

PULMONARY TUBERCULOSIS and PREGNANCY.

(A study of the early and late effects of pregnancy and subsequent child-rearing on pulmonary tuberculosis in women living in an industrial area.)

BY

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INTRODUCTION.

I. Aim of the Investigation.

The aim of this investigation was to determine (i) the early effects and (ii) the long-term effects of pregnancy and subsequent child-rearing on Pulmonary Tuberculosis in women attending the Chest Clinics of an industrial area over the period January, 1940 to January, 1950.

It was hoped also, from the information gained to put forward recommendations for the general management of the combined condition.

2. Procedure.

Before presenting details of this investigation I think it would be valuable to consider some of the important general factors of the two entities of this study, namely, pulmonary tuberculosis in women of child-bearing age and child-bearing itself. With these factors fresh in mind, I then propose to trace the growth of our knowledge of the subject by discussing the most relevant and worth-while contributions in the literature.

I shall then set out my own investigation and my results and compare them with those of others who have made similar studies. This will be followed by a critical discussion of the present views on the problem, my conclusions,

recommendations and summary.

3. General points on Pulmonary Tuberculosis.

Pulmonary tuberculosis can be a baffling disease in its insidiousness, powers of mimicry of other disease, varied pathology, immunity reactions and response to treatment. Even with the resources we bring to bear on the disease to-day, it remains undefeated and a scourge in our midst. Combine this pathological process with the physiological processes of conception, gestation and parturition and we would have apparently a condition fraught with many dangers and problems.

In the British Isles the normal child-bearing period of a woman's life is from 17 to 45 years of age. The "adult" type of phthisis is most commonly found in this age group, though it is becoming increasingly common to find the onset of primary infection delayed till the early adult period or later. An important factor in the outcome of tuberculous infection of the lungs is the type of lesion present or, in other words, the general and local reaction of the body to the tubercle bacillus and its toxins. With the disease on the ascendancy there is an exudative reaction followed by liquefaction of the lung tissue and cavity formation. At the other end of the scale, when the host reacts favourably, there is a productive and protective reaction with the formation of fibrous tissue and an attempt to wall off and localise the disease. Between these two extremes we find destructive processes side by side with reparative processes, so giving rise to the fibro-caseous

type of disease. The "natural" outcome of the disease depends on the ascendancy of either the exudative or productive process. This appears to be governed in the main by the person's overall resistance to the tubercle bacillus and consists of the sum of the acquired and natural resistance, the latter being probably the more important.

In women of child-bearing age resistance to tuberculosis is found to be lowest in the group 17-25 years and increases fairly steeply till it reaches a maximum in the late thirties. Towards the age of the menopause the resistance begins to wane. In the age group 17-25 years we find that the predominant type of pulmonary lesion is exudative and that at this period the individual's resistance or power to produce a reparative reaction is lowest. The highest female mortality from pulmonary tuberculosis is, as would be expected, found in this age group.

Resistance both specific and general to tuberculosis can be affected by environment. It is lowered by stresses mental and physical, such as emotional conflict, anxiety, cold, damp, fatigue and undernourishment. In the presence of one or more of these factors and especially where the person is exposed to daily infection such as occurs in an infected over-crowded household, resistance is lowered and eventually overcome.

Race plays a part in determining the degree of resistance but in the British Isles it can hardly be looked upon as important as environment. Concurrent debilitating illnesses like diabetes, nephritis and anaemia, or a local inflammatory condition of the lungs such^{as} chronic bronchitis or

pneumonia lead to lowering of resistance and efficiency of the exudative process.

In more recent years attention has been drawn to the role of the hormones in determining the degree of both specific and general resistance. With pulmonary tuberculosis in the female the gonadotropic and oestrogenic hormones may be exerting an influence on resistance especially during pregnancy when hormonal activity is at its height. The real significance of the hormones in the field of resistance to infections in general has not yet been determined but from our present knowledge it would seem that they play an important part.

With the advent of the anti-biotics such as P.A.S. and Streptomycin and the great advances made in thoracic surgery, treatment can now greatly influence the course of pulmonary tuberculosis. The exudative lesions respond best to the anti-biotics and subsequent minor surgical procedures such^{as} artificial pneumothorax and phrenic paresis with pneumoperitoneum whilst the productive lesions are most amenable to radical surgical procedures such as local resection, lobectomy, pneumonectomy or thoracoplasty either alone or in conjunction with some form of resection. These measures, however, appear to affect little the inherent or basic resistance of the individual to tuberculosis with the consequent everpresent danger of relapse.

4. General points on Pregnancy.

Conception, gestation and parturition are essentially physiological. They are, however, very delicately balanced and it is often very difficult to say when one or other

has become pathological. The tendency to become abnormal seems to depend, amongst other things, on age and parity. The lowest maternal mortality is found in the age group 20-25 years and mounts gradually above that age group. Again there is a greater tendency for things to go wrong in the first pregnancy than in any other pregnancy up to the fifth and the longer the first pregnancy is delayed the greater the risk. Some women have their general bodily economy enhanced by pregnancy whilst others have it depressed, sometimes markedly so, but the majority of women react in a way somewhere between the two. We are not quite certain of the effect of pregnancy on resistance to intercurrent disease in general but because of the high hormonal activity at this time it is probable that the influence is not unimportant. As with tuberculosis, treatment for the infections and abnormalities commonly associated with pregnancy has been greatly improved especially with the use of the Sulpha-drugs, anti-biotics and blood transfusions. The confinement itself, if well conducted, can now be undertaken without leading to any undue or dangerous exhaustion of the patient.

Review of the Literature.

Bearing in mind the points mentioned about pulmonary tuberculosis in women of child-bearing age and pregnancy, we can examine the development of thought and practice in the management of pulmonary tuberculosis complicated by pregnancy.

As far back in history as the time of the Pharaohs of Ancient Egypt, pulmonary tuberculosis or "consumption" appears to have been recognised and "temples of healing" for victims of this disease were flourishing in the Nile valley around 2000-3000 B.C. Between 460 B.C. and 400 B.C. the Greek physician Hippocrates was aware of the benign and often beneficial effect of pregnancy on consumption and he went so far as to advocate pregnancy as a treatment for the consumptive woman. Later, in the 2nd century A.D. another famous Greek physician, Galen, followed the same theory and practice. They must have noticed, however, that pregnancy and consumption could be a disastrous combination but despite this their teachings held sway in the medical world right through to the 19th century. Physicians of the calibre of Sydenham, the father of English medicine, and continental physicians such as Rokitansky professed that pregnancy was beneficial to the tuberculous woman. Even as late as the first two decades of the 20th century this belief was still commonly held by the laity.

About the beginning of the 19th century the pendulum began to swing to the other side and by the latter

half of the century almost complete reversal of medical opinion had occurred. The treatment of pulmonary tuberculosis itself was advanced in this century. George Bodington in England in 1840 put into operation the sanatorium idea and renounced the current methods of treatment by tartar emetic, "antiphlogistic art of depletion" and nursing of the patient in tightly closed rooms.

Two French physicians, Louis and Ortega, each presented a series of cases showing the profoundly deleterious effect a pregnancy and confinement had on the course of active pulmonary tuberculosis. They advised that a tuberculous woman should not marry, that if married should have no children and if pregnant should be aborted. In these days, however, it must have been possible only to diagnose those with moderately or far advanced disease and with the standard of treatment for the pulmonary disease it was, their conclusions were based on cases whose prognosis was at best poor and at worst, hopeless. Many mild or smouldering cases who had one or more pregnancies with no obvious untoward effect on the general health could not have been included and the darkest side of the scene alone presented. Again women married early and bore the first three or four of their children when in the age group of the highest mortality from pulmonary tuberculosis. Families were large and one pregnancy followed fast on another with the result that chronic debility became an ally of the tubercle bacillus. No doubt at that time inadequate treatment for the lung disease, malnutrition, over-crowding and resulting intercurrent infection all played a

part, and another physician, Dubois, seemed to have good grounds for saying that "a tuberculous woman may bear her first accouchement well, a second with difficulty, but a third, never!" The views expressed by Louis, Ortega and Dubois became the current teaching for about 90 years. As late as 1914 in the transactions of the Medical Society of the State of New York it is recorded that Dr. Parry and Dr. Lobensteine, two noted obstetricians of the day, deplored the belief still present amongst the laity that pregnancy should be advocated in the treatment of pulmonary tuberculosis. They agreed that 65-75% of moderately advanced cases of pulmonary tuberculosis were made worse by pregnancy whilst advanced cases were always made worse. In all active cases they advised therapeutic abortion. They pointed out, however, that abortion performed after the 12th week could lead to a flare-up of the lung disease to much the same extent as a full-term delivery and unless the woman's condition was deteriorating rapidly, advocated conservative treatment of the pregnancy after the first trimester.

. Following the first World War interest in the problem of pulmonary tuberculosis and pregnancy was revived by Forssner of Stockholm. In 1924 he presented his findings in the study of a series of 203 pregnant tuberculous women. These women were patients at two large maternity hospitals and he compared their lung conditions over a two-year period following delivery with those of 396 non-pregnant tuberculous women attending a tuberculosis dispensary over the same period. The study was important because of the large number of cases in the series,

the consideration of the cases according to the extent of the pulmonary disease using Turban's classification and the attempt to make use of a control series. Important information such as results according to age groups and the treatment employed for the lung condition are lacking. The author, however, showed in his final analysis that in the minor and less advanced cases of phthisis complicated by a pregnancy, the after-histories at the end of two years showed very little difference when compared with those of the control group. In the more advanced cases he found that the pregnant women fared worse than the controls though to a lesser extent than was formerly believed. He was inclined to the view that therapeutic abortion was not justified in cases of active pulmonary tuberculosis.

Opinions, however, continued to conflict as evidenced by the statements of Pankow in Germany in 1926. He thought that in every case of active lung disease where pregnancy occurred, the latter should be terminated. His countryman, Junger, also advised interruption of pregnancy in active cases but advised against interference when the lung disease was quiescent. About this time another German, Schultze-Rhonhof, studied a series of cases of pulmonary tuberculosis complicated by pregnancy and concluded that in the majority, gestation, delivery and the puerperium exerted very little influence on the pulmonary lesions.

In 1927 Jeannin, in France, pointed out that most reactivations occurred either early in pregnancy or shortly after delivery and believed that in active cases, especially of

the fibro-caseous type, early therapeutic attention should be carried out. In the same year Rist of Paris published his experience and views on the subject. He firmly believed that pregnancy in the majority of cases had a deleterious effect on the pulmonary disease and regretted that there were still physicians who considered that a tuberculous woman could bear children without any undue effect on the lung condition. He suggested that this impression arose from the loose criteria used for the diagnosis of tuberculosis. "When, however," he states, "statistics are based upon reliable diagnostic criteria, they invariably show that pregnancy in a tuberculous woman leads to an aggravation of the symptoms, to the extension of existing lesions, to the production of fresh ones and to the flaring-up of those which were quiescent." He goes on to say that, "the mother may survive confinement for a time but her condition has become definitely and permanently worse. The few exceptions to the rule concern women who have a markedly fibrotic and obviously mild form of tuberculosis." He presented a series of cases of pulmonary tuberculosis complicated by pregnancy between 1919 and 1926. They consisted of 52 cases of women under medical care for pulmonary tuberculosis and who later became pregnant; 117 women who were healthy before conception and who developed pulmonary tuberculosis either during or after pregnancy and a series of 58 cases in whom artificial pneumothorax treatment was instituted either before, during or shortly after pregnancy. He makes no use of a control group except for the cases treated by artificial pneumothorax.

In his first group of 52 cases where the lung disease was present before conception it can be assumed that the disease was active at the time of conception. Of these 52 cases, 40 had bilateral disease and presumably were moderately advanced. At the end of one year following delivery, 36.5% of these moderately advanced cases were dead and at the end of two years 50% were dead. As the author failed, however, to take into account the profound effect of age of the patient and type of lesion on the outcome of the pulmonary disease, it is difficult to give correct significance to his figures.

In his next group of 117 cases who were allegedly healthy before conception we have no direct and substantial proof that they were so. A number may have had quiescent or mild fibrotic disease producing little or no signs and symptoms and could have been discovered only by radiography. Again he gives no information on the age-groups, type and extent of the lung lesion or the parity of the patients.

The following table shows the mortality amongst these cases two years following delivery according to the time of the first diagnosis of active lung disease.

| Period of Onset of active lung disease. | Number of Cases. | Death rate 2 years after parturition. |
|---|------------------|---------------------------------------|
| Ist Trimester | 33 | 66% |
| 2nd or 3rd Trimester | 22 | 72% |
| 6mths post-partum | 62 | 39% |
| Totals | II7 | Average- 50% |

The mortality was highest in those cases who apparently developed their lung disease during pregnancy. At the end of two years following parturition these II7 cases showed a 50% mortality and 36% were in a serious condition.

