3	0	0	Nipples deeply fissured ...	The children were unable to take the nipples at all.
9	3	1	2 (see under last col.)	Both nipples depressed ...	1st child could not take either nipple; no attempt made at drawing them out; 2nd child was able to take the L. breast after drawing out, and 3rd child took both breasts.
10	3	0	2	Both nipples depressed but R. very much so, and L. only slightly	Cracked nipples with 1st child and an abscess in R. breast with 2nd child. The 2nd and 3rd children were fed on the L. breast. Aps. 1A/24 and 3A/15.
11	5	0	0	Both nipples retracted, also never any milk in R. breast	Nipples too retracted to use. Ap. 9/4.
12	1	1	1	Both nipples retracted ...	With difficulty the child was fed for 2 months. Patient had eczema of the nipples at age of 46; which she treated with ointment and it got well.

APPENDIX 5.

Details of Cases of Injury to the Breast, associated with a definite History of Bruising, among the Women of the Cancer Series.

A. Cases where the Injury and the Growth were in the same Breast.

No. in table.	Side affected.	Period between injury and growth.	History of injury.
1	L.	20 years ...	Fall from a bicycle, bruising caused by breast hitting the handle-bars. All her life since girlhood patient had had attacks of mammary pain. Later she noticed a lump and she was treated for 2 years by a private doctor for "chronic mastitis." She refused operation till the growth was advanced.
2	R.	9 years ...	Blow with the handle of clothes wringer causing bruising. No lump at the time. Patient had transient mastitis of same breast 26 years previously. Ap. 2/1.
3	L.	2-3 months...	Blow from the handle of a bicycle some weeks before noticing lump; the breast was bruised.
4	L.	11 months ...	Had a blow on the left breast in a crowd, which caused pain and bruising. The breast had been noticed to be smaller than the right for 5 years. Patient seems to have been uncertain whether it had always been so or not. There was no lump at the time of the injury; this was first noticed 11 months later. History indefinite, but suggests either an abnormality or a diseased condition prior to the accident.
5	L.	Uncertain ? some years	Patient had numerous bruises on her breast (? breasts) in her youth. Later she had a severe knock from an elbow, on the site where the growth appeared later. She also had cracked nipples; also puerperal mastitis in opposite breast. This patient had a simple ovarian cyst removed in 1915 and a malignant one from the other ovary in 1920. She also had had nasal polypi removed. Ap. 3/3 and 1/35.
6	L.	4 years ...	Fell off steps and dislocated L. shoulder, with severe bruising of L. breast. Later ? date she noticed a very small lump.

APPENDIX 5—continued.

No. in table.	Side affected.	Period between injury and growth.	History of injury.
7	L.	7 years ...	Hit left breast heavily against the coal house door: very painful and bruised. Was then pregnant, and was confined a month later. Lactation was extremely painful with that breast. Seven years later she again injured the same spot and then felt the lump for the first time; it was not palpable on the occasion of the first injury.
8	L.	About 27 years	When 2 months pregnant she fell downstairs and hit her breast against the post at the bottom. Breast exceedingly painful and looked "like raw liver." Was bad for a long time, but she was able to feed the child with that breast.
9	R.	2 years ...	Patient was hit violently in the street by the elbow of a drunken man; breast painful and badly bruised; remained tender till she felt the lump 2 years later. Also had cracked nipple and transient mastitis in the same breast. Ap. 2/6 and 3/4.
10	L.	3 months ...	Was carrying a large pile of dishes along a dark corridor and ran into an open cupboard door. L. breast terribly discoloured for a long time and very painful. No lump was palpable at the time of the injury. First palpable 3 months later. Ap. 12/27.
11	L.	31 years ...	While nursing the last child but one patient bruised the L. breast accidentally against a door. (The L. breast was used for feeding more than the R.) The breast suppurated and the abscess was opened. It healed completely, and she used the breast for feeding the last child. <i>Note.</i> —The case is not included in Ap. 1 as the connection between the injury and the lactation was fortuitous.
12	L.	16 years and 1 year	Got hit on left breast when "larking" 16 years before; breast badly discoloured and painful, but cleared up. About one year before operation a heavy curtain cornice fell on to the same breast and about the same spot. Again there was bruising and much pain, but no lump was then present; first palpable about 6 months later.

APPENDIX 5—continued.

No. in table.	Side affected.	Period between injury and growth.	History of injury.
13	R.	? A short time only	During the last lactation in 1900 the R. breast was hit very hard by a ball. As the bruise disappeared a hard red area appeared at the site of the injury. The redness gradually disappeared, but the hard lump remained, and was stationary till 1911, when, after the prolonged strain of nursing a brother it began to grow rapidly.
14	L.	9 months ...	Blow from a broom handle; breast black and blue; no lump then palpable—first felt 9 months later.
15	L.	About a year	Fell on a rake; L. breast discoloured; no lump then; first felt a year later.
16	L.	8 years ...	Had a knock from a chair—breast black and blue. Lump appeared later on site of injury.
17	R.	One year ...	Fell off a tramcar—whole side black and blue. Lump felt a year later.
18	L.	3 years ...	Blow from the handle of a wringer on L. breast; skin discoloured. Lump first felt 2 years later.
19	L.	3-4 years ...	Hit breast against a door; bruising and much pain. No lump then.
20	L.	1 year ...	Blow on L. breast causing bruising, no lump palpable then. The opposite breast had a retracted nipple, and had also an abscess; the left breast had been used almost exclusively for suckling 5 children. Ap. 1/34 and 4/34.
21	L.	3-4 months	Received a severe blow from an artificial arm worn by a son, who had fits after being wounded in the war. Breast black where blow fell, and very painful. No lump at the time. Rubbed it gently, and as the pain disappeared she began to feel the lump. The affected breast had been used exclusively for feeding, as there was a deformity of the R. one. Ap. 4/33.
22	R.	Injury in "girlhood"	Blow from a man's elbow in a crowd. Breast black and blue. Ap. 7/23.
23	R.	1 year ...	Direct blow from a fist on R. breast: discoloured and painful. Pain gradually ceased and in a few months a small lump appeared which increased steadily and gained rapidly in size: later blood-stained discharge from the nipple.

APPENDIX 5—continued.

No. in table.	Side affected.	Period between injury and growth.	History of injury.
24	L.	1 year ...	Fell over a stool a year previously. L. breast badly bruised. Lump felt about a year later. Also abscess of same breast. Ap. 1/18.
25	R.	9 months ...	A packing case of fruit fell on R. breast: no lump then. Skin discoloured. Lump felt about 9 months later.
26	R.	4 years ...	There have been blows on both breasts. The L. breast was injured by a fall 24 years before; an abscess formed which was opened at hospital. About 24 years later there was an injury to the R. breast with bruising and "lumps" were felt: the "lumps" apparently disappeared. 3½ years later she felt one lump in the R. breast: this was operated on and was cancer. Three years later again there was a lump in the L. breast—also cancer—presumably secondary—which was also operated upon.
27	L.	3-4 months	Bruised L. breast against a desk. Site of greatest injury rather higher in the breast than the site of the lump which appeared after 3-4 months.
28	L.	2-3 months	A clothes line just set up with heavy wet things fell hard on L. breast: no lump then, but bruising. Ap. 12/31.
29	R.	7-8 years ...	Hit on L. breast: very painful and discoloured for a long while. Lump first felt on same spot 7-8 years later.
30	R.	1-2 years ...	Knocked R. breast hard against corner of a table when working on munitions during the war. Skin bruised for some time. Lump not then present.
31	L.	1 year ...	About a year before operation patient slipped in her bath and hit her left breast against the edge. The pain was intense and much worse than the amount of discoloration suggested. As she continued to have considerable discomfort she went to her doctor a year later, who found the lump. Also deformity of breast. Ap. 4/28.
32	L.	10 years ...	Patient hit her L. breast very hard in the dark against the handle of a perambulator which had been left standing accidentally in the passage. She fainted with the pain; the breast was badly bruised and very painful for 2-3 weeks. Nine years

APPENDIX 5—continued.

No. in table.	Side affected.	Period between injury and growth.	History of injury.
			later the same spot became painful and discharge came from the nipple. The lump appeared rather later again.
33	L.	4 years ...	Fell off a tramcar and was unconscious. L. side and breast terribly bruised; took a long time to get well.
34	R.	1 year ...	Fell off a tramcar on to her R. side: R. arm and breast badly bruised and painful: complained very much of it for a long time. Lump first palpable about a year later.
35	L.	15 years ...	One of patient's children who had fits was sleeping in her bed, when in a fit he caught and bit right into the L. nipple: took a long time to heal and was painful for some months. About 15 years later she began to feel a lump and the old wound re-opened and began to discharge.
36	R.	2 years ...	Patient was getting on to a bus when a man carrying a large mirror suddenly decided to get off: he got up suddenly and the corner of the mirror hit her breast. The skin was discoloured and the place very painful. She used iodine and it gradually went away. Lump felt on same spot 2 years later.
37	L.	A few months afterwards	Patient was knocked off her bicycle by a butcher's cart and the L. breast hit the handle-bar. The breast was black all over the outer side and very painful. It never got right and the lump was felt a few months later: there had been no cessation of the pain.
38	L.	16 years ...	Was playing with a brother at the age of 16. He ran away and in doing so slammed a door on to her L. breast. It was very painful and badly bruised for some weeks: had been very painful at intervals ever since. Ap. 4/30 and 10/28.
39	L.	3-4 years ...	Was getting on to a chair to put out gas during an air-raid; stood too near the edge; chair fell over and hit the L. breast. Breast terribly bruised and painful: patient was in bed for a week with it: the arm also was bruised and painful. Lump first felt 3-4 years later.
40	L.	6 months ...	Fell out of bed on to the fender and hurt L. breast: was badly bruised and tender for a long time.

APPENDIX 5—continued.

No. in table.	Side affected.	Period between injury and growth.	History of injury.
41	L.	4-5 years ...	Slipped on some ice when acting as postman during the war; fell heavily on to the bag of parcels she was carrying: the whole of the left side and breast was severely bruised. The breast gradually got right. Lump first felt about 4 years later.
<i>B. Cases where the Injury was in the opposite breast to the growth.</i>			
42	R. has growth L. had injury	At age of 20	Blow with resulting bruising on L. breast—41 years before operation: for many years there was a small lump at the site of the injury which gave occasional pain. No note as to when this lump disappeared. Never any injury to R. breast.
43	Injury to R. L. affected by cancer	36-38 years after injury to opposite breast	Fell on her breast at age of 17—abscess formed: was fomented till it burst: bad for several months—then healed completely.