In Forsner's control group the mortality at the end of two years was 39% but the two groups are not fairly comparable as we have no knowledge of their age composition and only vague information on the type and extent of the pulmonary lesions.

Despite this high mortality Rist did not advocate therapeutic abortion with active disease as he thought it ineffective in arresting the course of the lung condition. He rather recommended the induction of artificial pneumothorax in unilateral lung disease and to allow the pregnancy to proceed to term.

During the period of Rist's investigation it was not generally accepted that bilateral artificial

pneumothorax was feasible and thoracoscopy with adhesion section under direct vision had not been developed. Satisfactory artificial pneumothorax was obtained only in those cases showing selective collapse of the lung.

To justify the view quoted above, Rist presented his findings in the group of 58 cases in which a unilateral artificial pneumothorax was effected either before the onset of pregnancy, during the pregnancy or shortly after confinement.

His findings two years after confinement are shown in the following table.

| Time of induction of artificial pneumothorax. | Number of cases. | Number improved. | Number worse. | Death rate 2 years after parturition. |
|---|------------------|------------------|---------------|---------------------------------------|
| Before conception | 18 | 14 | - | 22% |
| During pregnancy | 25 | 9 | 6 | 40% |
| Within 2 months post-partum. | 15 | 5 | 2 | 53% |
| Totals | 58 | 28 | 8 | Average-39% |

Assuming that the disease in these 58 cases was predominantly unilateral and setting aside considerations of age at diagnosis and type of lesion, it is obvious that those with a satisfactory artificial pneumothorax in being at the onset of pregnancy fared best and that this treatment

appeared to afford some measure of protection against flare-up of the disease as a result of undergoing pregnancy and parturition.

In the work of Rist we see the emphasis being placed upon treatment for the lung disease and not on the complicating condition of pregnancy.

Formerly the obstetricians had been most vocal on the condition of pulmonary tuberculosis complicated by pregnancy and their inclination had been to concentrate on the pregnancy which was within their sphere and more or less to ignore the treatment of the lung disease which was outwith their sphere.

In 1928 Alice Hill in America published her results in the first large scale statistical study of pregnancy in pulmonary tuberculosis. She chose for her study those cases in whom pregnancy was an incident in their tuberculous history, that is, cases whose whole tuberculous history was known to the tuberculosis dispensaries and not just random cases drawn from the wards of maternity hospitals as had been the practice in former studies. Her information was drawn purely from the case reports and records of white tuberculous women attending the dispensaries and municipal and private sanatoria of Detroit and Michigan during the five year period January 1920 to December 1924.

Her series consisted of 349 women who had a pregnancy either during the course of their tuberculous illness or who were diagnosed as tuberculous during a pregnancy or immediately afterwards. As a control group she took 160 married tuberculous women attending these clinics at the same period but who had no pregnancy for at least one year prior to the diagnosis of the lung condition. Each control was matched with a pregnancy case with whom she was comparable in age, nationality, stage of disease and amount of sanatorium treatment. She found it difficult to obtain a larger comparable control series as the number of married tuberculous women under 20 years of age who had had a pregnancy far outnumbered the married tuberculous women under 20 years who had had no pregnancy. In other words, a married tuberculous woman under the age of 20 years seldom passed her 20th birthday without being pregnant. In the higher age groups she found this position reversed. The condition of the lung disease at the end of one year or two years following delivery in the pregnancy cases who could be matched, was compared with the state of their 160 controls at the end of the same periods.

Of the 349 pregnancy cases studied the deplorable fact was revealed that only 123 of them had as much as six weeks continuous sanatorium treatment. The matched cases, however, had a comparable amount of sanatorium treatment though the latter was not always adequate in length and quality. Her study of the 160 matched pregnancy cases showed that at the end of one and two years after delivery, their lung conditions

were better than their controls. Less than one in twelve diagnosed as tuberculous before pregnancy were dead at the end of one year. "This," she states, "seems to indicate that the pregnant tuberculous woman under treatment faces a risk no greater than that of the tuberculous woman plus that of the normal woman who becomes pregnant." Of those who were first diagnosed as tuberculous during pregnancy, more were dead at the end of one year than in the control group but at the end of two years there was little difference between the two. One in five diagnosed as tuberculous during pregnancy was dead at the end of one year. Those whose lung disease was diagnosed immediately after confinement fared in much the same way as the control group at the end of one and two years. One in three of them was dead two years after the confinement. The author found that when the lung disease was diagnosed after confinement it tended to be much more advanced than when diagnosed before or during pregnancy but points out that this is probably due to the fact that the disease was allowed to progress to an advanced stage before being diagnosed. In many of these cases she was of the opinion that the disease was in all probability present during and even before the onset of pregnancy. The highest death rate amongst the pregnancy cases occurred in the primiparae of the age group 20-24 years ^{is} which the age group in tuberculous women as a whole showing the highest mortality. As regards maternal mortality this age group normally shows the lowest figure and the author concluded that the mortality in these primiparae was more closely related to the greater risk of this

particular age group from pulmonary tuberculosis than to the age of their primiparity. Despite this, however, she believed that the death rate was greatly influenced by the time of first diagnosis of the lung disease, that is, whether it was diagnosed before, during or after pregnancy and that this probably had a greater bearing on the prognosis than the actual age of the patient.

In England at this time (1939) at a combined discussion by the section of Obstetrics and Gynaecology of the Royal Society of Medicine and The Tuberculosis Association the consensus of opinion was expressed by Mr. Alec Bourne and Dr. G. Marshall. They held the view that on the whole it was best to allow the pregnancy to proceed to term in any stage of the disease. They state, however, that there was still a strong body of opinion in favour of termination of the pregnancy in the first fourteen weeks in the presence of advanced disease of the lungs or where the disease had only recently been rendered quiescent. All were more or less agreed that the lung disease should receive every possible treatment no matter what decision was made concerning the treatment of the pregnancy.

The important point at this period was that mainly as a result of the work of Rist and the statistical studies by Alice Hill attention was focused on the effect of treatment for the lung disease in pregnant tuberculous women. It came to be realised that treatment of the pregnancy was secondary to treatment of the lung condition. The technique of producing relaxation and resting of the diseased lung was gradually

improving and in the twenties of this century bilateral artificial pneumothorax had established its place in treatment. The development of thoracoscopy with intra-pleural division of adhesions under direct vision widened the range of artificial pneumothorax tremendously. With the perfection of this method of relaxation of the lungs, the prognosis in pulmonary tuberculosis became distinctly brighter. Where artificial pneumothorax could not be applied other methods came into use, such as the raising of the hemi-diaphragm by phrenic nerve interruption and reinforcement of the diaphragmatic elevation by artificial pneumo-peritoneum. Improvements in surgical technique and anaesthesia led to permanent collapse of diseased lung tissue being made possible by plastic operations on the thoracic cage, the chief amongst these being the two-stage thoracoplasty.

Seeley, Siddall and Balzer of the Herman Kiefer Hospital and the Division of Obstetrics and Gynaecology, Wayne University, in 1939 studied the state of the lung disease one year after delivery in 109 tuberculous women who were adequately treated post-partum for their disease. Their patients were divided into two groups (i) those who had little or no pulmonary treatment during pregnancy and who served as controls and (ii) those who had sanatorium treatment for two months or more before delivery. Of the latter group 54 had treatment for the lungs in the form of artificial pneumothorax or phrenic nerve interruption or both.

On comparing the two main groups after allowing for

type and extent of the disease, it was found that the mortality one year after delivery was higher in the group who had no pre-delivery sanatorium treatment. Of the 54 who had collapse therapy, it was shown that those who had the collapse induced before the onset of pregnancy fared better than those who did not commence collapse therapy until some time during pregnancy. Their results are shown in the following table.

| | Arrested | Improved | Unimproved | Died | Totals |
|-----------------------------------|----------|----------|------------|---------|--------|
| Treatment begun before pregnancy. | 3 (16%) | 14 (74%) | 1 (5%) | 1 (5%) | 19 |
| Treatment begun during pregnancy | 3 (9%) | 24 (68%) | 3 (9%) | 5 (14%) | 35 |

The series of cases treated with collapse therapy is not large and the treated cases are rather haphazardly matched with the controls. The age groupings are inadequately dealt with and the extent and type of the disease at the onset of pregnancy not clearly defined. Despite this, however, the overall figures for the cases who had treatment for the lung disease before or during pregnancy show a great improvement on those who had no lung treatment up until the time of their confinement. The authors concluded that adequate treatment for the lung disease before and during pregnancy led to a more favourable outcome one year after delivery and that collapse therapy by artificial pneumothorax or phrenic nerve interruption or both offered a good degree of protection against flare-up of the disease during pregnancy, parturition and the period of

infant-rearing.

From the other side of the world about 1940, A.B. Crenham of the Royal Prince Alfred Hospital, Sydney, gave his views on the problem. He believed that active treatment for the lungs, especially with collapse therapy, was the correct course to follow and that to resort to interference with the pregnancy was an open admission of failure.

Mariette, Larson and Litzenberg from the University of Minnesota presented a study of 86 tuberculous women treated in Glen Lake Sanatorium during a pregnancy between the years 1921-1940 and who were allowed to proceed to term. Of these cases 64 were actually delivered in sanatorium. The pregnant women fell into the broad age group 18-39 years and more than half of them had successful collapse therapy. They were followed up for periods as long as 12 years or more. Their death rate was compared with that of 2,230 non-pregnant tuberculous women of the same age group treated during the same period in Glen Lake Sanatorium. Extent, type of disease and allowance for the different prognosis in the various age groups were not considered in the rough comparison but they found that 18% of the pregnant women had died by 1940 as compared with 39% of the non-pregnant women. The authors concluded that if the lung disease during pregnancy were properly treated and especially with collapse therapy, pregnancy did not adversely affect the final outcome.

Baker and Ward, obstetricians of Worcester, Massachusetts, in 1924 stated that pregnancy had a harmful effect

on pulmonary tuberculosis but believed that deactivation could be prevented by protecting the lungs through collapse therapy. They advocated collapse of the diseased lungs during pregnancy, parturition and for some months afterwards.

To give point to their belief they presented a small series of eleven cases of pregnant tuberculous women whose lung disease was treated by collapse therapy and who were observed for seven years following parturition. None of the cases showed re-activation during the seven year period. No details were given, however, of the age of their patients, type and extent of disease or their parity.

In 1944, Cutler of Philadelphia, U.S.A., described a small but interesting series of private patients, 26 in number, who had pulmonary tuberculosis complicated by pregnancy. He stated that in the non-pregnant woman with advanced pulmonary tuberculosis collapse therapy had greatly improved the prognosis. He set out, therefore, to re-evaluate the prognosis in the pregnant woman with advanced disease when adequate collapse measures were being undertaken. His 26 patients were all in good circumstances and co-operative and were followed up for periods varying from 16 months to 15 years after parturition. He made no mention of the age of his patients or the type of disease encountered but we find that 15 had predominantly unilateral disease and 11 had definitely advanced bilateral disease at the time of the first diagnosis. The lung disease had been rendered quiescent by collapse therapy for an average period of one year before the onset of pregnancy in 21 of the

cases, 3 had active disease at the onset of pregnancy and 2 were not diagnosed as tuberculous until the early months of pregnancy. Of the 21 quiescent cases, 4 showed a reactivation following parturition, the interesting fact being that the reactivation occurred in the lung not protected by collapse therapy. The 3 cases who were active through failure of collapse therapy became worse after the onset of pregnancy. These 3 cases the author considered to be good controls in that they demonstrated the risk of pregnancy in women with advanced lung disease that is not adequately controlled by collapse therapy. Cutler concluded that when the disease is under control by the use of collapse measures, one or more pregnancies may be undertaken with safety. In the light of his experience with these 26 cases he made the startling assertion that the period of collapse therapy was the safest period for a tuberculous woman to marry, have children and rear a family.

From the Sea View Hospital, Philadelphia, in 1939 Ornstein and Epstein presented a series of 82 pregnant women with pulmonary tuberculosis treated and confined in their hospital during the year 1938. They grouped their cases according to the type of lesion at diagnosis, namely (i) caseous-pneumonic with open cavities, (ii) resolving exudative type and (iii) chronic productive type. They believed that the type of the pulmonary lesions was far more important than the extent of the lesions, age groups, parity or method of delivery at or near term. The cases were divided according to the type of lesion and method of treatment as follows:-

| Type of Disease | Number | Treatment Adopted | |
|---------------------------------------|--------|-------------------|---------------|
| | | Collapsee Therapy | Bed-rest only |
| Caseous-pneumonic with open cavities. | 59 | 47 | 12 |
| Resolving exudative type. | 8 | 0 | 8 |
| Chronic productive type | 15 | 0 | 15 |
| Totals | 82 | 47 | 35 |

Only those with caseous-pneumonic disease were treated with collapse therapy. This type of treatment was instituted at unspecified times before or during pregnancy and was applied in 47 cases, of whom 33 had an artificial pneumothorax and 14 had a thoracoplasty. The overall results at the end of the observation period following parturition are given in the next table.

| Type of Disease | Number | Improved | Not Improved | Worse | Died |
|---------------------|--------|----------|--------------|-------|------|
| Caseous-pneumonic | 59 | 39 | 9 | 1 | 10 |
| Resolving Exudative | 8 | 8 | - | - | - |
| Chronic Productive | 15 | 15 | - | - | - |
| Totals | 82 | 62 | 9 | 1 | 10 |

All the deaths occurred in patients with the caseous-pneumonic type of disease and amounted to 10, i.e. 12.2% of the total. Of the 10 who died, 9 had had an ineffective artificial pneumothorax and the remaining one had had bed-rest only. None of the thoracoplasty cases showed any deterioration after parturition. Those with resolving exudative or chronic productive type of disease showed some improvement. The final figures were- (i) death rate 12.2% (ii) improved 75.7% (iii) no change 10.9% and (iv) much

worse 1.2%.

The authors concluded that the greatest mortality occurred in those with caseous-pneumonic type of disease and especially where it could not be controlled by collapse therapy. They pointed out that caseous-pneumonic disease in the non-pregnant woman carried the worst prognosis also but as long as it could be kept under control by collapse therapy an additional burden such as pregnancy and parturition appeared to exert little influence.

To emphasize the beneficial effects of collapse therapy on the lung disease during pregnancy the authors compared their findings with a comparable study made by Ornstein and Kovnat in the same hospital in 1935 of a series of 85 pregnant women with pulmonary tuberculosis. In 1935 little or no collapse measures were attempted. The cases were grouped in the same way according to the type of lesion and their findings compared with those in 1938 as shown below.

| | Improved | Worse | Dead |
|------|----------|-------|-------|
| 1935 | 45.5% | 16.5% | 36% |
| 1938 | 75.7% | 12.1% | 12.2% |

The two studies are comparable only in number involved and type of lung lesion but despite this, the overall improvement after the use of collapse therapy is striking, the mortality being reduced by about two-thirds.

Harvey B. Matthews, Clinical Professor of Obstetrics and

Gynaecology, Long Island College of Medicine, New York, in 1940 considered that the prognosis in active pulmonary tuberculosis complicated by pregnancy was affected by the type of pulmonary lesion and the treatment instituted for it. He advocated rigorous treatment for the tuberculosis with collapse therapy and stated that the pregnant woman should have the same treatment for the pulmonary disease as the non-pregnant woman. The results thus obtained were far better than those of 10-20 years ago and the statistics gathered then on the effect of pregnancy on pulmonary tuberculosis he regarded as out of date. He stressed the fact there were cases which collapse measures could not control and in his opinion it was only in those that treatment had to be diverted to the physiological process and the pregnancy terminated.

The permanent diminution in vital capacity caused by a thoracoplasty was thought to be a contra-indication to its use in pregnancy and it was not until about 1930 that the association of pregnancy and thoracoplasty began to occur. Up to 1940, Seeley, Siddall and Balzer found only 31 cases quoted in the literature. In their opinion the literature gave an optimistic view of the picture as probably only the successful cases were reported. On the other hand, it was to be remembered that thoracoplasty was used in the main on those cases with advanced disease which was unsuitable or had been unsuccessfully treated by more conservative methods of collapse. These 31 reported cases had 34 full-time or premature deliveries. One of them died and 5 had serious exacerbations of the lung disease

during pregnancy or within one year of delivery.

In the Herman Kiefer Hospital of Wayne University, 144 female patients had had a thoracoplasty up to 1940. Seeley, Siddall and Balzer followed up these cases and found that 10 of them subsequently became pregnant. All 10 had fairly far advanced disease at the time of the operation which was performed 1-5 years before delivery. They were aged 22-30 years and their parity varied from one to seven. All had been rendered quiescent before the onset of pregnancy and only two had reactivation of the lung disease within one year following delivery. The authors also mentioned that they had 4 cases in their care on whom thoracoplasty was successfully performed during pregnancy. They concluded, but probably optimistically on the scanty data they presented, that the majority of women can go through pregnancy safely after a successful thoracoplasty operation.

In 1939, Ornstein and Epstein from the Sea View Hospital, presented a study of 82 tuberculous women treated and confined during the year 1938. Of their 82 cases, 12 had had a thoracoplasty for advanced disease with cavitation and were rendered quiescent for unspecified periods before becoming pregnant. All 12 gave birth to a live child and had no reactivation of disease within the year of observation.

By 1942 Stanfield, obstetrician and gynaecologist, East Suffolk and Ipswich Hospital, could collect from the literature 39 cases of tuberculous women treated by thoracoplasty and subsequently undergoing a pregnancy. We added one

case of his own. Each one of the 40 cases reported on had fairly far advanced disease at the time of operation but had become quiescent before the onset of pregnancy. Full-term or near full-term deliveries occurred in 32 cases, whilst two aborted spontaneously and 6 were aborted therapeutically within the first trimester. In all 8 cases showed reactivation either during pregnancy or within 2 years of delivery. There was only one death and 3 of the reactivations occurred in women who had had a therapeutic abortion performed. The various authors blamed the home conditions of the patients rather than the pregnancy and parturition for the break-downs. Troublesome dyspnoea in late pregnancy and during parturition was an infrequent occurrence despite initial misgivings to the contrary. Stanfield concluded that women suffering from pulmonary tuberculosis which had responded well to a thoracoplasty may safely be allowed to bear children provided their home conditions are satisfactory.

McIntyre, Robroyston Hospital, Glasgow, reported 12 cases of thoracoplasty associated with pregnancy, the deliveries taking place in Robroyston Hospital between February 1947 and March 1948. Moderately advanced disease was present in all cases at the time of the operation, the latter being performed from I-10 years before conception in 11 cases and in the remaining case during the 14th week of her pregnancy. This latter case was the only one not rendered quiescent before the onset of pregnancy. The ages of the patients ranged from 23-32 years and 5 were primiparae and 7 were multiparae. Except in one case

who had a pleurisy during her pregnancy and remained active. no reactivation was seen 3 months after delivery. Spontaneous delivery occurred in 6 cases, 6 were assisted by the application of low forceps but only in 2 cases was parturition accompanied by respiratory embarrassment and this was only of slight degree.

Though constituting a definite advance in the treatment of pulmonary tuberculosis , artificial pneumothorax and thoracoplasty were found to have a common disadvantage in that they were inefficient and frequently ineffective in dealing with infiltration and cavitation at the base of the lung. In addition at least 90% of cases of artificial pneumothorax required the cutting of intra-pleural adhesions to obtain satisfactory selective collapse and to avoid if possible, the bug-bear of fluid formation. This was further complicated by the fact that many adhesions were too dangerous to divide on account of the contained blood vessels or pulmonary tissue with the result that the pneumothorax had to be abandoned or kept going in an inefficient form. All too frequently this latter course appeared to have been followed. Thoracoplasty was an irreversible major operation generally requiring to be done in two or more stages and resulting in unsightly deformity of the chest. Some simpler and reversible procedure which could be effective in basal lesions but without the operative risk of adhesion section or thoracoplasty was required.

About 1929-31, Banyai appeared to hit upon a solution to the problem by relaxing the lung through elevation of the diaphragm. The elevation was produced by introducing

air into the peritoneal cavity and increasing the pressure on the under surface of the diaphragm. Artificial pneumoperitoneum had been used in peritoneal tuberculosis for many years following the observation that admission of air to the abdominal cavity during exploratory laporatomy appeared to promote healing of the disease.

Banyai in a preliminary report in 1931 of 44 cases of pulmonary disease treated by this method stated that he obtained encouraging results. In 1934 he published a report of 100 cases of whom 71% obtained symptomatic relief and suggested that artificial pneumoperitoneum should be used in conjunction with phrenic nerve paralysis.

Centoscudi in 1936 made a similar recommendation and it was soon realised that the greatest relaxation of the lung base could be obtained in this way.

For some time no one appeared to make a specific investigation to compare the efficiency of phrenic paralysis in the treatment of pulmonary tuberculosis in the pregnant woman with other forms of collapse therapy. Cohen of Black Notley Sanatorium, Essex, presented a series of 100 tuberculosis women treated and confined in his sanatorium from 1937-1943 and another 77 cases treated and confined between 1943 and 1946. Where collapse therapy was warranted all forms were used including phrenic paralysis, the lung disease being treated as if the pregnancy did not exist. He apparently obtained good results in his cases treated with phrenic paralysis. Cutler of Philadelphia, however, in his presentation of 26 private cases, found that exacerbation

or embolism of disease during or after pregnancy occurred in the lung not collapsed, poorly collapsed or treated with phrenic nerve paralysis. With this latter type of collapse, failure occurred in one case only and the author was not justified on this data alone on coming to any conclusion. In 1939, Seeley, Siddall and Balzer published a series of 100 pregnant tuberculous women, some of whom were treated by phrenic paralysis. Like Cohen, they stated that they obtained good results from this form of collapse therapy.

When Banyai in 1931 drew attention to the possibility of treating pulmonary tuberculosis with pneumoperitoneum, the obstetricians put forth the following theory. They argued that during the later months of pregnancy in the tuberculous woman, the large uterus caused elevation of the diaphragm in the same way as pneumoperitoneum, with relaxation of lung tissue and promotion of healing. This, they maintained, accounted for the improvement in the lung condition seen in many tuberculous women towards the end of pregnancy. Conversely, they argued, on evacuation of the uterus, the diaphragm was permitted to descend suddenly causing stretching of the lung tissue and reactivation of quiescent lesions. If this descent of the diaphragm could be prevented the beneficial effect of the pregnancy could be maintained and the ill effects of parturition avoided. They therefore advised the filling of the lax abdominal cavity with air as soon as possible after the third stage of labour and applying a tight binder to the abdomen. For some unknown reason elevation of the diaphragm by

performing the simple operation of phrenic crush in the neck, say, just before the onset of labour was never considered. This theory of the harmful action of the diaphragm on the lung disease following on parturition gained many followers though no serious attempt was made at the time to prove that the diaphragm did ascend before and descend after parturition. The theory was simple, appeared logical and seemingly gave a clear cut explanation of the effect of parturition on the lung disease. The strange fact emerges, however, that this theory was proved to be, in the main, untenable even before it became popular. Roloff from Germany, in 1929 recorded the intra-pleural pressures in cases with artificial pneumothorax immediately before and after parturition and found no significant difference. The inference to be drawn was that there was little or no change in the volume of the intra-pleural space and that there must have been little or no alteration in the level of the diaphragm.

In 1928 A.P. McGinty of Michigan University, made a specific study of the comparative effects of pregnancy and phrenic nerve paralysis on the diaphragm and their relation to pulmonary tuberculosis. In doing this he repeated the work of Heynemann, Klafton and Palugyay. With the use of special radiographic apparatus, these workers showed that about 2-3 weeks before the onset of labour, the diaphragm on full expiration assumed a level in the chest that was higher than that assumed during full expiration after labour, i.e. there was greater relaxation of the diaphragm on full expiration during the last few weeks of pregnancy. On full inspiration, however, they demonstrated that

the diaphragm descended to the same level during the period before labour as it did after labour. They showed, therefore, that the large uterus towards the end of pregnancy did not rise and splint the diaphragm so much as produce a greater relaxation of it and so allowed it to rise higher in the chest and increase its amplitude of excursion between full inspiration and full expiration. They also demonstrated that during quiet respiration there was little or no difference in the diaphragmatic excursion in the pregnant and non-pregnant state.

McGinty made his observation in 50 pregnant women and compared their diaphragmatic levels with those of non-pregnant women with a phrenic paralysis. He found that those with a phrenic paralysis had a much greater elevation of the diaphragm which in addition showed only slight paradoxical movement but no respiratory excursion. This high diaphragm possessing no active movement, he maintained, was of much more therapeutic value than the slightly elevated but mobile diaphragm obtaining during the later weeks of pregnancy. Measurements of vital capacity demonstrated that there was little difference during and after pregnancy, the effect of the enlarged uterus being to splay the lower ribs and increase the breadth of the thoracic cage. The volume lost by diminution of the vertical measurement through the slight elevation of the diaphragm was compensated by the increased horizontal measurement.