APPENDIX 5A.
Details of Cases of Injury to the Breast—associated with a definite History of Bruising, among the Women of the Control Series.

No. in table.	Side affected.	Periods since injury.	History of injury.
1	L.	Several years	Fell off a ladder—injured chest and abdomen and had "black bruise" on L. breast.
2	L.	"Some" years	A bale of clothes fell on her. Breast was "black and blue." Ap. 1A/49.
3	L.	About 18 months	Fell on her breast—bad bruise resulted.
4	Not stated	4 years ...	Fell across a fence—much bruising of breast.
5	L.	45 years (about)	Patient had a severe blow and remembered the bruising clearly.
6	R.	30 years ...	Was thrown from a cart. Breast badly bruised.
7	Both breasts.	13 years ...	Had a fall and bruised both breasts. Ap. 1A/34.
8	R.	6 months ...	Patient had a blow on the breast, which was discolored.
9	L.	14 years ...	Patient had a blow on the L. breast in 1910; 3 months later an abscess developed; at operation found to be tuberculous.
10	Not stated	4 years ...	Received a severe blow on R. breast in a crowd; bruising at the time and occasionally painful ever since.

APPENDIX 6.

Details of Cases with definite History of Injury to the Breast, but where the Occurrence of Bruising was either absent or not remembered, among the Women of the Cancer Series.

No. in table.	Side affected	Years between injury and noticing growth.	Remarks.
1	L.	Few months	Patient suffers from senile cataract and walked against the edge of an open door, giving a severe blow to her L. breast. Breast very painful: no lump then palpable. Discoloration of skin not noticed.
2	L.	6 months ...	Hit breast with a board, skin red at the time, but no prolonged discoloration, no lump then present.
3	R.	? 3-4 years ...	Blow on R. breast: no bruising: no lump present, at the time. Aps. 4/26 and 12/4.
4	L.	6 months ...	Fell off a table and struck her L. breast: did not notice any bruising—no lump felt.
5	R.	Some months	Tripped and fell striking R. breast against a stair rail. No bruising noticed. Ap. 12/6.
6	L.	2 years ...	Fell while getting on to a tramcar: was under treatment for the injury for some time: no recollection as to bruising, but no lump was then palpable.
7	R.	A few weeks	A few weeks before the last confinement but one, patient fell on an ash pail and hurt the R. breast. About a week later she felt a lump which was certainly not there at the time of the injury. The lump was treated as "clotted milk" and an abscess found which was opened, but left a nodule on healing: the breast was removed before the next confinement.
8	R.	2 years ...	Severe blow on R. breast from the handle of a wringer—did not look for bruising. Ap. 12/13.
9	L.	Over a month	Hit L. breast against the post of a bed: no discoloration noticed—and no lump felt then. Ap. 10/15.
10	R.	3 months ...	A boy ran into her, bumping his head hard against the R. breast. Breast painful ever since: no visible discoloration and no lump there. Ap. 10/41.
11	R.	See next column	In 1900 patient hit her R. breast against a bedpost: she is quite sure there was no lump then. A hard painless lump became palpable soon afterwards. She has had five children since then and has used the breast to feed all of

APPENDIX 6—continued.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
12	L.	2 years ...	them in spite of the lump. She has noticed that the lump was always temporarily most noticeable on weaning, and only began to grow towards the end of 1922.
13	L.	One year	Fell over a chair and hurt L. breast; no discoloration of skin and no lump felt.
14	L.	"Years" ago	Blow on L. breast from an elbow. No discoloration of skin. Lump first felt a year later.
15	R.	"As a girl"	Fall on L. breast ? years ago; no discoloration remembered.
16	R.	?	Had a blow on R. breast from a fist. No discoloration. Ap. 1/11.
17	R.	About 6 months	Blow from an elbow on R. breast: sore for a day or two; no discoloration. Was mangling and working quickly, lost control of the handle which came up and hit her hard on the R. breast: no lump then, but appeared in about 6 months on the same spot.
18	R.	Some months	Blow from a broom handle. No discoloration. No lump at the time.
19	L.	41 years ...	Blow on same spot as subsequent growth at age of 30 years—no bruising, but was painful for some time.
20	R.	6 years ...	Gave herself a blow against furniture—there was much pain—no recollection as to bruising.
21	L.	6 years ...	Blow on L. breast when in crowd. Pain for some days—no bruising.
22	L.	6 years ...	Blow on breast in an air-raid crowd. Great pain at the time, no bruising—no lump then.
23	L.	7-8 months ...	Quarrelled with another woman who came up behind and hit patient violently on the L. breast. Breast very sore for a long while; no lump then, but did not look for discoloration.
24	R.	? 25 or more years ago ...	Blow on R. breast causing great pain for some days—no recollection as to bruising. Ap. 12/20.
25	L.	Some years .	Hit by a cricket ball on same place as lump came later—no further details given.
26	R.	One year ...	Struck by a brush handle; lump first felt one year later; also transient mastitis. Ap. 2/5.

APPENDIX 6—continued.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
27	L.	5 years . . .	Severe fall on L. arm and side. Breast began to swell about a week later and a lump became palpable. Later again the breast began to shrivel. Ap. 1/36.
28	R.	A few weeks	Patient had a blow on the R. breast from the handle of a wringer. A few weeks later she felt a very small lump; the lump was about the size of a pea when she attended hospital somewhat later. Patient had a ? secondary growth in the L. breast 5 years later.
29	L.	About 9 months	Fell on her L. breast; some months afterwards noticed a small lump which was painful and gradually increased in size.
30	L.	18 months . . .	Fell off step on to L. side. Breast very painful, did not look for bruising, but no lump was palpable.
31	R.	? 1½ years . . .	Is a weaver; was hit by a shuttle on the R. breast. Later a lump appeared and about 9 months later again a lump appeared in L. breast; there was no discoloration of the skin after the injury. Both breasts showed "carcinoma."
32	L.	Many years . . .	One of the children in a "scramble" knocked the L. breast perhaps 16 or more years before. There was no discoloration of the skin.
33	L.	5-6 years . . .	Was struck accidentally on the R. breast during the war one night in the street. Breast very painful for a time—did not look for bruising. Lump first felt 5-6 years later.
34	L.	8 months . . .	Fell and struck the L. breast; no bruising was noticed.
35	L.	11 months . . .	Had two knocks at short intervals on the bedpost, both on same spot. Breast very painful both times. Did not look for bruising, but no lump was palpable.
36	R.	2 years (about)	Fell on her face and hurt face and R. breast; breast very sore and painful. Patient knows that the nose showed bruising, but did not look at the breast.
37	R.	? 3 years (not more)	Fell off a chair and dislocated her shoulder and hurt her breast; did not look for bruising, but breast was painful a long time. Next year she fell downstairs and hurt the same breast. Later as she had a good deal of pain she felt the breast and found the lump. Ap. 10/5.

APPENDIX 6—continued.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
38	R.	2 years . . .	Accident—details not given by patient—to R. breast. Was painful for some time; did not look for bruising. Lump palpable about 2 years later.
39	L.	One year . . .	Hit L. breast hard with the handle of mangle. Breast very sore and painful, but no lump then.
40	R.	One year . . .	Fell off a bus and hurt R. side and breast. Did not look for bruising.
41	R.	One year . . .	Stood too near the edge of a chair, which fell over and hit R. breast. Breast very painful. She did the same thing again a little later. A few months later again there was hæmorrhage from the nipple. Ap. 12/24.
42	L.	34 years . . .	Was playing with her brother at age of 16; fell and hurt her breast badly; sore afterwards, a lump became palpable at the site of the injury; the lump began to grow when patient was about 51 years of age, but only slowly.
43	R.	2 years . . .	Fell on R. breast which was very painful, did not look for bruising; first felt small lump 2 years later.
44	L.	10 years and 4 years.	Has twice fallen heavily on to L. side and breast. Breast very tender afterwards; did not look for bruising. Ap. 10/6.
45	R.	5 to 6 months	Had a severe blow on R. breast from the handle of a machine she was working; breast very painful for some days and remained tender to touch till operation; did not look for bruising. Lump first felt 1-6 months after injury. Ap. 10/33.
46	R.	18 months . . .	Hit herself hard against the bedpost; breast very painful, but skin not discoloured; later also hurt herself by straining the R. side—afterwards discharge from nipple. Lump felt later again. Ap. 10/10.
47	R.	5 months . . .	Was hit in the breast by a lunatic relative; has also had repeated slight injuries to that breast in the course of her work. Ap. 7/34.
48	L.	26 years . . .	The 1st child nearly bit off the nipple when aged 16 months. 14 years later, after weaning the last child there was a discharge from the nipple. Long after she noticed a small lump, but did not apply for treatment till some years later.

APPENDIX 6—continued.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
49	R.	6 months ...	Was hit by a ball a boy was playing with in the yard of the school where she works. The place was very painful and never got well; a few months later she felt the lump; there was no lump at the time of injury.
50	L.	"Some years"	Fell over a bench and struck the breast hard. Some years later she first felt the lump. Ap. 10/12.
51	L.	7-8 years ...	Fell and in falling struck the breast against a piece of furniture. No lump then, and no bruising.
52	L.	1½ years ...	Kicked on L. breast about a year before noticing lump. The breast "felt bruised" for some days, but no discoloration noticed. No lump palpable then.
53	L.	Many years ago	Knocked herself against the bed-post many years ago: caused much pain in L. breast. The L. breast was used more than the R. for nursing in the last (4th) lactation.
54	R.	3 years ...	Blow on breast from child in bed: considerable pain, but no bruising noticed. Also transient mastitis of same breast. Ap. 2/19.
55	L.	3 months ...	Blow against bed-post—no bruising noticed. Lump first felt 3 months later.
56	L.	3 years ...	Had a hard knock on the breast from a man's elbow. Breast very painful, but she did not look for bruising. The Path. Report notes the presence of cysts between the growth and the skin of the nipple.
57	R.	No note ...	Was struck on the breast by someone falling on to her.
58	L.	Some months	There was an injury to the L. nipple some months before the lump was felt.
59	L.	No note ...	Patient struck the L. breast against a sharp table corner—no discoloration of skin was noticed.
60	R.	One year ...	Patient received a heavy blow on the breast from a spring mattress—no note of discoloration. Ap. 1/23.
61	R.	2 years ...	Blow on R. breast 2 years previously while nursing maniacal patient.
62	L.	2 months ...	An adopted child (patient married late in life and had no children of her own) stood heavily on the breast in bed. No discoloration was noticed at the time—lump first noticed weeks later. Ap. 10/23.

APPENDIX 6—continued.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
63	L.	5 months ...	Severe fall on to L. side: arm and chest hurt. No note as to bruising. Lump first palpable 5 months later. Ap. 1/14.
64	R.	16 years ...	Patient had a blow on the R. breast from a fall. No note as to bruising.
65	L.	"Years" ago	L. breast hit hard by the handle of a broom. No note as to bruising.
66	L.	6 months ...	Kicked in the breast by a young grandchild: no lump then, but hardness of skin noticed soon afterwards.
67	L.	20 months ...	Fell out of bed just before last confinement: hurt breast badly: child stillborn.
68	L.	3 months, 2 years and 5 years before	Two falls on to breast 2 and 5 years before: about 3 months before lump appeared some children knocked the same breast: there was no lump present then.
69	L.	6 months ...	Fourteen years previously patient had painful lumps in both breasts: L. worse than R. Under treatment both breasts cleared up in 4-5 years. Six months before operation she had a blow on the L. breast, which became swollen and painful (no note on bruising). The lump was first felt about a month later.
70	L.	No note ...	Blow on L. breast from tennis ball. Painful for some time after: no lump present at time of injury. Ap. 3/12.
71	R.	1 year ...	Blow on R. breast one year before lump was noticed. No note as to bruising. Ap. 10/36.
72	L.	1 year ...	Blow on L. breast: no bruising and did not remain painful. Lump noticed about a year later. Ap. 10/20.
73	L.	1 month and 8 years	Blow on L. breast 8 years previously: no discoloration or lump then. About one month before lump was first felt she knocked herself against the banister of the stairs. Also irritation from corsets. Ap. 7/29.
74	L.	1 year ...	Patient was struck on the L. breast by the horn of a cow about a year before she first felt the lump.
75	R.	No note ...	Patient states that she had a blow on the breast from the handle of a tub. A lump appeared soon after, which first disappeared and then returned later. Case inoperable.

APPENDIX 6—continued.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
76	R.	6 months ...	Was hit on the breast by a girl's elbow about 6 months before noticing lump.
77	L.	1 year ...	Knock on L. breast from a boy's head: very painful for a time. Lump first felt one year later.
78	R.	"Many" years ago.	Knocked the breast against the corner of a table many years ago: painful and for some days afterwards patient also had transient mastitis. Ap. 2/16.
79	R.	About 7 years	Patient ran into an iron bar and had much pain for several days: she had a second injury on the same place shortly afterwards.
80	L.	5 years ...	Fell off a tramcar and hit the L. breast against the footplate; it was very painful.
81	L.	2 to 3 years...	Patient was carrying a heavy basket of linen and knocked it accidentally against the L. breast. There was much pain for several days, but bruising was not looked for. Lump first felt 2 to 3 years later.
82	L.	2 months ...	Patient was thrown through the wind-screen of a motor-car in an accident. She fell heavily with the metal button of a handbag firmly pressed into the L. breast. The whole breast was sore and painful for a long while, especially where the button had pressed. About 2 months later she began to feel a very small lump on that spot.
83	R.	A few months	Was trying to move a heavy roll of stuff at her work without assistance. The top piece overbalanced and fell hard on to the R. breast. She was almost stupefied with the pain at the time, and had much pain for a long time. She did not look for bruising. There was no lump palpable till about 4 months later.
84	L.	20 years ...	Patient was squeezed between two tables with iron edges. The whole chest was very painful for some time. She did not look for bruising.
85	L.	2 to 3 years...	Patient stepped off a chair when hanging clothes and hit her L. side heavily against the fender. She broke the L. wrist, and the whole arm and side was very painful and swollen for a long time: the arm was so bad that she paid little attention to the breast. She was under treatment by two different doctors for

APPENDIX 6—continued.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
86	R.	2 months ...	swelling of the arm, but the breast was never examined till she went to a hospital where the growth was found. Was hit on R. breast by a ball: the spot was very painful for a time, but she did not look for bruising: there was no lump present then: about 2 months later she first felt a small lump on the site of the injury.
87	R.	8 to 9 months	Patient fell on a piece of banana skin and the steel knob of the hand-bag she was carrying was pressed hard into the breast. The pain in that breast continued with itching of the nipple; then a scab came on the nipple, which she pulled off, and later a lump appeared outside the nipple.
88	L.	2 months ...	Patient is a parlourmaid, and was carrying a trunk upstairs when she hit one corner against the staircase rail and the trunk hit her in the breast. It was very painful for some days. She did not look for bruising. Two months later she felt a small lump on the same spot.
89	R.	A few months	Patient knocked the breast violently against the knob of a cot: the breast was very painful: she did not look for bruising: there was no lump at the time of the injury. The lump was first felt a few months later. It did not grow for 11 years.

The following six cases are shown separately as being of a somewhat different character to those given above.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
90	R.	9 months ...	Was mincing some meat and was putting much pressure on the mincer: suddenly had a sharp pain in the breast "as if something broke": very soon afterwards a discharge began from the nipple and continued up to operation, 9 months later.

APPENDIX 6—continued.

No. in table.	Side affected.	Years between injury and noticing growth.	Remarks.
91	L.	1 to 2 years...	Felt a "strain" in the L. breast when pumping water: no bruising seen, but breast was frequently painful since then.
92	L.	About 8 years	Hurt her L. side and breast when working at a munition factory during the war—there was no lump then.
93	R.	49 years ...	Extensive burn over all R. side as a child of 2 years. Scarring of skin all over R. breast and across mid-line to 2nd and 3rd L. intercostal spaces, but not over L. breast.
94	R.	? 1 to 2 years	Strained herself one day working in a torpedo factory. 1 to 2 years later felt small nodule in the armpit which gradually grew towards breast: operation 7 years later.
95	R.	Over a year...	Patient had a sick child who was on the breast till death at 11 months. Soon afterwards there was a sore place on the nipple which healed. Later it broke down again several times. Finally she attended hospital and was operated on for cancer.

APPENDIX 6A.

Details of Cases with Definite History of Injury to the Breast, but where the occurrence of Bruising was either absent or not remembered, among the Women of the Control Series.

No. in table.	Side affected.	Period since injury.	History of injury.
1	Not stated	20 years ...	Fell downstairs when pregnant; said breast was injured.
2	L.	6 months ...	Fell downstairs and hit L. shoulder and breast.
3	Not stated	4 years ...	Blow chiefly on abdomen, on the breast also.
4	Not remembered	"Many" years	A blow which was painful at the time, but no other details remembered.
5	L.	"Many" years	Dropped a clothes pole on L. breast. No recollection as to bruising.
6	L.	24 years ...	Hit L. breast on the handle of a door: breast was swollen, but not discoloured. Also had puerperal mastitis with abscess in same breast. Ap. 1A/9.

APPENDIX 6—continued.

No. in table.	Side affected.	Period since injury.	History of injury.
7	R.	12 years ...	Blow from a clothes pole. No bruising noticed: later a "simple" tumour developed and was removed. Ap. 8/4.
8	R.	8 years ...	A blow on the breast. No bruising.
9	R.	5 to 6 years...	One of the children fell on to the breast. Also deformity of nipples and tuberculosis of the breast. Ap. 4A/2 and 9/6.
10	Not stated	Few months	Had a blow on breast. No discoloration of skin. Ap. 3A/4.
11	Not stated	44 years ...	Patient had a blow on the breast, during lactation: an abscess developed Ap. 1A/30.
12	R.	"Some" years	Had a blow on the breast; was very painful afterwards, but no bruising; also cracked nipples. Ap. 3A/6.
13	L.	2 months ...	A blow on the L. breast; lump not then palpable, but felt one month later; operation 2 months after blow. Ap. 9/5.
14	L.	A "few" years	Fell on a chair; hit by chair leg. Bruising not looked for. Ap. 8/12.
15	R.	About a year	Fell on the edge of a pail; skin reddened. Lump felt later. Ap. 8/11.
16	L.	14 years ...	Patient "racked" herself badly one day at work. Lump developed later. Ap. 8/10.
17	L.	31 years ...	Blow on breast at age of 15. Cyst developed later. Ap. 8/9.
18	R.	4 to 5 years...	Fell on her R. side and hurt breast; did not look for bruising. Also had cracked nipple of same side. Aps. 3A/12 and 9/3.

APPENDIX 7.

Details of Cases where there has been continued slight injury to the Breast, among the Women of the Cancer Series.

No. in table.	Civil state.	Side affected.	Nature of injury.
1	S.	R.	Chronic irritation of corsets especially on R. breast: a tumour developed which was removed and found to be malignant. Fourteen years later there was an injury to the L. breast after which a tumour—also found to be malignant—appeared in that breast. The data are insufficient to suggest whether the second tumour was secondary to the first or whether it was a fresh growth.

APPENDIX 7—continued.

No. in table.	Civil state.	Side affected.	Nature of injury.
2	W.	L.	A pair of corsets had long irritated the part of the breast where the growth appeared. Aps. 3/11 and 12/7.
3	M.	R.	Continued physical strain owing to the prolonged nursing of a paralytic father-in-law, also much heavy washing and wringing arising out of the same.
4	M.	R.	The upper end of a corset bone had long irritated the breast where the lump developed. Ap. 2/15.
5	M.	R.	Corset had always pressed on the R. breast and was believed to have caused the trouble. Ap. 4/18.
6	S.	L.	Corsets had always pressed on that breast.
7	S.	R.	Patient is an unpicker in a millinery establishment. In unpicking long threads the hand constantly struck the R. breast now affected.
8	M.	L.	Always wore high corsets which hurt her so that she had placed a pad at the top as they hurt her breast when she scrubbed the floors.
9	M.	R.	Stays caused friction against the breasts so that she wore a pad of flannel at the top to ease them.
10	S.	L.	Had continuous heavy lifting for many years and repeatedly strained herself.
11	M.	L.	Had frequent falls and knocks against furniture owing to a nervous affection of one leg.
12	S.	L.	Steel corset bones used to indent the breasts near the region where the growth appeared.
13	S.	R.	Corset bones had always pressed in the vicinity of the tumour.
14	M.	R.	Patient is a great knitter; she used two very long bone pins and kept one firmly pressed in the R. axilla.
15	S.	L.	Patient explained that she and her mother both "knock themselves about." She knocked her L. breast frequently against the bedpost in making her bed as the bed was so placed that it caught the L. breast. She continued knocking herself during the 4 years she felt the lump and had continued doing so since the operation.
16	M.	R.	Always had great "tiredness" of R. arm and side after washing or using wringer.
17	S.	R.	Has played the banjo daily for 15 years which always gave discomfort in the breast owing to the pressure of the instrument.
18	M.	R.	Used to lift a daughter who wore a Thomas' splint for about 2 years; always lifted her with the splint pressed against the R.