Thus by 1938 it had been amply demonstrated that sudden descent of the diaphragm after parturition could play only a minor part, if any, in producing reactivation of lung disease.

The marked excursions of the diaphragm during the deep respirations produced by the physical efforts of the second stage of labour would appear to be a more likely cause of stretching of the lung tissue.

The work of the above authors, however, appeared to have gone unnoticed and the theory of the deleterious effect of the diaphragm at parturition was maintained. As an example of this, Josephine Barnes of the University College Hospital, London, in 1939 presented one case to demonstrate what could be done to prevent the alleged fall in the diaphragmatic level and so avoid reactivation of the lung disease. Her case was aged 23 years and had had her third confinement which had been easy and spontaneous. She gave no details of the type and extent of the lung disease except that the patient was sputum negative before the onset of labour. Immediately after the third stage 3000ccs of air were introduced into the patient's peritoneal cavity and a firm abdominal binder applied. The woman was thereafter confined strictly to bed and given a course of Sanocrysin amounting to a total of 4.56gm. An x-ray taken three weeks later was stated to show improvement in the lung condition. According to the author all the air had disappeared from the abdomen within a week and no further refills were given. She presented no evidence to show that the pneumoperitoneum elevated the diaphragm and the strict bed-rest plus the course of Sanocrysin were more likely to have been the cause of the improvement than a single fill of air into the abdominal cavity.

Baker of Massachusetts in 1942 advocated the induction

of an artificial pneumothorax before labour or phrenic nerve section, this latter procedure being much more rational than the induction of pneumoperitoneum after labour. On the other hand, Hiltz, of the Nova Scotia Sanatorium, Newfoundland, was evidently satisfied with the application of a 10-20 lb. sand-bag to the abdomen and tight binders.

Phyllis Dingle, obstetrician of Redhill County Hospital, Surrey, in 1944 presented a study of 30 cases of tuberculous women in whom she had induced artificial pneumoperitoneum "prophylactically" in the puerperium with the object of keeping the diaphragm raised to prevent reactivation of lung disease. She gave no information of the ages of her patients, their parity or the type of disease but 12 had satisfactory collapse therapy in being in the ante-natal period whilst 8 had their disease quiescent or healed in the ante-natal period. That is, two-thirds of her patients had quiescent lung disease before delivery. The remaining 10 of the 30 patients had active lung disease during pregnancy, one half of this group having only minimal or moderately advanced disease, and the other half far advanced disease. Within one hour of the delivery which was in every case rendered as easy as possible by episiotomy or the application of forceps, she introduced 3000ccs of air into the peritoneal cavity. The pneumoperitoneum was maintained by giving a refill of 2000ccs. the following week with 1000ccs. weekly thereafter for a month. During the month of pneumoperitoneum treatment she confined the patients strictly to bed and suppressed lactation. She presented no data to show that she

had in fact succeeded in affecting the level of the diaphragm in her cases. All the women who already had successful collapse therapy came through with no reactivation at the end of the month's period of observation - an event which could have been forecast with some certainty without the "aid" of pneumoperitoneum. Of the 10 active cases, 7 improved but 5 of them had minimal or moderately advanced disease only which could possibly have improved equally well on the month's strict bed-rest. Death occurred in 2 of the remaining 3 cases who deteriorated. The author's results were not impressive and as the induction of an artificial pneumoperitoneum can be a dangerous and painful procedure especially when the air is collecting beneath the diaphragm, it would seem unwarranted to inflict it upon a woman already tired by her labour.

Tisdall in 1939 and Ornstein and Epstein thought that the diaphragm played no part in the flaring-up of lung disease after parturition. Cohen of Black Notley Sanatorium, Essex, on discussing 100 cases of pregnant women in 1943 and 177 cases in 1946 found it unnecessary to give a refill immediately after parturition in those cases treated by artificial pneumothorax. He was of the opinion that this fact disposed of the argument that the diaphragm descended to an appreciable degree on evacuation of the uterus at or near full term. He also pointed out that reactivation of the lung disease was apt to occur during the first three months of pregnancy when alteration of the level of the diaphragm could not have been considered to have taken place.

Before the effects of collapse therapy in the

treatment of pulmonary tuberculosis complicated by pregnancy were appreciated and attention was directed to the possible role of the diaphragm, most physicians and obstetricians concentrated on what might be done about the pregnancy. They believed the pregnancy to be harmful in every case. Louis, Ortega, Dubois and Rist firmly believed this and advocated removal of the harmful process by performing therapeutic abortion. Rist, however, was one of the first to cast doubts on this course but De Lee expressed the view of the majority when he said, "Until it can be incontestably proved that pregnancy actually improves the tuberculous woman, early abortion in every case of active phthisis is the most charitable course." It was soon recognised, however, that an abortion performed after the third month was apt to lead to rapid exacerbation of the disease in much the same way as a normal full-time delivery might do and that woman with far advanced disease were prone to spontaneous abortion often with far less harm to themselves.

In 1926, Bridgman and Norwood of John Hopkins Hospital, published their findings of a study of 134 pregnant tuberculous women. 57% of their cases who were aborted therapeutically were dead within a year of the operation. Their view was that operative interference with pregnancy in the presence of an active pulmonary lesion was followed by a higher mortality rate than spontaneous delivery. Rist believed that in an active case therapeutic abortion failed to arrest the course of the lung disease and that application of collapse therapy which could control the disease was much more rational and to

be preferred. No serious attempt, however, would appear to have been made to compare the effect of therapeutic abortion with that of full-term spontaneous delivery in tuberculous women.

In 1930, Barnes and Barnes of the American Sanatorium Association collected information on 410 pregnant tuberculous women by sending questionnaires to various sanatoria and hospitals. They made a comparison of 42 cases who were aborted before the fifth month of pregnancy with 275 cases who had a full-term delivery. They found that 40.4% of the aborted cases as against 37% of the full-term cases showed marked activity of the tuberculosis after delivery. They came to the conclusion that most of the favourable cases in their series tending towards arrest of the lung disease seemed to have gone on to arrest despite the pregnancy and the majority of the progressively active cases appeared to have progressed as surely with the empty as with the gravid uterus. The authors summed up by saying, "It is difficult to see how terminating a pregnancy in far advanced cases with a fever and cavities can offer much hope when we know that in women who are not and who never have been pregnant, most cases progress to death in a few months or a year or two at the most."

In 1931, Marshall of the British Tuberculosis Association advised therapeutic abortion in the first trimester in women whose lung disease had been recently rendered quiescent or which had recently become active. On the other hand, Eourne, at a meeting of the Obstetrical and Gynaecological Section of the Royal Society of Medicine, expressed the opinion that therapeutic

abortion had no place in the treatment of pulmonary tuberculosis complicated by pregnancy. Jameson in his book "Gynaecological and Obstetrical Tuberculosis" in 1935 advised that the question of interruption of the pregnancy should be delayed till the 12th-14th week and during this time the lung disease kept under close observation to determine its probable course. If the disease were progressing favourably he advised continuation of the pregnancy but if the lung condition showed a tendency to deteriorate he advocated therapeutic abortion. A.B. Matthews, Clinical Professor of Obstetrics and Gynaecology, Long Island College of Medicine, in 1940 was of the view that therapeutic abortion was **not** necessary except where the tuberculosis for various reasons could not be properly managed. Such a reason existed when the tuberculous disease was so far advanced as to exclude successful "arrest" when first seen by the obstetrician or when the disease was of the fulminating caseous-pneumonic type with cavitation that held no hope of yielding to collapse therapy including thoracoplasty..

In 1947, Stewart of Uxbridge Chest Clinic and Simmonds of Clare Hall Sanatorium, Middlesex, jointly published their findings on 216 pregnant tuberculous women. Their cases were obtained from a special central register noting pregnancies occurring in tuberculous women attending the Chest Clinics of the County of Middlesex during the period 1944-1946. As controls they had 259 non-pregnant women attending the Chest Clinics during the same period and comparable with the pregnant group in age, activity and duration of disease, standard of treatment,

social class and parity. The age groups, however, were rather broad, the cases being divided into those over and those under 30 years of age. A fair proportion of their cases, namely 56, had a therapeutic abortion performed in the first trimester, 20 of these having active disease at the onset of pregnancy and 36 having quiescent or arrested disease. Full-term delivery occurred in 160 cases, 30 of whom had active lung disease at the onset of pregnancy and 130 quiescent or arrested disease. The state of the disease 3-6 months after delivery in the pregnant group was compared with that of the control series and the results were as follows.-

Results in Active Cases.

| Change in state of lung disease. | Pregnancy Group | | Non-pregnant Group. |
|----------------------------------|-----------------------|---------------------|---------------------|
| | Therapeutic abortion. | Full-term delivery. | |
| Better or Stationary | 12 (60%) | 22 (73.2%) | 77 (67.5%) |
| Worse or Dead | 8 (40%) | 8 (26.8%) | 37 (32.5%) |
| Totals | 20 | 30 | 114 |

Those who were aborted fared worse than those who had a full-term delivery - 40% deteriorating as against 26.8%. This difference, the authors believed, was sufficient to show that a full-term delivery was less harmful in the presence of active lung disease than a therapeutic abortion.

In their quiescent cases the results were as follows.-

Results in Quiescent or Arrested Cases.

| Change in state of lung disease. | Pregnant Group. | | Non-pregnant Group. |
|----------------------------------|-----------------------|---------------------|---------------------|
| | Therapeutic Abortion. | Full-term delivery. | |
| Better or Stationary. | 33 (92%) | 117 (90%) | 110 (88%) |
| Worse or Dead. | 3 (8%) | 13 (10%) | 15 (12%) |
| Totals | 36 | 130 | 125 |

In those with quiescent or arrested disease at the onset of pregnancy there was little or no difference in the end result in the aborted group and the group allowed to proceed to a full-term delivery. 8-10% of the pregnant group deteriorated, an incidence much the same as that found in the non-pregnant group. The authors concluded that therapeutic abortion in the medical management of tuberculous pregnant women was unnecessary except in a few selected cases.

In 1947 Barone, Fino and Heatherington of the Department of Obstetrics, Pittsburg University, presented a series of 62 tuberculous women who had a pregnancy during the eleven year period 1930 - 1941. During the first part of the period under survey therapeutic abortion was the recognised way of dealing with the combination of pregnancy and pulmonary tuberculosis whilst in the latter half of the period conservatism regarding the pregnancy became more or less the rule. The authors took the opportunity of comparing the results obtained by each

method of dealing with the pregnancy. The follow-up period lasted 5-15 years so that early and late results were recorded. The pregnant women were studied with regard to age, parity, extent and type of the lung disease and method of delivery at or near full-term. 24 of their cases were primiparae. These women showed a mortality rate of 28.6% with therapeutic abortion as against 22.2% with near or full-term delivery despite the fact that half of the latter group had moderately advanced to far advanced lung disease. The corresponding figures for the multiparae were 25% for those allowed a near or full-term delivery and 63.6% for those who had a therapeutic abortion. The highest mortality in the primiparae occurred in the age group 19-21 years and in the multiparae in their lowest age group, namely 23-30 yrs. The overall mortality in the aborted patients was 38.5% whereas the overall mortality in those who were delivered spontaneously at or near full-term was 19.2%. The authors concluded that therapeutic abortion was rarely to be advised and that spontaneous delivery at or near full-term gave better results regardless of the extent of the pulmonary disease.

When interference in the form of therapeutic abortion had been discredited except in a minority of cases, attention was given to the best method of delivery of the tuberculous women at or near full-term. It was well recognised that a difficult labour or a labour resulting in shock and undue loss of blood would depress the patient's resistance and tip the balance in favour of reactivation of the lung disease. The avoidance of a difficult or dangerous confinement would be

obtained by the induction of labour by either medical or surgical means 2-4 weeks before term or the performance of caesarean section or episiotomy with or without the application of low forceps. The most popular method of easing the second stage according to the writers who gave any details was by episiotomy and the application of low forceps. Cohen in his description of 177 cases of tuberculous women confined at Black Notley Sanatorium stated that the practice there was to allow spontaneous delivery but the application of low forceps was always considered if the second stage lasted over two hours.