APPENDIX 7—continued.

No. in table.	Civil state.	Side affected.	Nature of injury.
19	M.	L.	breast. It gave her a good deal of pain in the breast, but she continued to do this all through the 2 years the child was in the splint.
20	W.	L.	Wore high corsets which had caused discomfort in both breasts. Ap. 4/16.
21	S.	R.	Wore corsets which often hurt the breasts. Had frequent "digs" in the breast from carrying boxes in the shop where she worked. Ap. 10/30.
22	M.	L.	Has always worn high corsets with "struts." Had not noticed friction. Ap. 3/15.
23	W.	R.	Has had frequent irritation of the breast by her corsets. Ap. 5/22.
24	S.	L.	L. breast continually subjected to minor injuries while at work.
25	M.	L.	Patient thinks she has often strained herself with excessive golf playing.
26	M.	L.	Patient states that she has continuously over-reached herself doing her housework and has irritated the breast. Ap. 10/22.
27	M.	R.	Patient often strained herself nursing a father who had had cerebral hemorrhage.
28	M.	L.	Corsets had always been tight across the breasts. Ap. 4/27.
29	W.	L.	The busk of her corset had pressed over the site of the present tumour for some time. Ap. 6/73.
30	M.	R.	As a girl patient wore tight corsets and had been in the habit of protecting the R. breast with a handkerchief—presumably the R. breast was larger than the L.
31	M.	R.	Strained herself frequently with much heavy lifting in the grocer's shop where she now works.
32	W.	R.	Often hit the R. breast when using the mangle.
33	M.	R.	Gets frequent knocks on R. breast (? both breasts) in lifting heavy boxes, which she does in her work.
34	S.	R.	Had frequent injuries to her breast in connection with her work. Ap. 6/47.
35	S.	L.	Patient had worn high stiff corsets for many years; she bought a new pair, apparently rather stiffer than the others and these hurt her; she felt her breast and found the lump. She continued wearing the corsets in spite of the pain and continued to wear the same corsets after the operation.
36	M.	L.	Patient had always worn high corsets; in one situation she had much washing to do and the rubbing board was exactly the height of the top of her corsets.

APPENDIX 7A—continued.

No. in table.	Civil state.	Side affected.	Nature of injury.
37	M.	R.	The bones pressed continually into her breast when washing until at last she got some still higher corsets to protect the spot. She felt no lump till some years after she had stopped the work. Knocked herself repeatedly against the end of the bedstead.
38	S.	R.	Continually knocked the R. breast against the bedpost in making the bed; was "always hurting" herself and continued doing so after she noticed the lump.
39	M.	L.	Had a corset bone pressing into L. breast for many years; the spot gradually became tender but only after some years: finally she felt the spot and found a very small lump to which she paid no attention for 6 years, during which time it grew steadily.
40	M.	L.	Has always worn tight corsets. About a year before operation she noticed that the skin towards the centre of the chest was discoloured just where the bones pressed: she loosened her corsets, but felt the lump some months later.
41	W	L.	Stay busks had "poked in" for many years. There had been an abscess in the other breast exactly opposite to the site of the growth. Ap. 1/33.

APPENDIX 7A.

Details of cases where there has been continued slight Injury to the Breast, among the Women of the Control Series.

1	M.	R.	Hit her R. breast frequently when cleaning the rollers of the machine she works.
2	M.	Not stated	Repeated blows from time to time, details not obtainable.
3	M.	L.	Corset bones "stick into breasts" when at work. Ap. 8/13.
4	S.	L.	Patient is a professional cellist and the instrument presses chiefly against the L. breast: there is also a history of injury, but the side of the injury was not clearly remembered. Ap. 8/14.
5	W.	Not stated	Breast is often hit by a swing door she has to pass through while doing her work.

APPENDICES 8 TO 12 INCLUSIVE.

These appendices are intended to convey necessary information as to the pathological data for each case in which it was available. In a few instances some additional notes have been supplied in order to make the information more complete. Cross-referencing has been carried through as in the previous appendices, and references are made throughout between both sets of appendices.

APPENDIX 8.

Cases of "Chronic Mastitis" or Hyperplasia among the Control Patients.

51. S.* A small nodule removed from L. breast, under local anæsthetic. *Path. Report.* Fibrosed breast tissue. No other note.
- 52 at operation. S.* A cyst was removed 3 years ago from one breast said to have been "non-malignant."
51. M.* Accidentally discovered lump in the L. breast. *Operation.* Removal of breast with large cyst. *Path. Report.* The specimen shows increase of fat, loss of glandular substance and the presence of areas of fibrosis with persistent ducts, some of which show cystic dilatation; one large cyst smooth-walled of almost tangerine size. There is no evidence of solid growth. Microscopic examination shows the breast to be the seat of chronic mastitis, with dilatation of the ducts and increase of fibrous tissue. There is no evidence of malignant change.
- 34 at operation. S.* She attended hospital for the tumour (apparently without delay), which was removed. The tumour was said to be a "simple tumour." Patient is now in hospital for a large ovarian tumour. The breasts are stated to be normal. Ap. 6A/7.
- 50 at operation. W.* In 1912 (at the age of 46) patient noticed a lump in her L. breast. She consulted a doctor, who "dispersed" it with ointments. In 1916 it recurred and in the same place. As first doctor was dead she consulted another, who advised her to attend hospital, which she did; stated to have been a cyst. The cyst was removed. 1924. Patient is in hospital for acute nephritis; the breasts are healthy, except for the scar of the former wound.
63. M.* Two months before coming up to hospital she noticed a lump in the L. breast; there was very little pain, the growth was not adherent to either skin or deep fascia: no enlarged glands palpable. *Operation.* Removal of section of breast. *Path. Report.* Microscope. Cyst of breast. No further notes. Ap. 1A/18.
47. S.* About ten weeks before admission patient felt lumps in the R. breast, one as large as a walnut. Lumps not attached to skin or deep fascia; no glands palpable in axilla. *Operation.* Removal of section of gland containing the larger cyst, and removal of several smaller cysts. No pathological examination was made.
48. S.* About two weeks before operation patient noticed a lump in the L. breast; she had pain with it on palpation. Lump not adherent to skin or to deep fascia: one enlarged gland palpable in the axilla. *Operation.* On incision a cyst was found, which was removed. *Path. Report.* Chronic cystic mastitis.

* These numbers and letters refer to the age and civil state of the patients.

9. 46. M.* At the age of 15 patient had a blow on the breast which did not produce discoloration. Later a lump developed; it was operated upon, patient believed it was found to be a cyst. No path. report available. Breasts now clinically normal. Ap. 6A/17.

10. 48. M.* In 1918 patient noticed a lump in the L. breast; it was not attached to either skin or deep fascia; no glands palpable. *Operation.* Amputation of L. mamma. *Path. Report.* Fibro-adenoma. In 1923 patient felt a lump in the R. breast; not attached to either skin or deep fascia; no enlarged glands. *Operation.* Excision of lump. *Path. Report.* Fibro-adenoma. Ap. 6A/16.

11. 42. S.* About a year ago patient fell on the edge of a pail while at work and struck her right breast. Since then there has been constant pain. The skin at the time was reddened but not otherwise discoloured. The lump was felt for 2 to 3 months before attending hospital. The lump was not adherent to either skin or deep fascia; no enlarged glands palpable. *Operation.* Amputation of breast with axillary lymphatics. *Path. Report.* Chronic mastitis—the glands show chronic inflammatory changes. Ap. 6A/15.

12. 56. M.* Lump not adherent to either skin or deep fascia; no axillary glands palpable. *Operation.* Amputation of breast and (?) axillary contents. *Path. Report.* Small breast with a central mass occupying the mammary area; no infiltration of integuments or axillary tissues. Mass consists of more or less discrete nodules in various stages of necrosis, with loose areolar tissue holding the lobules together. It gave the impression of a morbid condition diffused throughout the whole of the glandular tissue rather than that of a discrete mass. *Section.* A diffuse hyperplasia of the glandular epithelium resulting in a heaping up of those elements which distend the acini, followed by central necrosis. There did not appear to be any invasion of the surrounding connective tissues which showed all stages of sub-acute inflammatory changes. The case should be kept under observation as likely to develop malignant characters. Patient was well six years later. Ap. 6A/14.

13. 46. M.* Patient complains of a painless lump in the L. breast. No notes of operation. Clinical diagnosis:—Cysts in chronic mastitis. Ap. 7A/3.

14. 54. S.* Patient is a professional 'cellist and the 'cello presses somewhat against the breast. Lump in R. breast ten years ago. Gradually got well without treatment. Discharge of blood from L. nipple for one year and shooting pains lately. No details as to condition on admission. An operation was performed, of which there is no detail. *Path. Report.* Chronic mastitis with cysts. Small intra-cystic papilloma. Microscopically no evidence of malignant disease. Ap. 7A/4.

15. 50. M.* Lump noticed about six months before operation. Tenderness about six weeks before. On palpation fine lobulation in both breasts; two hard lumps in R. Lump free; no palpable glands. *Operation.* Removal of breast. *Path. Report.* Cyst of breast. Patient was well five years later. Ap. 4A/1.

16. 39. M.* Growth noticed for some years—about the size of a nut and stationary; in 1922 it began to grow and she attended hospital. Lump not attached to skin or deep fascia; no glands palpable in axilla. *Operation.* Removal of breast and axillary contents. *Path. Report.* Microscopically the gland contains pus in many places; much thickened tissue with cysts. Microscopically there is seen to be almost entirely fibrous tissue with very little glandular tissue; suggestive of chronic mastitis with cysts. Ap. 3A/11.