The performance of caesarean section was mentioned by various authors but no attempt was made to compare the effects on the lung disease following this method of delivery with those obtained after spontaneous delivery. Barone, Fino and Heatherington, mentioned above, were the first to evaluate the results of surgical delivery and compare them with those of spontaneous delivery. Of their 62 cases, 11 had a caesarean section, 25 had therapeutic abortion and 26 had a spontaneous delivery. The highest mortality, 38.5%, occurred in those who had a therapeutic abortion, closely followed by the mortality, 36.3%, in those who had a caesarean section, whereas those who had a spontaneous delivery suffered a mortality from the lung disease of only 19.2%. Despite far advanced lung disease, the young primiparae appeared to stand the operation of caesarean section better than the multiparae. The authors concluded that operative interference with the pregnancy in the form of therapeutic abortion or caesarean section was associated with

a higher overall mortality from the lung disease than spontaneous delivery.

Before the advent of Mass Miniature Radiography of the chest and ascertainment of the incidence of pulmonary tuberculosis in the general population it was realised that pregnant women constituted a special section in whom it was doubly important to detect tuberculosis early and commence treatment. Routine radiography of the chest of women attending local authority and hospital ante-natal clinics was considered too expensive when only the large film method was available. One of the earliest attempts at "case-finding" amongst this selected group was described by Janne and Muir of the Santa Clara County Hospital, San Jose, California in 1939. Their aim was to Mantoux test each pregnant woman attending the ante-natal clinic of the hospital and to take a large radiograph of the chest of each positive reactor. In the interval 1936-38 they Mantoux tested 691 pregnant women and found 252 giving a positive reaction. These 252 had an x-ray examination of chest and pulmonary tuberculosis was demonstrated in 12. Of these, 10 had minimal disease, one had moderately advanced disease and one had far advanced disease, giving an incidence of 1.7% of unsuspected active pulmonary tuberculosis.

In 1938 Eisele and Mason of Chicago, by using the x-ray fluorescent screen, examined 10,968 pregnant women and discovered an incidence of 1.7% of unsuspected active pulmonary tuberculosis.

Corbet in 1944 published his findings of a similar

survey of 53,792 pregnant women delivered in the Rotunda, Coombe and National Maternity Hospitals of Dublin between 1935 and 1942. His screenings revealed 150 cases of unsuspected active tuberculosis giving an incidence of 0.28%. He advised a large film of the chest of each pregnant woman but the authorities considered that the number of cases brought to light did not justify the labour and cost involved.

In 1943 fluoroscopy was done on 1,125 women following their first ante-natal examination at Paddington Hospital, London, by Frank and Jacobs. They found 0.5% with active disease requiring immediate admission to ^a sanatorium and 0.2% with possibly active disease requiring close observation.

Dawson in New Zealand during the three years 1943-1945 x-rayed the chests of 1000 women attending the ante-natal clinics of the Queen Mary Maternity Hospital at Dunedin. He found an incidence of 0.6% of unsuspected active cases and 2.4% of non-active cases. From these figures he stated that the incidence of pulmonary tuberculosis in pregnant women was no greater than that in women of child-bearing age as a whole. At the Uxbridge Chest Clinic, Middlesex, Roe took large films of the chests of 1,088 pregnant women referred to the Clinic after their first ante-natal examination during the two years 1943-1945. He found an incidence of 0.45% of unsuspected active pulmonary disease.

During the latter years of the 1939-1945 World War, mass miniature radiography was brought into use in the Forces, thus enabling large groups of the population to be x-rayed

quickly, cheaply and with a high degree of technical efficiency. In this way Clive x-rayed 30,000 W.A.A.F. personnel of the age group 17½-45 years, taking a large film of those showing a suspicious miniature. He found an incidence of 0.4% with active pulmonary tuberculosis requiring immediate hospital treatment and 0.6% requiring observation. In a similar study of factory and office girls of 14-34 years of age the Mass Radiography Council reported an incidence of 1-1.7% of significant lesions and an incidence of 0.4-0.6% requiring immediate hospital treatment.

From the figures obtained from these mass surveys it was clearly shown that the incidence of pulmonary tuberculosis in pregnancy was no greater than that occurring in the general population of women of child-bearing age and that pregnancy itself did not appear to carry a greater risk of the development of pulmonary tuberculosis.

For many years it had been known that bad social and economic conditions went hand-in-hand with pulmonary tuberculosis. In 1939 Professor Payling Wright and Dr. Hart published a statistical study of Tuberculosis and Social Conditions in England with special reference to young adults. They set out principally to examine the problem of development, distribution and causation of the retardation in the decline in the mortality from pulmonary tuberculosis in young adults that made its appearance early in the present century. They examined the problem in relation to such important social conditions that could be ascertained from national and local statistics.

The principal factors they studied included (i) the general standard of living (ii) poverty (iii) housing (iv) internal migration and (v) volume of employment. They found the slowing of the decline of the mortality rate in this group of the population affected young women more than young men and was most noticeable in the highly industrial areas. In some County Boroughs it was found that the mortality from pulmonary tuberculosis was higher in 1931-33 than it had been 20 years before. This retardation in the decline in the mortality they considered was due to three factors:-(i) a predisposing factor - a special sensitiveness of young adults in comparison with other age groups to social conditions as reflected in their mortality from pulmonary tuberculosis. This special sensitiveness may be brought about by the stress and strain of industrial occupations during the important formative years of adolescence and early adult life (ii) general determining factors - the check to the rise in the standard of living about 1900 which caused a set-back in the improvement of general housing conditions and the accentuated increase in the industrial employment of young women (iii) local determining factors - unsatisfactory local social conditions, the most important of these being bad housing, poverty and sub-standard nutrition.

The authors thought the possible effect of marriage to be two-fold in young women and to operate in opposite directions. The retardation in the decline in the phthisis mortality rate was found to take place mainly in the unmarried young women as the married ones tended to be withdrawn from industry. On the

other hand the writers thought that on account of pregnancy, married women ran a greater risk of developing pulmonary tuberculosis.

The problem of pulmonary tuberculosis and pregnancy would appear to lend itself admirably to experimental work on animals in the laboratory. Guinea-pigs could easily be infected with the human type of tubercle bacillus and would react to invasion in much the same way as the human subject. In addition the guinea pig could be easily made pregnant whilst tuberculous but despite this, experimental work appeared to be scanty and the results contradictory until fairly recent years. On the assumption that Chorionic Gonadotropic Hormone was the cause of the temporary amelioration of the lung disease in early pregnancy in tuberculous women, Steinbach and Klein in 1937 set out to test the effect of injection of this hormone in the form of Antuitrin-S on tuberculosis experimentally produced in non-pregnant guinea-pigs and rabbits. They found that the animals injected showed less tuberculosis than those of the control group. They concluded that their assumption of the beneficial effect of chorionic gonadotropin in pregnant tuberculous women was probably correct. Their findings, however, were not corroborated by Skillen and Bogen who repeated the experiments the following year. These workers used pregnant guinea-pigs and rabbits and found injections of the pregnancy hormones had no effect on the tuberculous disease. They also made the observation that the pregnant tuberculous animals fared no worse than the non-pregnant animals. This latter finding was verified by Burke in 1940.

His experiments were performed on 134 rabbits which were injected inta-tracheally with human tubercle bacilli and 106 which were injected with bovine tubercle bacilli. Nine of the first group had litters and 12 of the latter group. Only one animal died of tuberculosis and the others were killed to permit of study of the lesions at different stages of the disease. Comparison of x-ray and post-mortem findings in the pregnant rabbits with (with) the findings in males and non-pregnant females did not reveal anything to suggest that pregnancy had had an influence on the progress of the tuberculous infection. In 1942 Wade carried out similar experiments in pregnant and non-pregnant rabbits and obtained the same results.

In 1949 Lurie, Abramson and Allison, who on experimenting with sexually mature rabbits infected in the laboratory with tuberculosis found that Oestrogen in large doses uniformly retarded the progress of the disease at the site of the ~~intra~~-cutaneous inoculation, diminished the extent of the infection in the internal organs and suppressed to a considerable degree the dissemination in the body. In a smaller group of rabbits the periodic administration of chorionic gonadotropin was found to uniformly enhance the progress of the tuberculosis at the site of the inoculation and to increase its dissemination in the body - a finding which was opposed to that of Steinbach and Klein. They found also that neither oestrogen nor gonadotropin exerted any effect on antibody formation. They were of the opinion that oestrogen produced its effect of retarding the progress and dissemination of the disease chiefly

by reducing the permeability of the connective tissue and its capillaries, whereas the adverse effect of chorionic gonadotropin was produced by increasing the permeability of connective tissue and its capillaries.

During the past few years the influence of the hormones in pulmonary tuberculosis complicated by pregnancy have been studied more intensely. Venning in 1946 showed that during pregnancy there was a hypertrophy of the adrenal cortex and hypersecretion of the sugar hormones. The degree of increase of these latter hormones was measured by the amount of "corticoids" excreted in the urine. These were found to increase greatly in the first trimester in company with the increase of gonadotropins and to return to about the normal level by the 14-17th. week. At this time the level of the gonadotropins was also found to fall. Between the 20th and 23rd week the corticoid excretion was shown to rise again this time in company with a rising level of oestrogen and gonadotropin and reaching in the later months the high levels found in Cushing's Syndrome. In the last month of pregnancy, the corticoids were found to fall somewhat whilst in the puerperium they fell sharply to normal.

Recently Ragan and others have demonstrated that the sugar hormones secreted by the adrenal cortex in response to the adrenocorticotrophic hormone (A.C.T.H.) have an inhibitory effect on wound healing and the formation of granulation and fibrous tissue. Long in Britain and Rose in Canada have shown that A.C.T.H. will non-specifically depress both tuberculin sensitivity and the anaphylactic types of hypersensitivity.

In 1943 Repperman demonstrated that oestrogen will stimulate adrenal cortex activity and the thyroid gland in pregnancy is shown to do the same. It was postulated, therefore, that these increased corticoids by decreasing tuberculin sensitivity reduced the destruction of tissue which normally occurs as a reaction to invasion by the tubercle bacillus. In other words, the patient's resistance to tuberculosis was increased. It was pointed out, on the other hand, that the increase of corticoids may retard healing or even break down protective fibrous tissue and lead to flare-up of the disease.

The interplay of the hormones , one upon the other, during pregnancy has been amply demonstrated to influence the lung disease but their precise mode of action and possible therapeutic use have not yet been determined.

The study of the literature on pulmonary tuberculosis complicated by pregnancy reveals examples of the harmful effects that can ensue from the laying down of dogmatic opinions especially where these have been founded on scanty clinical data. It will be seen also that progress on the subject had long been retarded by ill-founded opinions and unwarranted conclusions derived from investigations that were not properly thought-out or controlled. Studies carried out, however, during the last 30 years have served to clarify the views on the effects of pregnancy on pulmonary tuberculosis and opened up a wide field for future investigation.

The Investigation.

I. Aim of the Investigation.

The aim of the investigation was to determine (a) the early effects and (b) the late effects of child-bearing on pulmonary tuberculosis in married women living in an industrial area of Yorkshire during the 10 year period January, 1940 - January, 1950. From the information obtained it was hoped to put forward recommendations for the general management of the combined condition.

2. Description of the Industrial Area and Economic Conditions.

The area in which this investigation was carried out lies mainly in the West Riding on the eastern edge of the Yorkshire coalfield. The remainder of the area is situated in an agricultural belt of the East Riding. The total region involved extends over 300 square miles and contained in 1946 the estimated population of 209,846.

Four chest clinics serve the area, the two largest ones being situated in the predominantly mining districts of Pontefract, Castleford and South Kirby. The two smaller clinics are in the inland ports of Goole and Selby where light and heavy industries other than coal-mining support the population. In the mining districts other industries are carried on, such as the making

of liquorice confectionary, furniture, chemicals, glass-ware and the distilling of coal-tar. In the inland ports of Goole and Selby flour-milling, the manufacture of animal feeding stuffs and fertilisers and the building of barges and coastal vessels are the chief industries.

Throughout the 10 year period January 1940 - January 1950, a high level of employment existed for both sexes and except in the intervening agricultural districts, weekly earnings were relatively high.

The housing standards were typical of a mining area with closely set rows of terraced houses built at minimum cost about 40 years or more ago. But for the intervention of the late war and in the hands of a progressive Housing Committee a great many of them would have been scheduled for demolition. Throughout the 10 year period the standard of housing improved little despite the post-war building programme.

On account of food rationing and relatively high wages, the standard of nutrition was fairly uniform. Pregnant women and tuberculous women obtained supplements to the ration such as milk, butter, fats, eggs, meat and protective vitamin preparations. Items such as extra milk and vitamins were issued free of charge, depending on the patient's financial circumstances.

During the war years sanatorium beds were lamentably short because of the demands of the Emergency Medical Service and in the post-war years the same conditions prevailed, mainly through the shortage of nursing staff.