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Atypical Tubercle with Hyperplasia.

17. 53. M.* Patient fed six children on both breasts for nearly two years each. Eighteen months ago she noticed a lump in the L. breast, and there was pain, and the breast gradually increased in size with retraction of nipple and discoloration of the skin. Scattered hard nodules felt on palpation, not attached to surrounding tissue. One small gland palpable in axilla. *Operation.* Removal of left breast only. *Path. Report.* An atypical form of tubercle, with a good deal of breaking down of the granulation tissue and of proliferation of the epithelial structures of the breast.

APPENDIX 9.

Cases diagnosed clinically as Cancer, but which on Pathological Examination were stated to be non-malignant.

1. 47 at 1st operation. S.* Supra-vaginal hysterectomy for fibroids 18 months previously, apparently at same time as first breast operation. Lump in breast noticed about 18 months ago. Patient is suffering from "involutionary insanity." 1st operation. Half the breast was then removed. No pathological report available. Later, about 18 months after, patient returned with a recurrence on the same site and complained of pain radiating down the arm. The mass was said clinically to be attached to the deep fascia, but not to the skin. 2nd operation. Complete for cancer; some glandular involvement found. *Path. Report.* Chronic mastitis.

2. 50. S.* Lump noticed about 6 months before applying for treatment. Pain in the arm and breast for some months before feeling for lump; when discovered was about "the size of an apple." Clinical diagnosis was either a carcinoma or sarcoma of breast. *Operation.* Breast, some of axillary contents and sternal part of pect. major removed. *Path. Report.* Available for lymph glands only. Gland—"Section shows lymphatic gland, in which vessels are dilated and some extravasation of blood is present in the connective tissue spaces; no secondary deposits of either carcinoma or sarcoma cells found. After consideration it was agreed by the surgeon that the case was one of "chronic mastitis."

3. 55. M.* Complains of lump in the R. breast, first noticed about 10 months before. Growth adherent to skin and glands palpable in axilla. *Operation.* Complete for cancer. *Path. Report.* Breast is the seat of chronic mastitis. Several duct papillomata are present, one large growth and several smaller. The lymphatic glands show chronic inflammatory changes with marked hyperplasia of sinus epithelium. The pathologist did "not think there is any evidence of malignancy." Aps. 3A/12 and 6A/18.

4. 50. W.* About six months before operation, patient had severe pain in the breast, and attended her doctor; was treated for six months with plasters etc., no improvement. Lump in L. breast not attached to skin but attached to deep fascia; no glands palpable in axilla. *Clinical diagnosis.* Carcinoma. *Operation.* Amputation of L. breast. *Path. Report.* Section of breast shows chronic interstitial mastitis; axillary gland normal. No evidence of malignancy. Ap. 4A/11.

5. 52. M.* There is a lump about the size of an egg in the L. breast not adherent to skin or deep fascia; no glands palpable in axilla. *Operation.* Complete for cancer. *Path. Report.* The whole breast is fibrous and the nipple is somewhat retracted. Below the nipple is a cyst of walnut size with a well-defined wall and turbid contents. Microscopic examination shows the characters of a chronic mastitis. There is diffuse overgrowth of

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fibrous tissue with atrophy of gland substance of which only small islets remain. The few ducts showing are somewhat dilated. Ap. 6A/13.

The two following cases, Nos. 6 and 7, have been included as being of general interest, although they are not exactly parallel to the first five.

Number 6 being diagnosed as cancer was found to be tuberculous. Number 7 was diagnosed as cancer but the pathological report said "chronic mastitis." In view of the fact that the patient returned nine years later with cancer in the opposite breast the diagnosis may perhaps have been due to a complete section not having been taken of the breast.

6. 42. M.* She was able to feed the first three children on both breasts using a shield for the right one. The 4th and 5th child she fed on the left breast only and the 6th (and last) not at all. No reason is given for the cessation of use of R. breast. About 5 or 6 years ago one of the children fell on the R. breast, which was very painful for some time, but there was no discoloration of the skin. About a year ago she noticed a lump and began to have pain in the great pectoral muscle when she did heavy work. *Clinical notes.* R. nipple indrawn and slightly eczematous; Mass in breast adherent to breast tissue and to nipple; not to deep fascia. Enlarged glands in axilla. *Operation.* Radical for cancer. *Path. Report.* Histologically breast tissue shows many foci of tubercle, some of which show early caseous change. Glands in axilla show lymphoid hyperplasia—no tubercles. Aps. 3A/2 and 6A/9.

7. 49. M.* L. breast 6 months; R. breast 18 months. On admission to hospital in 1914. "A regular swelling 2 inches across in the upper and inner quadrant, freely movable and unattached to skin, deep fascia or nipple. No enlarged glands felt." *Operation.* Complete as the growth appeared to be a scirrhus. The pathological report said "Section of left breast tumour shows much fibrosis and some hyperplasia of gland tissue. The epithelium is single-layered and not infiltrating the stroma. No evidence of new growth in sections made from two different places." Nine years later this patient returned with a growth in the opposite breast, which she had noticed for 18 months. The tumour "showed slight fixity to the skin, none to deep fascia or nipple. Small soft glands felt in the axilla. Complete operation. The pathological report says "Section of breast tumour shows a scirrhus carcinoma. There is a small gland close to the tumour; the connective tissue around it is densely infiltrated with growth, but the gland shows dilated lymphatics only. The axillary glands show no infiltration.

APPENDIX 10.

Dealing with cases where the Clinical Diagnosis was uncertain or was non-malignant, the cases proving to be malignant.

A. Cases in which the precise form of the lesion was either not diagnosed or was believed to be a fibro-adenoma.

1. 30. S.* Pain in arm for many months before pain in breast. Lump apparently noticed some months before pain in breast, and then 2 months before she sought advice. *Diagnosis in Casualty*—Fibro-adenoma. Growth removed as out-patient. *Section* showed a "cellular carcinoma surrounded by chronic mastitis." A complete operation was carried out shortly after. Patient was well three months later.

2. 59. M.* Two lumps removed from the left breast in an out-patient department in 1913; presumably supposed to be non-malignant. Two years later, in 1915, another lump appeared which gradually increased

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in size. In 1919 patient attended a different hospital. *Clinical notes* state: "On admission five or six small hard nodules in the substance of the left breast." *Path. Report.* "Sections of breast nodules show a scirrhus carcinoma." Sections show much secondary deposit in the axillary glands. Ap. 1/24.

3. 50. S.* About 3 years. *Clinical notes:* "An irregular mass in the upper outer quadrant of left breast, freely movable and not attached to skin." *1st operation.* Removal of breast only. *Path. Report.* Section of breast shows dilated spaces which appear to be of glandular origin, some of which are cystic, but mostly packed with cells. The tumour is not encapsulated and is undoubtedly malignant. The appearance suggests a malignant adenoma. *2nd operation* a week later. Complete operation for cancer. No recurrence 5 years later.

4. 47. W.* *1st operation.* Lump removed by a local doctor: no pathological report is available, but it may be assumed that it was supposed to be innocent, seeing that the tumour only was removed. A few months later she was operated on for cancer: the breast and axillary contents were removed. Just over 2 years later she attended another hospital with a recurrence when the complete operation was undertaken. No pathological reports are available.

5. 55. M.* No delay after finding lump. *Clinical notes* say: Both breasts very small and atrophic. *1st operation.* Breast removed by sub-mammary re-section, leaving the nipple. *Path. Report.* "The thickened tissue shows dense fibrosis—no evidence of growth." Microscopically the chief feature is the presence of dense, diffusely scattered fibrosis, without any definite tumour or glandular involvement. Condition undoubtedly malignant, with general hyperplasia of the glandular tissue and correspondingly of the stroma. There are several small areas of an acute inflammatory nature—the acini being surrounded with small round-celled infiltration. *2nd operation* 6 weeks later. Complete: Halsted's. No sign of recurrence 4½ years later. Patient was well 9 years later. Ap. 6/37.

6. 41. S.* Presumably the growth was considered non-malignant as the breast alone and some enlarged axillary glands were removed. It is not clear from the clinical notes whether there was any attempt at a further operation. There is no pathological report on the breast removed, but it appears that the axillary glands "show extensive infiltration with spheroidal celled carcinoma." About 1½ years later patient returned with an inoperable local recurrence. Ap. 6/44.

7. 36. S.* Patient started epileptic fits at 22, but is now almost well. Had an injury to the opposite breast one year previously. The lump was about 1 inch in diameter not attached to either skin or deep fascia: removed for diagnosis: also a gland. *Path. Report.* Early carcinoma mammae sections of lymphatic gland shows the gland substance to be almost entirely replaced by secondary carcinoma of spheroidal-celled type. *2nd operation* 3 days later. Complete operation with wide removal. 8 days later an X-ray report stated that the mediastinal glands were enlarged.

8. 31. M.* History of an injury but considerable uncertainty as to whether before or after the growth was noticed—it has therefore been neglected. Growth seen at O.P. where a section of the growth was removed for diagnosis. *Path. Report* stated that the growth was a carcinoma. Patient was admitted next day and a complete operation performed.

9. 59. M.* The clinical notes state "growth attached to skin but not to deep fascia. No glands palpable in axilla. Right breast contains several harder nodules which move freely in breast substance and are not attached deeply—chronic interstitial mastitis." Patient had not used

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the affected breast for feeding the only child born alive as it "was too much trouble to use both." She used the right breast only. Growth apparently noticed about 3 years, but had become painful in the weeks before she attended hospital. At operation a frozen section was made and reported to be carcinomatous. The complete operation was then performed with fresh instruments, etc. *Path. Report.* Section shows patches of spheroidal-celled carcinomatous areas surrounded by masses of fibrous tissue. Diagnosis.—Very chronic scirrhus carcinoma.

10. 53. S.* Attended hospital about 6 weeks after feeling lump. Hit herself hard against the bedpost, 18 months before feeling lump on same spot. Had felt repeatedly for lump, as she was afraid of cancer. Later strained herself lifting a heavy mattress after which, blood-stained discharge from the nipple about a year after 1st injury. Lump felt six months after the discharge. Clinical notes state: "Growth fixed to nipple, but not to muscle. No glands felt in axilla. At the operation a frozen section was made for diagnosis and reported malignant. The complete operation was then carried out with fresh instruments, etc. *Path. Report.* A spheroidal-celled carcinoma undergoing colloid degeneration. Ap. 6/46.