3. Vital Statistics.

The number of women of child-bearing age notified in the West Riding as suffering from pulmonary tuberculosis has risen steadily since the beginning of the late war. In 1939, the figure was 356, in 1945 it was 402, in 1948 it was 458 and by the end of 1949 the annual figure had risen to 467.

The overall mortality from pulmonary tuberculosis in the West Riding also rose steadily throughout the war years. The rate in 1945 was 0.32 per 1000 whilst during the year 1950 it had risen to 0.4 per 1000. Despite this, the mortality has always compared favourably with that of England and Wales, which, over the same period has varied from 0.44 to 0.47 per 1000. In contrast to the rising mortality from pulmonary tuberculosis, the maternal mortality has shown a steady decrease since 1938. The introduction of the sulphonamides, penicillin and the blood transfusion service has reduced the 1938 figure of 3.5 per 1000 live and still-births to approximately half, namely 1.15 per 1000 births. Thus in the 10 year period under review, the incidence and mortality of pulmonary tuberculosis has steadily increased whilst the mortality from child-bearing has steadily decreased.

4. Method of Recording and Definition of Terms.

A series was compiled of 101 tuberculous women whose illness was complicated by a pregnancy at some time during the 10 year period January 1940-January 1950.

Each pregnancy case was examined by myself except

where death or transference of the patient to another district made it impossible. In all cases the clinical records, x-ray films of the chest, laboratory findings and Health Visitors' reports were scrutinised and the following data obtained:-

- (a) Age of the patient with type and extent of the lung disease at the time of notification.
- (b) Type, duration and result of treatment.
- (c) State of the lung disease as near the time of conception as possible.
- (d) State of the lung disease at one month post-partum.
- (e) State of disease at January 1950 or as near thereto as possible.
- (f) Number of the pregnancy.
- (g) Period of gestation and type of delivery.
- (h) Social conditions.

The lung disease was considered "active" when there was clinical or radiological evidence of progressive lesions or where the sputum was found to contain tubercle bacilli. The disease was considered to be "quiescent" when clinically and radiologically there was no evidence of progression or regression of the lesions. The term "quiescent" embraced cases which were considered to be "arrested" or "recovered".

The type of lung disease was classified broadly according to the predominant variety of lesion present, namely, either "exudative" or "productive".

The extent of the lung disease was recorded in compliance with the Ministry of Health classification, namely,

sputum negative cases AI, AII, and AIII and sputum positive cases BI, BII and BIII.

The social conditions of the patients were known intimately to the Health Visitors and many of the homes I visited personally. In classifying the social conditions into (a) good, (b) fair, and (c) frankly bad, cognizance was taken of the size of the family, the number of bed-rooms available, health and earning capacity of the bread-winner and domestic, financial and other assistance available to the household.

Child-bearing age was taken as 17-45 years as there was no record of a pregnancy occurring outside this broad age group in the women of the series. The cases were studied in the age groups 17-24 years, 25-34 years and 35-45 years.

Regarding pregnancy itself, a delivery occurring at the 38th week or later was recorded as "full-term", from the 28th - 37th week as "premature" and if before the 28th week as an "abortion".

When dealing with the early effects, "child-bearing" was considered to include the processes of conception, gestation, parturition and the first month of infant-rearing.

When dealing with the late effects, "child-bearing" was considered to include the above plus child-rearing and the running of a home.

One month post-partum was chosen as the most suitable point to observe the early effects as (a) most patients had recovered by that time from the effects of parturition per se, (b) the trend of the lung disease had become apparent, (c) most

patients by that time were able to attend the chest clinic on foot or by ambulance and so allowed of accurate assessment of their lung condition.

The early effects were determined by comparing the state of the lung disease at one month post-partum with the state as assessed as near to the onset of pregnancy as possible.

The late effects were determined by comparing the state of the lung disease at or as near to the end of the investigation as possible with that obtaining at the onset of pregnancy. In addition the final assessment of the pregnancy cases was compared with that of a control group observed over the same period.

5. The Problem of a Control Series.

The prognosis in uncomplicated cases of pulmonary tuberculosis is often difficult and uncertain. Physicians long experienced in the treatment of this disease are loathe to give a dogmatic opinion on the prognosis as minimal cases are not uncommonly seen to rapidly deteriorate despite all treatment, whilst apparently hopeless cases improve to an amazing degree and linger on for many years. In addition the disease is characterised by a marked tendency towards remission and relapse which makes the assessment of the effect of a complicating condition such as pregnancy very difficult to carry out with a reasonable degree of accuracy.

Again the outcome of pulmonary tuberculosis is affected by a number of factors, the principal ones being:-

(i) age at onset of the disease, (ii) type and extent of lesion at first diagnosis (iii) type, quality and duration of treatment, (iv) social and economic conditions and (v) general and specific resistance of the patient to tuberculous infection.

A case of pulmonary tuberculosis complicated by pregnancy and her ideal control would require to match each other closely in all these variable factors. In practice this was found difficult to obtain unless a very large number of control cases could be made available. The problem, also, was made more complex by the fact that two very important variables could not be recorded with accuracy. These were the general and specific resistance of the patient to tuberculosis and the effect of the pregnancy itself on the general bodily economy. Both had to be omitted from the reckoning.

Three possible ways of studying controls for the pregnancy cases presented themselves. All but one were unsatisfactory from the purely statistical point of view.

Method I.

The first and simplest method was to study the change in state of the lung disease at January 1950 in all the married women of child-bearing age notified as suffering from pulmonary tuberculosis within the period of observation and whose tuberculous illness was not complicated by pregnancy. This method, however, could only provide a broad picture of the outcome of pulmonary tuberculosis in married women of child-bearing age in the industrial area. It could not provide a series comparable to the pregnancy cases in age distribution, type and

extent of disease and period of observation. The bulk of the worst cases who would naturally tend to avoid pregnancy would be found in this group and the death rate consequently loaded.

Method II.

The second method was to take all the married women of child-bearing age with pulmonary tuberculosis unassociated with pregnancy and who were notified in one particular year so that they could be observed over a similar period of time. In the first place the pregnancy cases did not lend themselves to this type of comparison as insufficient cases arose in any particular year. Setting aside the difficulty of obtaining the proper proportion of cases in each age group etc., it was found that the total number of controls notified in any one year was also insufficient to give a series.

Method III.

The third method which would be statistically the most satisfactory, was to pair each pregnancy case with a control case that was comparable in age group, extent and type of disease, type and duration of treatment and social conditions. The control case would be assessed at intervals comparable with the periods of assessment of the pregnancy case, namely, just before conception, at one month post-partum and at the end of the observation period, January 1950. Whilst allocating the controls that would match in all the above variables, it was found that there was a deficiency in the married tuberculous women of the age group 17-24 years whose disease was not associated with pregnancy. The same difficulty was encountered to a lesser extent

in the age group 25-34 years. In the highest age group 35-45yrs. the reverse condition obtained.

It was apparent that a very large number of controls would be necessary to obtain a "twin" that would be statistically satisfactory for each pregnancy case. The numbers available in this investigation were insufficient for such a control method to be carried out and one had to be content with Method I. despite its obvious deficiencies.

6. Presentation of the Control Series.

Before detailing the pregnancy cases, I shall present the findings in the control series using Method I. so that a rough sketch can be drawn of the outcome of pulmonary tuberculosis in married women of child-bearing age in this industrial area. The number of controls studied in this way were as shown in Table I.

(Table I.)

| Married Women (No Children) | Married Women (One or More Children) | Total |
|--------------------------------|---|-------|
| 54 | 113 | 167 |

(Type and Extent of Disease at First Diagnosis.)

These 167 married women of child-bearing age, notified as suffering from pulmonary tuberculosis during the period January 1940 - January 1950 were classified according to age groups and type and extent of disease at first diagnosis as shown in Table II.

(Table II.)

| Age Groups. | Number per age group. | Type of Disease | | Extent of Disease | | |
|-------------|-----------------------|-----------------|-------|-------------------|---------|---------|
| | | Exud. | Prod. | A1 & B1 | A2 & B2 | A3 & B3 |
| 17-24 | 38 | 38 | - | 7 | 18 | 13 |
| 25-34 | 81 | 42 | 39 | 23 | 33 | 20 |
| 35-45 | 48 | 9 | 39 | 18 | 18 | 12 |
| Totals | 167 | 89 | 78 | 48 | 74 | 45 |

This table shows that the greatest incidence of disease was present in the age group 25-34 years in whom the lesions tended to be in a moderately or far advanced state at the time of first diagnosis. The exudative type of lesion was slightly more prevalent than the productive type.

(Outcome at January 1950.)

The prognosis for this control group would appear to be bad and this is borne out by the end results. These end results are shown in Table III.

(Table III.)

| Age Groups | No. per age group | State of Disease at Jan. 1950 (End Results) | | | |
|------------|-------------------|---|--------|----------|-------------------|
| | | Quiescent | Active | Dead | % Active or Dead. |
| 17-24 | 38 | 9 | 13 | 16 (42%) | 76% |
| 25-34 | 81 | 24 | 24 | 33 (40%) | 70% |
| 35-45 | 48 | 17 | 13 | 18 (37%) | 64% |
| Totals | 167 | 50 | 50 | 67 | Average 70%. |

At the end of the observation period, 70% still had active disease or were dead. The highest mortality and persistence of activity of the disease was found in the lowest age group and decreased by an appreciable amount in the highest age group. This is the general experience with pulmonary tuberculosis in women.

(Outcome According to Type and Extent of Disease at Diagnosis.)

Table IV shows the outcome of the disease at January 1950 when studied according to (i) type (ii) extent of the disease at first diagnosis.

(Table IV.)

| State of disease at Jan. 1950. | Type of Disease | | Extent of Disease at First Diagnosis. | | | Totals |
|--------------------------------|-----------------|-------|---------------------------------------|---------|---------|--------|
| | Exud. | Prod. | A1 & B1 | A2 & B2 | A3 & B3 | |
| Quiescent | 33 | 17 | 32 | 10 | - | 50 |
| Active | 21 | 29 | 9 | 30 | 11 | 50 |
| Dead | 35 | 32 | 7 | 26 | 34 | 57 |
| Totals | 89 | 78 | 48 | 74 | 45 | 167 |

The mortality from the exudative type of disease was 39% and from the productive type of disease 46%. Women whose disease was still active or who were dead at January 1950 amounted to 63% in the exudative type and 79% in the productive type. It thus appeared that the productive type of lesion was responsible for the greater amount of persistently active disease and mortality. Regarding the outcome at January 1950 according to the extent of the disease at first diagnosis, it is shown that those who had moderately advanced disease (A2 & B2) and far advanced disease (A3 & B3) suffered the highest mortality and persistence of activity of the lung condition.

(Outcome According to Type of Treatment.)

When the control group was studied according to the type of treatment received, the final state of the disease at January 1950 was as recorded in Table V.

(Table 7.)

| State of Disease at January 1950. | Type of Treatment | | | Totals |
|--------------------------------------|----------------------|-------------------------|--------------------------|--------|
| | Collapse Therapy. | Sanatorium bed-rest. | Domiciliary bed-rest. | |
| Quiescent | 8 | 20 | 22 | 50 |
| Active | 11 | 34 | 5 | 50 |
| Dead | 7 | 35 | 25 | 67 |
| Totals | 26 | 89 | 52 | 167 |

Collapse therapy consisted of either a (i) artificial pneumothorax alone or combined with a phrenic paresis or (ii) phrenic paresis with or without an artificial pneumoperitoneum or (iii) thoracoplasty or (iv) extra-pleural pneumothorax.

Collapse therapy apparently yielded poor results as 26% of the cases to whom it was applied had died by the end of the observation period. This could possibly be explained by the fact that 22 of the 26 cases involved had moderately advanced to far advanced disease at the time of first diagnosis.

Sanatorium treatment without collapse therapy consisted of bed-rest followed by graduated activity. By Jan. 1950 39% of these cases were dead.

Domiciliary treatment which comprised mainly bed-rest was a very doubtful quantity. With children in the home and bad housing conditions, domiciliary treatment amounted frequently to no treatment at all. Mild cases such as primary tuberculous pleurises tended to get better by themselves at home. On the other hand, those with moderately advanced disease who refused sanatorium treatment and those whose disease was too far advanced to obtain substantial benefit from sanatorium treatment tended to become worse as shown by the fact that by January 1950 about

50% of them were dead.

(Outcome According to Social Conditions.)

The social conditions of the control series were studied in three groups:- (i) Good conditions where isolation and adequate nursing care were possible in the home (ii) Fair conditions where isolation of the patient was possible but where home nursing was of rather poor quality and (iii) Frankly bad conditions where there was overcrowding with little or no possibility of proper isolation or home care of the patient.

The outcome of the disease at January 1950 according to social conditions is shown in Table VI.

(Table VI.)

| State of Disease at January 1950. | Social Conditions. | | | Totals. |
|-----------------------------------|--------------------|------|-----|---------|
| | Good | Fair | Bad | |
| Quiescent | 15 | 12 | 23 | 50 |
| Active | 6 | 21 | 23 | 50 |
| Dead | 11 | 24 | 32 | 67 |
| Totals | 32 | 57 | 78 | 167 |

It is clear from the table that a large proportion of the cases lived in poor social conditions - 80% of them being classified as fair or frankly bad. Of those living in good social conditions 53% still had active disease or were dead and of those living in bad social conditions 83% still had active disease or were dead by the end of the observation period.

This is roughly the experience normally found in pulmonary tuberculosis in relation to social conditions.

(Outcome According to Size of Family.)

It is reasonable to assume that on the

whole the greater number of children a tuberculous mother has to care for in the home, the greater will be the mental and physical strain upon her. The outcome of the disease according to the number of children in the home (or, roughly, the parity of the patient) was studied and the findings given in Table VII.

(Table VII.)

| State of Disease at January 1950. | Number of Children. | | | | | | Totals. |
|-----------------------------------|---------------------|-----|-----|-----|-----|------------|---------|
| | 0 | I | 2 | 3 | 4 | 5 or more. | |
| Quiescent | I6 | I4 | II | 5 | 2 | 2 | 50 |
| Active | I9 | I6 | 8 | 3 | I | 3 | 50 |
| Dead | I9 | I4 | I6 | 8 | 4 | 6 | 67 |
| Totals | 54 | 44 | 35 | I6 | 7 | II | I67 |
| Active or Dead at Jan. 1950. | 70% | 68% | 66% | 68% | 7I% | 8I% | |

It is seen that those with 4 children comprised the smallest group whilst those with no children comprised the largest group. This suggests that married women with pulmonary tuberculosis tend to avoid pregnancy. Those with no children did not appear to fare any better with regard to persistence of activity of the disease and mortality than the women who had up to 4 children. With 5 or more children in the home, the outcome would appear to be worse but with the small number of cases involved in this group the figure of 8I% has doubtful significance.

(Periods of Observation.)

The duration of the follow-up periods for the control series is shown in Table VIII.

(Table VIII.)

| 0-I yr. | 2 yrs. | 3 yrs. | 4 yrs. | 5 yrs. | 6 yrs. | 7 yrs. | 8 yrs. | 9 yrs. |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| 65 | I2 | II | 2 | 34 | 20 | II | 6 | 1 |

Follow-up periods of up to 4 years were observed with 53% of the cases and 47% of the cases were followed-up for 5 years or more. The relatively large number of cases who were followed-up for only one year or less was due to the fact that 37 of the 65 cases died within one year of notification. This would appear to be correlated with the finding in Table II that 71% of the cases had moderately or far advanced disease at first diagnosis.

7. (Summary of Findings.)

Summarising the study of the control group we have the following findings:-

- (1) they were mainly of age 25 years and over with the greatest number falling into the age group 25-34 years.
- (2) 71% of the cases had moderately or far advanced disease at the time of first diagnosis.
- (3) the highest mortality and persistence of active disease was found in the lowest age group (17-24) and decreased by an appreciable amount in the highest age group (35-45 yrs.)
- (4) the productive type of lesion caused greater mortality and persistence of active disease than the exudative type.
- (5) collapse therapy yielded indifferent results but appeared to be better than sanatorium bed-rest alone and much better than domiciliary bed-rest.
- (6) the majority of the patients were living in poor social conditions - 80% of them living in conditions which were only fair or frankly bad.
- (7) the outcome of the lung disease appeared to be related directly to social conditions, those living in the worst

conditions showing the worst results.

- (8) study of the parity of the group suggested that women with active pulmonary tuberculosis tended to avoid pregnancy.
- (9) those women of the group with no children appeared to fare no better than those who had up to 4 children.
- (10) by the end of the observation period, 40% of the control group were dead and 30% still had active disease.

8. Presentation of the Pregnancy Cases.

Having obtained a rough sketch of the outcome of pulmonary tuberculosis in women of child-bearing age in this industrial area, we now turn to the study of the effects of a complicating pregnancy on the pulmonary disease.

A total of IOI cases were notified as suffering from pulmonary tuberculosis during the period January 1940-January 1950, and who had one or more pregnancies complicating their tuberculous illness during that period.

These IOI cases were studied in a similar manner to the foregoing control group with special regard to the outcome of the disease according to the following factors:-

(i) age grouping (ii) type and extent of lung disease at notification (iii) type of treatment before conception (iv) social and economic conditions (v) parity and (vi) type of delivery.

The interval between the pre-conception assessment and the actual commencement of pregnancy varied from 4-6 weeks in patients with active lung disease and 3-6 months in those with quiescent disease. The period of observation for the short-

-term effects, therefore, ranged from 13-16 months except in those cases who aborted spontaneously or had a therapeutic abortion performed. The short-term effects were assessed by comparing the state of the lung disease at one month post-partum with that obtaining at the pre-conception assessment. For the long-term effects, the period of observation varied from a few months to nine years post-partum and were assessed by comparing the state of the lung disease at the end of the observation period with that at the pre-conception assessment. The end-results in the pregnancy cases were also compared with end-results in the control group.

Of the IOI pregnancy cases 49 were primiparae and 52 were multiparae. They gave rise to 126 pregnancies during the period under survey with 18 of the multiparae embarking on more than one pregnancy whilst tuberculous as follows:- 12 women had 2 pregnancies, 5 had 3 pregnancies, and one woman had 4 pregnancies. Each pregnancy was studied and assessed as a separate entity.

(Classification of the Pregnancies.)

The classification of the pregnancies is shown in Table I.

(Table I.)

| | No. of cases. | Type of Delivery. | | | | No. of pregnancies. |
|------------|---------------|-----------------------|-----------------------|-------------|------------|---------------------|
| | | Spontaneous abortion. | Therapeutic abortion. | Pre-mature. | Full-term. | |
| Primiparae | 49 | 2 | 4 | 6 | 37 | 49 |
| Multiparae | 52 | 6 | 3 | 14 | 54 | 77 |
| Totals | IOI | 8 | 7 | 20 | 91 | 126 |

(Classification According to Age Group, Type and Extent of Lung Disease.)

In Table II. the pregnancy cases are classified according to age group and type and extent of disease at notification.

(Table II.)

| Age Group. | No. per age gp. | Type of Disease. | | Extent of Disease at Notification. | | |
|------------|-----------------|------------------|-------|------------------------------------|---------|---------|
| | | Exud. | Prod. | A1 & B1 | A2 & B2 | A3 & B3 |
| I7-24 | 49 | 40 | 9 | 2I | 2I | 7 |
| 25-34 | 39 | 20 | 19 | 23 | 13 | 3 |
| 35-45 | 13 | 5 | 8 | 3 | 8 | 2 |
| Totals | 101 | 65 | 36 | 47 | 42 | 12 |

It is seen that the bulk of the cases (80%) were aged 34 years and under, the age group I7-24 years having the greatest number. The incidence of exudative to productive type of disease was in the ratio of about 2 to 1. In 89% of the cases the extent of the disease was mild or moderately advanced at the time of first diagnosis with only 11% having far advanced disease. With the control group the reverse was the case.

This suggests that definite selection had taken place on the part of the patients in that those whose lung disease carried a good prognosis at the time of notification tended to embark on a pregnancy whilst those with a bad prognosis tended to avoid pregnancy.

With the final outcome of the disease in the control cases fresh in mind, it is convenient to study the final outcome of the disease in the pregnancy cases and by comparing the two, assess the late effects of pregnancy on the lung disease.

(State of Lung Disease at January 1950.)

The end results of the pregnancy cases according to age groups were as shown in Table III.

(Table III.)

| Age Group. | State of disease at January 1950. | | | |
|------------|-----------------------------------|--------|------|-------------------|
| | Quiescent | Active | Dead | % Active or Dead. |
| 17-24 | 33 | 7 | 9 | 32% |
| 25-34 | 22 | II | 6 | 43% |
| 35-45 | 7 | I | 5 | 46% |
| Totals | 62 | 19 | 20 | Average - 38% |

Of these pregnancy cases 38% still had active disease or were dead at the end of the observation period as compared with 70% of the control cases.

The mortality and persistence of active disease appeared to be less in the youngest age group than in the other two age groups. Conclusions from this are probably unwarranted on account of the disparity of the numbers in each age group but one would have expected the youngest age group to do fairly well had they not become pregnant during their tuberculous illness as their initial lung disease carried a good prognosis in most cases.

(Outcome According to Type and Extent of Disease.)

The outcome at January 1950 according to the type and extent of disease at first diagnosis is shown in Table IV. - (See next page.)

The mortality from the exudative type of disease was 18% and from the productive type was 22%. The figures for mortality and persistence of activity of the disease were 33% for the

exudative type and 47% for the productive type.

(Table IV.)

| State of Disease at January 1950. | Type of Disease. | | Extent of Disease. | | |
|-----------------------------------|------------------|-------|--------------------|---------|---------|
| | Exud. | Prod. | A1 & B1 | A2 & B2 | A3 & B3 |
| Quiescent | 43 | 19 | 39 | 20 | 3 |
| Active | 10 | 9 | 7 | 6 | 4 |
| Dead | 12 | 8 | 1 | 14 | 5 |
| Totals | 65 | 36 | 47 | 42 | 12 |

It is seen that those with moderately or far advanced disease at first diagnosis fared worse than those who had only mild disease at first diagnosis, the mortality and persistence of activity of disease at the end of the observation period being 57% and 17% respectively.

(Outcome According to Type of Treatment.)

When the outcome of the disease was studied according to the type of treatment given the pulmonary disease we have the results as shown in Table V.

(Table V.)

| State of Disease at January 1950. | Type of Treatment. | | | Totals |
|-----------------------------------|--------------------|----------------------|-----------------------|--------|
| | Collapse Therapy. | Sanatorium Bed-rest. | Domiciliary Bed-rest. | |
| Quiescent | 14 | 22 | 26 | 62 |
| Active | 3 | 6 | 10 | 19 |
| Dead | 3 | 5 | 12 | 20 |
| Totals | 20 | 33 | 48 | 101 |

Persistence of activity of disease or death occurred in 30% of those treated by collapse therapy, in 33% treated by sanatorium bed-rest and in 46% of those who were treated at home.

Collapse therapy seemed to yield similar results to sanatorium bed-rest alone and those treated in this way fared better than

those treated at home. It must be remembered, however, that the women treated in sanatorium were to a great extent a selected group and the results were biased by the fact that far advanced cases on the whole were not admitted to sanatorium on account of the shortage of beds.

(Outcome According to Social Conditions.)

The end results in the pregnancy cases in relation to their social conditions were studied in the same way as the control group. The results are shown in Table VI.

(Table VI.)

| State of Disease at January 1950. | Social Conditions. | | | Totals. |
|-----------------------------------|--------------------|------|-----|---------|
| | Good | Fair | Bad | |
| Quiescent | 6 | 27 | 29 | 62 |
| Active | 3 | 7 | 9 | 19 |
| Dead | 2 | 7 | 11 | 20 |
| Totals | 11 | 41 | 49 | 101 |

From the table it is evident that the bulk of the cases lived in only fair or frankly bad conditions. Despite this, those who lived in good social conditions appeared to fare worse as 45% of them still had active disease or were dead by January 1950 as compared with 34% of those who lived in fair conditions and 40% of those who lived in conditions that were frankly bad. One would have expected the best results from those living in good social conditions but the disparity is probably due to the inequality of the numbers in each group. Those living in fairly good social conditions fared better than those living in frankly bad conditions which is the general experience with pulmonary tuberculosis.

(Outcome According to Size of Family.)

The effect of parity or number of children in the family on the state of the disease at January 1950 is shown in Table VII.

| State of Disease at January 1950. | Pregnancies during the Period of Observation. | | | | |
|-----------------------------------|---|-----------------|-----------------|-----------------|--------------------------|
| | Ist.Preg-nancy. | 2nd.Preg-nancy. | 3rd.Preg-nancy. | 4th.Preg-nancy. | 5th. or more Preg-nancy. |
| Quiescent | 30 | 10 | 14 | 4 | 4 |
| Active | 7 | 5 | 3 | 1 | 3 |
| Dead | 12 | 2 | 2 | 1 | 3 |
| Totals | 49 | 17 | 19 | 6 | 10 |
| Active or Dead at January 1950. | 38% | 41% | 26% | 33% | 30% |

The persistence of activity of disease and mortality amounted to 38% for the primiparae and also averaged about 38% for the multiparae. With regards to age groups, 71% of the primiparae were under 25 years whilst 84% of the multiparae were aged 25 years or over. These two classes were, therefore, divergent in age groups. The bulk of the primiparae were in the age group normally yielding the highest mortality from pulmonary disease whereas the multiparae were in the age group normally yielding a significantly lower mortality. Of the 10 women who had their 5th or subsequent pregnancy during the period under review, 9 had only mild or moderately advanced disease at first diagnosis. Despite this, 9 of these 10 women still had active disease or were dead by January 1950. Maternal morbidity is known to increase greatly from the 5th pregnancy onwards and this might reasonably have been the major factor in producing the serious

table above

outcome.