11. 36. M.* The clinical notes state: "Swelling in the outer and upper quadrant of the right breast. Two other smaller swellings to the outer and upper side of the nipple. Chronic interstitial mastitis in both breasts, and multiple involution cysts. The growth is attached to skin but not to the deep tissues. No glands felt in axilla." The diagnosis made was fibro-adenoma. The surgeon, however, performed the complete operation for cancer. *Path. Report* (abstract). "At first no evidence of carcinoma was detected in the section, but a further examination was made and a report of "duct-carcinoma" was the result.

12. 52. W.* Excision of hard lobular tumour. *Path. Report.* Adenoma. 14 months later patient returned with a fixed mass in the breast, with the skin involved and (?) also the axillary glands. Operation. An amputation of the breast was performed. *Path. Report.* Adeno-carcinoma with early invasion of glands. No further operation appears to have been undertaken at the time. Three years later patient returned with a large mass in the muscle over the site formerly occupied by the breast. Apparently a further operation was performed of which no details were given in the notes. *Path. Report* is "Adeno-carcinoma." Patient was still alive a year later, with no evidence of a recurrence. Ap. 6/50.

13. 59. M.* A tumour was removed from the right breast outside the gland as soon as discovered. No report available. Seven years later a discharge began from left nipple; clinical notes state: "There is a swelling in inner and lower quadrant; it is nodular and is not adherent to the skin or underlying tissues. No palpably enlarged glands in axilla. Operation. "Radical amputation of breast." *Path. Report.* Tumour of breast—chronic mastitis. The epithelium over the nipple shows some irregular thickening with patches of chronic inflammatory reaction around the bases of the papillae. There is also a certain amount of epithelial downgrowth the edges of which are rather ill-defined. The histological appearances suggest an early Paget's disease.

14. 38. S.* Noticed a bruise on the left breast about 2 years before, but has no idea of its origin. A painless lump about the size of a marble was removed from the left breast. *Path. Report.* Adenoma, with patches of scirrhus. 2nd operation 4 months later, complete operation for cancer. Patient was alive 4 years later, but there is no note as to her condition.

15. 55. W.* Clinical diagnosis of the lump appears to have been doubtful and no definite statement is made. 1st operation. Removal of the outer part of the breast. *Path. Report.* The breast tissue shows

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mastitis and two discrete masses tumour like in appearance and one especially of dense fibrous consistence. Microscopical examination shows the changes of chronic mastitis throughout the breast. Sections of the discrete masses show one to be almost entirely of the nature of an acute scirrhus cancer and the other shows a mastitis in which is developing a cancer; scirrhus in parts and in others more cellular. 2nd operation a fortnight later; complete for cancer. Ap. 6/9.

16. 46. M.* Notes state:—"Piece of breast tissue removed for examination." *Path. Report.* "Breast tissue:—Ducts dilated in places—some show marked epithelial hyperplasia, with accumulations of cells not unlike those of Paget's disease of nipple. In sections examined the surrounding tissue is not yet infiltrated." A complete operation for cancer was performed a fortnight later. There was no evidence of any recurrence 18 months later.

17. 53. M.* Tumour in upper and inner quadrant of L. breast. Clinical notes state that it was uncertain whether the tumour was a scirrhus or a fibro-adenoma; it lay deep in the breast. 1st operation. Tumour excised. *Path. Report.* Scirrhus carcinoma. 2nd operation (apparently a week later). Breast with axillary contents and with pectoralis major removed. Two years later a small local recurrence was excised.

18. 64. W.* Found by doctor when consulted upon another matter. Tumour removed by doctor for microscopy. *Path. Report.* "Section of breast tumour shows a spheroidal-celled carcinoma." Patient was then sent to hospital when a radical operation was performed.

19. 50. M.* A small lump was removed from the right breast for microscopy. *Path. Report* said "Sections of breast tumour show in some places chronic mastitis, and one small patch where the arrangement of cells is so irregular as to suggest an early scirrhus. The gland sent shows in section much fibrous change and some caseation; in places it is infiltrated with a spheroidal-celled carcinoma." A complete operation was then performed. There was no recurrence after nine years. Ap. 1/27.

20. 49. M.* Tumour in L. breast not attached to either skin or deep fascia, no glands palpable. Operation. Tumour only removed. *Path. Report.* "Carcinoma of breast." Patient was told to return for a further operation but would not do so. Seen a year later there was no recurrence in the breast but several large hard glands were felt in the axilla. Ap. 6/72.

21. 32. S.* Lump not attached to either skin or deep fascia—no axillary glands palpable. Diagnosis—fibro-adenoma. 1st operation. Removal of lump only. *Path. Report.* "Microscopic examination of lump—carcinoma." 2nd operation. Radical operation.

22. 47. M.* Growth adherent to skin near nipple but not to deep fascia. No axillary glands palpable. 1st operation. Nodule excised for diagnosis. *Path. Report.* Scirrhus carcinoma. 2nd operation. Removal of breast and axillary contents. Patient was well 14 years later. Ap. 7/26.

23. 48. M.* Lump adherent to skin, but not to deep fascia. No axillary glands palpable. Operation. Small portion of the tumour removed for examination. *Path. Report.* "Portion removed for examination shows scirrhus carcinoma." No later history is available. Ap. 6/62.

24. 39. M.* Lump noticed about a year after weaning and patient was under her doctor, who thought it was mastitis. Had hard "knot" in left breast before weaning younger child about 2 years before operation. Lump not attached to either skin or deep fascia, but glands palpable in axilla. 1st operation. Removal of swelling from left breast. *Path. Report.* Scirrhus carcinoma. 2nd operation. Radical operation for cancer.

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25. 42 M.* Lump noticed almost immediately after she left hospital after a hysterectomy. Lump not attached to either skin or deep fascia and no enlarged axillary glands palpable. *1st operation.* Removal of adenoma of breast. *Path. Report.* Section of tumour; spheroidal-celled carcinoma. *2nd operation.* Radical operation for cancer of the breast.

26. 61. M.* Patient had noticed a lump in the left breast for about 20 years; it had begun to give trouble so she attended a hospital "hoping it could be dispersed." The lump only was removed at that hospital so that the diagnosis was presumably not malignant. Almost immediately afterwards she felt a lump in the right breast, and attended another hospital where the complete operation was undertaken. *Path. Report* showed that the growth was malignant.

27. 51. S.* On admission there was a lump which was not adherent to either skin or deep fascia: no glands palpable in axilla: no note as to condition of L. breast. *1st operation.* Excision of R. breast only. *Path. Report.* Chronic mastitis. About 3 months later patient noticed a lump in the left breast and attended hospital 4 months later. This lump was adherent to skin but not to deep fascia, and no axillary glands were palpable. *2nd operation.* Complete for cancer on left breast. *Path. Report.* Left breast examined—scirrhous carcinoma with secondary involvement of glands. Two years later "There are several small hard nodules in R. and L. supra-clavicular regions." No note as to condition of R. axilla.

28. 32. M.* Both breasts when examined at out-patients seemed to be alike chronic mastitis and apparently no lump felt. A month later a lump was felt in one breast, and patient was admitted for operation. At operation a frozen section was made and appeared to show mastitis only. Later. *Path. Report* said "shows infiltration with a very actively growing spheroidal-celled carcinoma." The breast and axillary contents were removed a week later. Patient was known to be well five months later. Aps. 4/30 and 5/38.

B. Cases in which the Lesion was Clinically Cystic.

29. 46. S.* Lump not adherent to skin or deep fascia. No axillary glands palpable. *1st operation:* removal of tumour. *Path. Report.* The tumour was mainly cystic, containing dark-coloured fluid. At one point in the cyst wall there was a pedunculated growth which was suspicious of malignancy. Report on microscopic section—malignant. *2nd operation* a few days later. Complete operation for cancer.

30. 38. S.* A small swelling, apparently cystic, the size of a bean, removed in the out-patient theatre. Freely moveable in breast tissue. Axillary glands palpable. *Path. Report.* "Section of so-called fibro-adenoma shows a scirrhous carcinoma." Patient was admitted and a complete operation performed 11 days later. Section of the axillary glands showed fibrosis only. Patient was well 18 months later. Ap. 7/12.

31. 28. S.* On admission a small fluctuating swelling in the upper and inner quadrant of the left breast. Not attached to skin or deep structures: freely moveable in the breast tissue. Nipple not retracted or displaced. Glands not enlarged. *Operation:* apparently tumour only removed. *Path. Report.* "Section of breast tumour shows a very cellular spheroidal-celled carcinoma." The complete operation was performed 14 days later. The axillary glands were found to show fibrosis only, and the patient was well eight years later.

32. 30. S.* Lump slightly attached to skin, but not to deep fascia; no glands palpable. Clinical diagnosis—cysts in chronic mastitis. A

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sector of the breast was excised. *Path. Report* said "Carcinoma." A complete operation was then performed a week later. No further notes available.

33. 52. W.* 4 or 5 months after feeling lump. Clinical notes say "growth adherent to skin but not to muscle; no glands felt in axilla." *1st operation.* A cyst was found which exuded colourless fluid: the cyst wall was adherent to the pectoral fascia. Cyst removed. *Path. Report* on cyst. Section shows spheroidal-celled carcinoma with some fibrous tissue. *2nd operation* ten days after first. Breast, axillary contents and pectoralis major (sternal portion) removed. Ap. 6/45.

34. 47. S.* *Path. Report.* Several cysts are present with intra-cystic proliferation covered with cubical epithelium containing several mitotic figures. It is not very irregular, but should be regarded as definitely malignant. There is much hamorrhage from the capillaries in the stroma of the papillomatous ingrowths.

35. 41. M.* The clinical diagnosis was uncertain and at the *1st operation* the lump only was removed. *Path. Report.* "Cyst size of a cherry with intra-cystic growth. Microscopically very cellular carcinoma with active nuclear division." At the *2nd operation* soon after the first the complete operation for cancer was undertaken. Patient was well 5 years later. Ap. 3/5.

36. 45. S.* A cyst was removed at a hospital. No pathological report is available for the present purpose. Very soon after she felt a lump and had pain. A year later she attended another hospital. The growth was then attached to both skin and deep fascia. *Operation.* Radical for cancer. *Path. Report.* Spheroidal-celled carcinoma of a very cellular type. Probably growing rapidly. Ap. 6/71.

37. 26. M.* A small cyst was removed at out-patients in November 1920. There had been some pain but not a great deal. Patient became pregnant soon after the removal of the cyst. When she weaned the child about 16 months later she felt a lump, which enlarged gradually. About a year later she attended hospital. Clinical notes state, "Growth adherent to both skin and deep fascia; enlarged glands in axilla. *Operation.* Breast and axillary glands removed." *Path. Report.* "The section of the growth in the breast tissue shows spheroidal-celled carcinoma of a very cellular type. In places there is more fibrous tissue formation and the appearances conform more to the scirrhous type of carcinoma, but generally the fibrous tissue is scanty, and the cellular growth prolific. The sections of the highest gland in the axilla show almost complete destruction of the lymphoid tissue and replacement of the normal gland elements by carcinoma." Six months later patient had "numerous small nodules of secondary growth in the skin and on both sides of the scar, extending some distances in to the axilla. Also recurrences above the clavicle."

38. 34. M.* About a year or less after a miscarriage when the breasts were very painful she began again to have pain in the right breast and after some months of pain she felt the breast and found a lump which was then very small, but began to grow rapidly. She attended hospital a few weeks after she felt the lump. The lump was not adherent to either skin or deep fascia. A few small glands palpable in the axilla. Clinical diagnosis—cyst in chronic mastitis. The cyst was to be removed posteriorly. At operation a mass of growth was found. The breast and axillary contents were removed. *Path. Report* said: "The breast contains a large, hard infiltrating growth which is thicker in the upper and inner quadrant, but has also spread through the greater part of the breast." Sections 1. Primary growth. Infiltration with a spheroidal-celled carcinoma. 2. An outlying part of the breast. Patches of round-celled infiltration and dilatation of the smaller ducts and acini. 3. Axillary

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glands. Secondary growth of spheroidal-celled carcinoma. Aps. 1/26 and 2/22.

39. 43. M.* The patient had cysts in both breasts as a girl. Later as they gave trouble she decided to have them operated upon. Both were removed at the same time when she was 28, a year before the birth of her first child. No report on the cysts is available. Sixteen years later she felt a small lump in one breast and went to her doctor who referred her at once to the hospital. A diagnosis of cancer was made and the complete operation performed. *Path. Report* stated: "The breast showed general fibrosis of its supporting structures with cystic degeneration: at one spot external to the nipple was a hard nodule of growth the size of a small hazel nut, scirrhous in character. The nodule proved to be a scirrhous carcinoma which had developed on the top of mastitis—chronic and cystic in nature. There were no metastases found. Nine years later there was no sign of recurrence. About two years after the menopause, and some 6 to 7 years after the operation on the breast for the scirrhous, patient had hæmorrhage from the vagina, and was in the Cancer hospital where the uterus was removed. Patient believed that it also was cancerous."

40. 49. M.* Patient was operated upon for "cystic mastitis": presumably a cyst was removed but the clinical notes are indefinite as to the operation performed. There was no macroscopic evidence of malignancy and no pathological report is available. Nearly 2 years later patient noticed a lump in the same breast which was slightly painful and felt hot at night. Three months later patient returned to her surgeon who performed the complete operation for cancer after a preliminary incision to ascertain the nature of the growth. *Path. Report* after 2nd operation states: "Breast shows highly malignant spheroidal-celled encephaloid carcinoma."

41. 29. S.* Three months before the lump was first noticed a boy ran into her, bumping the right breast with his head: since then the breast was painful although at the time there was no visible discolorations of the skin, and no lump was felt. The lump was noticed first about 3 months after the injury and was incised and drained twice before attending hospital about 8 months later, but no details are available. Clinical notes state: "A small hard lump in the lower and inner quadrant of the breast." The notes are scanty but it seems that a limited operation was performed owing to the absence of any clinical signs of malignancy. The *Pathological Report* says: "The specimen is a tumour of the size of a pigeon's egg. It is adherent to the skin, but except at one point is clearly demarcated from the breast tissue. The rest of the breast shows chronic mastitic changes. Microscopically the growth differs in structure in different places. Some areas are fibro-adenomatous, others are of the nature of soft adenomas with areas of invasion by cancer cells, and still other parts show the characters of a very acute cancer." Eight months later there was no evidence of a recurrence, but the remaining breast "is in a condition of slight generalised chronic mastitis." Ap. 6/10.

42. 41. M.* Clinical notes state: "Swelling under right nipple for some time. Same under left nipple lately. A few tender glands in right axilla, but none in left. Operation. On incision the swelling seemed to be a multiple cystic condition. The right breast and glands of axilla were removed. *Path. Report*. 1. Gland from axilla extensively infiltrated with carcinoma. 2. Cyst wall lined in places by a low flattened epithelium, and in others by glandular tissue. The wall is composed of dense fibrous tissue in which are ducts, showing catarrh, others showing irregular proliferation of epithelium, suggestive of malignant change. 3. Nodule above and to side of nipple has structure of scirrhous carcinoma. The patient was referred to the X-ray department.

43. 59. S.* Lump first noticed in R. breast after a heavy "lift"

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ten years ago: it was then the size of a marble; about nine years later it began to grow rapidly; it became painful and the skin was discoloured. R. breast smaller than L.: nipple retracted: lump adherent to skin and immovable in breast tissue: small soft glands in axilla. Operation. Radical for cancer. *Path. Report*. The whole breast is replaced by fibrous-tissue-like growth 3 in. by 3-ins. by 1-in. in size. At one end it shows a large cyst filled with papillomatous processes of a gelatinous appearance. Microscopically the tumour shows the characters of a scirrhous cancer undergoing colloid degeneration. The cancer cells are of medium size and arranged for the most part in small groups. Some parts of the mass show more fibrous tissue stroma than others. A gland examined shows malignant invasion.

44. 46. S.* Patient first noticed the lump at the age of 28 in the L. breast. Eighteen years later she hit her left breast with the handle of a broom, which caused throbbing pain for a week or two; there was no discoloration then. About eight months after the accident the lump became red and the skin broke: she attended hospital. Both breasts were found to be affected and the complete operation was performed on both sides. *Path. Report*. On L. breast, "the specimen is a typical very hard scirrhous carcinoma. While the supposed nipple (pigmented spot) certainly looked like one to the naked eye, I cannot find definite microscopic evidence that it is of that nature. The epidermis is deeply papillated but there are no duct or gland tissues remaining; ulceration due to the tumour has commenced. There has apparently been a chronic mastitis with cysts and the tumour goes much further into the gland than is apparent to the naked eye. The lymphatic glands have been invaded."

45. 37. S.* The clinical notes state "Radical incision over tumour. Swelling proved to be a cyst which burst during removal, containing a greenish, slightly mucoid fluid. Capsule and area of normal breast removed. *Path. Report*. Cyst wall of fibrous tissue lined by a low cubical epithelium. Tumour inside cyst is a papilloma, which shows early cancerous changes at its base, and has commenced to invade the capsule of the cyst."

46. 51. M.* *Path. Report*. More or less encapsulated tumour occupying a large area of the breast. On opening the capsule it was found to be distended with blood, and what appears to be a very vascular intracystic growth much of which was necrotic. Microscopically the growth appeared to have arisen in the mammary gland and first started as an intra-cystic adenoma which had become cancerous. No evidence of glandular involvement. In view of the clinical appearances of the case the surgeon had performed the complete operation. The patient was well seven years later. Ap. 1/29.

47. 36. S.* Pain in breast for 18 months. No lump felt till a few days before attending hospital. Clinical notes state growth not adherent either to the skin or to deep fascia: no axillary glands palpable. At operation a diagnostic section was cut and radical operation advised; several enlarged glands were found. *Path. Report* merely states: "Section shows chronic mastitis, with cyst formation." One year later patient returned to hospital and the notes say "X-ray showed large glands in mediastinum which had eaten away the left side of the manubrium." (The left breast was the one removed.)

APPENDIX 11.

Cases of "Chronic Mastitis" or Hyperplasia in which Cancer developed after a long interval.

1. 35. M.* Patient had twice had abscesses in both armpits: each time both had been opened. Went to her doctor at once on feeling growth. The tumour was removed by her doctor who presumably regarded it as

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non-malignant. Four years later she again felt a lump and at once attended a general hospital. 2nd operation complete for cancer. *Path. Report.* Spheroidal-celled carcinoma. Ap. 2/7.

2. 35. M.* Eleven years before noticing present trouble patient had a cyst removed from the same breast (R.) No pathological report is available; but it is stated to have been larger than the present lump. Three weeks before operation patient who was nursing her first baby had great pain on feeding in the right breast, and was obliged to wean the child at 15 months; she also felt a small lump. On admission: A lump about the size of a walnut freely movable in breast substance; no glands palpable in axilla. *Operation.* Removal of breast and axillary contents. *Path. Report.* "Scirrhous carcinoma."

3. 45. S.* Was operated on 19 years before for discharge from the nipple; no information available as to nature of operation, nor a pathological report. Patient now complains of a bloody discharge from the nipple; there is no palpable lump and no glands palpable in axilla. Radical operation for cancer. *Path. Report.* Carcinoma, intra-canalicular papillary adenomatous type.

4. 68. M.* Cyst removed from right breast in 1895 and again in 1900. In 1916 the cyst recurred again and was accompanied by discharge from the nipple. No pathological report on the cyst is available. 3rd operation in 1916, Radical. *Path. Report.* A large breast with a prominent nipple, underlying which was a malignant growth probably arising in the ducts of the mammary gland. One or two small nodules of growth were situated in the breast about 1 in. to 1½ in. from the nipple. *Microscopic Section.* "The main mass of the growth was a fibro-adenoma which had become malignant at the periphery. There was no evidence of glandular implication and the result of the operation should be satisfactory." Apart from some swelling of the right arm the patient was well 8 years later. Ap. 3/16.

5. 45. W.* Patient had an operation (slight) on the R. breast at 17 years—probably a cyst; she was able to use the breast for a few weeks to feed her only child. At the age of 44 she felt a lump in the L. breast, but had been feeling ill and losing weight for a long while before then; had not felt for a lump. Growth adherent to skin and deep fascia; numerous enlarged glands in axilla; nodules also in R. breast and metastasis in ribs, skin, pouch of Douglas and liver. Case considered inoperable.

APPENDIX 12.

Details of cases where "Chronic Mastitis" was reported on pathological examination.

1. 47. M.* *Path. Report.* The nipple is retracted and under it is a carcinomatous tumour. The axillary glands show malignant invasion. The breast generally shows the characters of a nodular mastitis with mucinate cysts, and the tumour presents the characters of a duct cancer.

2. 49. M.* *Path. Report.* The nipple is retracted and under it is a definite tumour extending deeply for ½ in. and laterally for ½ in. The breast has the characters of a chronic cystic mastitis. Microscopically the tumour is found to be a scirrhous cancer and the auxiliary glands show involvement with the same growth.

3. 43. M.* *Path. Report.* The breast shows evidence of chronic mastitis and contains a walnut-sized tumour in the nipple region. Microscopic examination shows the tumour to be a scirrhous cancer, with abundant fibrous stroma.

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4. 47. M.* Patient had a red birthmark on the L. breast which began to grow about 5 years before present trouble. The breast was removed and the growth found to be a fibro-sarcoma. About 4 years later (precise period uncertain) patient had a blow on the remaining breast. No bruising was visible and no lump was felt at the time. Some months later she noticed a lump in the breast and attended hospital. *Path. Report.* The breast contains a tumour mass with a central cavity containing purulent material. Microscopically the growth is a small celled scirrhous cancer developing in a breast, the seat of chronic mastitis. Aps. 4/26 and 6/3.

5. 50. M.* *Path. Report.* The breast shows evidence of chronic cystic mastitis with a cancerous tumour occupying the nipple region. The nipple is retracted and eszematous. Ap. 1/8.

6. 57. S.* *Path. Report.* The breast shows the changes characteristic of chronic mastitis with a small bean-sized growth in the periphery of the gland. Microscopically the growth is seen to be a scirrhous cancer. Ap. 6/5.

7. 67. W.* *Path. Report.* The breast shows evidence of cystic mastitis and a large lobulated tumour occupies part of it. Microscopic examination shows the tumour to be a rapidly growing scirrhous cancer of large-celled type undergoing degeneration in places. Aps. 3/11 and 7/2.

8. 39. M.* *Path. Report.* The tumour is a scirrhous cancer occurring in a breast the subject of chronic mastitis.

9. 37. S.* An indefinite history of a "small boil" with "deep roots" giving rise to local pain and which disappeared under treatment. *Path. Report.* Large cancerous growth in upper and outer quadrant of breast. The nipple is retracted, but the skin is not actually involved. The unaffected breast tissue is fibrous and nodular. Microscopically the tumour is seen to be an acute cancer. The rest of the breast shows the presence of mastitis with islets of cancer epithelium scattered between.

10. 58. W.* *Path. Report.* There is a tumour the size of a walnut in one quadrant of the breast. There is considerable atrophy of breast tissue with some dilatation of ducts; the nipple is retracted. Microscopically the breast shows chronic cystic mastitis with some papillomatous changes in the ducts. The tumour itself belongs to the group of acute scirrhous cancers.

11. 61. W.* *Path. Report.* Typical scirrhous tumour of walnut size and glands showing malignant involvement. Microscopical examination shows characteristic appearances of scirrhous cancer. A section through nipple shows dilatation of ducts, with epithelial proliferation and intra-cystic papillomata. The glands show diffuse scirrhous infiltration.

12. 39. M.* *Path. Report.* The breast has the appearance of chronic mastitis with a scirrhous tumour 1½ in. by 1½ in. by ½ in. in the upper part. Microscopically the characters of the tumour are those of a scirrhous cancer somewhat cellular in places. The rest of the breast shows a chronic mastitis.

13. 51. M.* *Path. Report.* A small walnut-sized tumour in a chronic mastitic breast. Microscopically it shows the character of an acute cancer with large irregular, often degenerate, cells and a very little stroma. Two glands show early invasion by tumour cells. Ap. 6/8.

14. 43. M.* *Path. Report.* The specimen is an excision of breast and axillary contents, etc. The nipple is protuberant and the skin and muscles are not involved in growth. The axillary glands are invaded. There is a nodular chronic mastitis of the whole breast and a hard tumour mass of walnut size at one part.

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15. 39. M.* *Path. Report.* The breast contains below the nipple a small hard tumour of haricot bean size. Section of the tumour shows great variety of appearance. There are areas of chronic mastitis, other of definite scirrhous cancer and others still of medullary type. The glands are invaded by the medullary type of tumour and the features of the sections suggest acute growth. Ap. 7/4.

16. 58. S.* *Path. Report.* Excision of breast, axillary contents and pectoral muscles. The skin is not notably involved; the nipple is not retracted. The tumour is $1\frac{1}{2}$ in. in diameter and the tissue between it and the nipple is fibrous. Microscopically the growth is a cellular scirrhous cancer. The bulk of the breast shows fibrous and senile mastitic changes. The glands show definite cancerous infiltration.

17. 50. M.* *Path. Report.* Tumour "has the structure of a duct papilloma which has become malignant." Another tumour in the same breast "has the structure of an encephaloid carcinoma with commencing colloid degeneration."

18. 49. S.* *Path. Report.* Carcinoma following chronic mastitis. Discomfort in both breasts for about a year before she felt the growth in the right one.

19. 53. M(2).* *Path. Report.* Breast is the seat of a chronic mastitis. In the ducts is epithelial proliferation suggestive of malignancy, while some portions of the tissues are infiltrated by carcinoma.

20. 48. M.* *Path. Report.* Section of breast tumour shows a very cellular spheroidal-celled carcinoma. A separate piece of breast tissue sectioned shows chronic mastitis. Ap. 6/24.

Blow on affected breast in childhood. Pain for some days. No recollection as to bruising.

21. 49. M.* The lump was still very small when she attended hospital. The clinical notes report "large areas of chronic interstitial mastitis as well as a growth. No pathological report available.

22. 39. M.* *Path. Report.* Section shows in part the peri-acinous fibrosis and small-celled infiltration of a chronic mastitis, but in another segment of the section there is a definite carcinomatous growth—a spheroidal-celled carcinoma.

23. 59. M.* *Path. Report.* The breast is small and atrophic; the greater part of what remains is occupied by a hard growth. The axillary fat contains several slightly enlarged glands. Sections. (1): Primary growth, a spheroidal-celled carcinoma. (2): Breast at a distance from the growth shows usual signs of chronic mastitis; particularly fibrous round the ducts.

24. 50. M.* The clinical notes state "extensive mastitis: growth attached to skin." *Path. Report.* An atrophic breast with a lower centrally placed nodule, scirrhous in appearance underlying the nipple, which appeared ulcerated; the growth was firmly attached to the skin; glands in axilla also involved. Microscopically the growth was very cellular, forming large alveolar masses which had arisen from great extra-glandular proliferation of the epithelium in the acini, forming intra-cystic papillomatous growths, and often with central necrosis as a result. In the lymph glands the growth was similar in type and actively growing. Ap. 6/41.

25. 43. S.* No lump was felt but a blood-stained discharge from the nipple began a few months after an alleged injury. *Path. Report.* Sections show all the usual signs of chronic mastitis. Proliferation of the epithelial cells which are for the most part still confined to the spaces containing the acini in which they have arisen. Epithelial proliferation found in the ducts near the nipple. Here and there the infiltration of the surrounding tissue

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has begun. Axillary lymph glands contain areas of secondary spheroidal-celled carcinoma.

26. 42. M.* *Path. Report.* Solid trabecular, tubular and acinar, cubical and polygonal carcinoma of breast. Dilatation of ducts of nipple with intra-ductular papillary adenoma and adenomatous hyperplasia of epithelium.

27. 30. M.* *Path. Report.* Spheroidal-celled carcinoma on section, the breast showed chronic interstitial mastitis around the carcinoma. Ap. 5/10.

28. 47. W.* The clinical notes give a tumour in the upper and inner part of the breast and chronic mastitis in the lower part. The *path. report* on the tumour was "carcinoma of breast." No further notes available.

29. 46. M.* *Path. Report.* This was a scirrhous carcinoma-adenomatous in type. The growth appeared to commence as a mastitis, there being cystic dilation of the acini, and round-celled infiltration surrounding those acini which showed only early proliferative changes.

30. 53. M.* The clinical notes state that there was chronic mastitis as well as a growth. *Path. Report.* on the growth only. Two separate lumps, one under nipple and one in inner and upper quadrant. Both were spheroidal-celled carcinomata of cellular type. Ap. 2/25.

31. 58. M.* *Path. Report.* Carcinoma and extensive fibrosis from chronic mastitis. Ap. 5/28.

32. 50. S.* The clinical notes say that both breasts have chronic mastitis, but the R. breast has a hard mass in upper and outer quadrant. *Path. Report.* The whole breast is enlarged and shows numerous small cysts containing green fluid or cheesy material. In the outer and upper quadrant is an infiltrating growth. Diagnosis: Chronic mastitis and carcinoma.

33. 51. M.* Growth doubtfully felt six months previously but discharge from nipple troublesome. *Path. Report.* An atrophic breast in which the gland had undergone general fibrosis forming a small hard flat mass which took the shape of the gland. On section "a carcinoma of the gland in which the acini of the gland showed great proliferation of their epithelium, which was 3 or 4 layers deep and much central necrosis of the inner layers. These alveolar masses of gland tissues are surrounded with dense fibrous tissue."

34. 30. S.* About six weeks before operation on the L. breast pt. knocked herself and on feeling the breast found two lumps. *Path. Report.* Sections of breast show chronic interstitial mastitis and in one part scirrhous carcinoma and in another adeno-carcinoma. A year later patient complained of pain in the R. breast, but no further clinical notes are available as to the condition.

35. 43. M.* Lump 7 years, but only began to grow a little before attending hospital. *Path. Report.* A breast showing a condition of general fibrosis in which were several small isolated hard nodules the size of small peas or lentils. On section each nodule resembled a small malignant focus. Microscopically the general condition of the breast was that known as "chronic mastitis". There were several small isolated hard nodules the size of small peas or lentils. The individual nodules were scirrhous foci of malignant changes, i.e., carcinomatous. "There are no malignant nodules in the lymph glands—the case should be carefully watched." Three years later a local recurrence was removed and another 4 years later when patient attended for the purpose of the present investigation there was a large local recurrence. Ap. 4/12.

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