(Follow-up Periods.)

The length of the follow-up periods after delivery is shown in Table VIII.

(Table VIII.)

| 0-Iyr. | 2yrs. | 3yrs. | 4yrs. | 5yrs. | 6yrs. | 7yrs. | 8yrs. | 9yrs. |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 8 | 14 | 13 | 4 | 12 | 10 | 7 | 13 | 20 |

62% were followed-up for 5 years or more after delivery and 33% were followed-up for periods up to 4 years.

9. Summary of Findings.

Summarising the experience with the pregnancy cases we have the following broad findings:-

- (1) They were mainly aged 34 years and under at first diagnosis with the greatest number falling into the age group 17-24 years.
- (2) 89% had only mild or moderately advanced disease at first diagnosis.
- (3) Those with moderately or far advanced disease at first diagnosis showed the greatest mortality and persistence of activity of the disease.
- (4) The greatest mortality and persistence of activity of the disease was found in the highest age group (35-45 years) and was appreciably less in the youngest age group.
- (5) The exudative type of lesion was more common than the productive type, the latter type giving rise to a greater persistence of activity of disease.

- (6) Collapse therapy yielded results which were little better than those obtained by sanatorium bed-rest alone but were substantially better than those obtained from domiciliary treatment.
- (7) The majority were living in poor social conditions - 39% of them living in conditions which were only fair or frankly bad.
- (8) Those living in fair social conditions had a more favourable outcome than those whose social conditions were frankly bad.
- (9) Those who had their first pregnancy during the course of their tuberculous illness fared in a similar manner to those who were having their 2nd, 3rd, or 4th pregnancy; those who were having their 5th or subsequent pregnancy fared worst of all.
- (10) By the end of the observation period 19% of the group were dead and 19% still had active disease.

10. Comparison of the Pregnancy Group with the Control Group.

The first striking feature about the two groups is not their similarity in composition but their difference. The pregnancy group was on the whole composed of younger women with disease that was only mild or at most moderately advanced in the majority of cases and the exudative type of lesion was the predominant one. Their prognosis at first diagnosis was fairly good. On the other hand, the control group with their greatest number having moderately advanced or far advanced disease at first diagnosis had a poor prognosis from the outset. In addition

they had a greater proportion of cases with the productive type of lesion which led to a greater persistence of activity of disease.

It would appear, then, that those tuberculous women who had their disease first diagnosed in the age group 25-34 years and who had a poor prognosis from the outset tended to avoid pregnancy whilst those who were first diagnosed when in the age group of high fertility (17-24 years) and who had a fair to good prognosis tended to embark on a pregnancy. In this area, therefore, there was a greater tendency for the married tuberculous women aged 17-24 years to have their disease associated with a pregnancy than not. This resulted in a deficiency in married women aged 17-24 years in the control group. Such a deficiency has been met with in other similar investigations, notably that of Alice Hill in America and Stewart and Simmonds in this country and is a major obstacle in acquiring a statistically satisfactory control series.

As pointed out previously the control group studied here can give only a broad picture of the outcome of pulmonary tuberculosis in married women of child-bearing age in this area. It tends, moreover, to accentuate the blacker side of the picture on account of the loading of the control group with cases that had a bad prognosis from the outset. In addition, the control cases were unfavourably placed as regards priority for sanatorium treatment on account of their age distribution and the extensive nature of the disease in the majority of the cases. The reverse would appear to have been the position of

the pregnancy cases but this was also partly offset by the overall shortage of sanatorium beds during the ten years' period of observation.

II. Late Effects of Pregnancy.

It is convenient first of all to compare the end-results in the pregnancy cases with the end-results in the control cases and so determine the late effects of pregnancy on the pulmonary disease. Bearing in mind the fore-going remarks about the control cases, we see that 70% of them were either dead or still had active disease at January 1950 whilst the corresponding figure for the pregnancy group was 38%, approximately half.

The mortality experienced by the two groups according to age distribution is shown in Table IX.

(Table IX.)

| Age Groupings. | Mortality in Control Group. | Mortality in Pregnancy Group. |
|----------------|-----------------------------|-------------------------------|
| 17-24 | 42% | 18% |
| 25-34 | 40% | 15% |
| 35-45 | 37% | 38% |

On account of the age distribution of the pregnancy cases, the exudative type of lesion was the more common and those of the group who had productive lesions tended to have a greater persistence of activity of the disease. The application of collapse measures appeared to yield little improvement on the end-results obtained by sanatorium bed-rest alone whilst domiciliary treatment yielded the poorest results of all.

As regards social conditions, the pregnancy cases reacted more or less in a similar manner. Those living in fairly good social conditions fared significantly better than those living in social conditions that were frankly bad.

In both the control group and pregnancy group it would appear that the presence of up to 4 children in the family affected the final outcome of the tuberculous disease less than would be expected. After the fifth pregnancy or with 5 or more children in the home the outcome greatly deteriorated in each group. This latter finding might be accounted for by the sharp increase in morbidity experienced by multiparae as a whole in relation to the fifth and subsequent pregnancy.

Summarising, it would appear that gestation, parturition, infant and child-rearing undertaken in the presence of tuberculous disease of the lungs did not on the whole adversely affect the long term outcome of the lung condition. The outcome of the disease in association with pregnancy appeared to be more intimately affected by the same factors that were operative in the non-pregnant tuberculous women of child-bearing age than by any particular reaction to pregnancy itself. These important factors influencing the outcome of the lung disease were demonstrated to be:-

- (1) age of the patient at first diagnosis,
- (2) type and extent of disease at first diagnosis,
- (3) availability and quality of sanatorium treatment,
- (4) social conditions.

I2. Early Effects of Pregnancy.

We now come to the study of the early effects of pregnancy on the pulmonary disease with the proviso that pregnancy embraces conception, gestation, parturition and early infant-rearing. The state of the disease was assessed as near to the date of each conception as possible with each pregnancy being studied as a separate incident. This initial assessment was then compared with that made at one month post-partum.

(Classification at Conception.)

In Table Ia. the cases are classified according to age groups and the state of the lung disease as assessed near the time of conception. Table Ib. shows the type and extent of the disease at this time and Table Ic. the type of treatment already received.

| Age Group. | No. per age SP. | State at Conception. | |
|------------|-----------------|----------------------|--------|
| | | Quiescent | Active |
| 17-24 | 40 | 23 | 17 |
| 25-34 | 60 | 39 | 21 |
| 35-45 | 26 | 12 | 14 |
| Totals | 126 | 74 | 52 |

(Table Ia.)

| Age Group. | No. per age SP. | Type of Disease | | Extent of Disease. | | |
|------------|-----------------|-----------------|-------|--------------------|---------|---------|
| | | Exud. | Prod. | A1 & B1 | A2 & B2 | A3 & B3 |
| 17-24 | 40 | 36 | 4 | 15 | 21 | 4 |
| 25-34 | 60 | 37 | 23 | 30 | 17 | 5 |
| 35-45 | 26 | 8 | 18 | 14 | 11 | 1 |
| Totals | 126 | 81 | 45 | 67 | 49 | 10 |

(Table Ib.)

(Table Ic.)

| Age Group. | No. per age gp. | Type of Treatment. | | |
|------------|-----------------|--------------------|----------------------|-----------------------|
| | | Collapse Therapy. | Sanatorium Bed-rest. | Domiciliary Bed-rest. |
| 17-24 | 40 | 8 | 10 | 22 |
| 25-34 | 60 | 8 | 18 | 34 |
| 35-45 | 26 | 4 | 12 | 10 |
| Totals | 126 | 20 | 40 | 66 |

77% of the pregnancies were undertaken at the age of 34 years or under with the greatest number in the age group 25-34 years. The exudative type of lesion was about twice as prevalent as the productive type. 91% of the pregnancies were associated with disease that was only mild or moderately advanced at the time of conception. The disease was quiescent near the commencement of 59% of the pregnancies and active with the remainder. The greatest number of these quiescent cases were under the age of 34 years. Less than half the cases (46%) had had sanatorium treatment.

(Outcome at 1 month Post-partum.)

The state of the disease at 1 month post-partum according to age groups is shown in Table II.

| Age Groups. | State at 1 mth. post-part. | | | Totals |
|-------------|----------------------------|--------|------|--------|
| | Quiescent | Active | Dead | |
| 17-24 | 26 | 13 | 1 | 40 |
| 25-34 | 41 | 18 | 1 | 60 |
| 35-45 | 11 | 15 | - | 26 |
| Totals | 78 | 46 | 2 | 126 |
| Percentage | 61% | 37% | 2% | -- |

(Table II.)

From this table we see that despite gestation, parturition and one month of infant-rearing there was a greater number of pregnancies accompanied by quiescent disease. At one month post-partum 73 pregnancies were associated with quiescent disease as against 74 at conception.

Of the 52 pregnancies that were associated with active disease at the time of conception 4 became associated with quiescent disease by one month post-partum and 2 women had died.

In 7 cases the disease had become active again by one month post-partum. All of these had moderately advanced disease at the time of conception. Quiescence of the disease was regained by one of them 3 years later, 3 were still active one year later and 3 had died two years later. As quiescent disease, however, is notoriously liable to become re-activated even under the best circumstances it is difficult to ascribe just how much of the re-activation was due to pregnancy.

In 10 active cases the disease had become quiescent by one month post-partum. Of these, 7 were quiescent two years later whilst the remaining 3 had become active again.

On the whole, it appeared that pregnancy up to the period one month post-partum affected the course of the disease very little one way or the other - those who had progressive disease with a bad prognosis continued on the downward path whilst those who had mild or healing disease continued to improve.

(Outcome According to Type and Extent of Disease at Conception.)

The results at one month post-partum according to the type and extent of the disease at conception are shown in Table III.

(Table III.)

| State of Disease at one month post-partum. | Type of Disease | | Extent of Disease | | |
|--|-----------------|-------|-------------------|---------|---------|
| | Exud. | Prod. | A1 & B1 | A2 & B2 | A3 & B3 |
| Quiescent | 59 | 13 | 53 | 24 | - |
| Active | 21 | 26 | 14 | 25 | 0 |
| Dead | 1 | 1 | - | - | 2 |
| Totals | 81 | 45 | 67 | 49 | 10 |

With the exudative type of lesion 25% of the pregnancies were associated with active disease at one month post-partum whilst with the productive type of lesion 57% were associated with active disease. The productive type of lesion, therefore, appeared to be responsible for greater persistence of activity of the disease.

Of the 10 cases who had far advanced disease at the time of conception, 2 had died ~~at~~ by one month post-partum and the others still had active lesions. The pregnancies accompanied by mild or moderately advanced disease at the time of conception had 66% of their number associated with quiescent disease at one month post-partum, 34% with active disease and none had died. Thus the outcome with mild or moderately advanced disease was significantly better than with far advanced disease.

(Outcome According to Type of Treatment before Conception.)

Studying the outcome according to the type of treatment received before conception, the results were as shown in Table IV.

| State at 1mth. post-partum. | Collapse Therapy. | Sanatorium Bed-rest. | Domiciliary Bed-rest. |
|-----------------------------|-------------------|----------------------|-----------------------|
| Quiescent | 15 | 25 | 38 |
| Active | 5 | 14 | 27 |
| Dead | - | 1 | 1 |
| Totals | 20 | 40 | 66 |

(Table IV.)

Where the patients had had sanatorium treatment before conception, 67% of the pregnancies were associated with quiescent disease at one month post-partum. With domiciliary treatment only before conception, 57% of the pregnancies were associated with quiescent disease at one month post-partum.

It would appear that, on the whole, those who had sanatorium treatment before conception fared better after a pregnancy than those who had only domiciliary treatment.

(Outcome According to Social Conditions.)

The results at one month post-partum according to social conditions are shown in Table V.

| State at 1 mth. post-partum. | Social Conditions | | |
|------------------------------|-------------------|------|-----|
| | Good | Fair | Bad |
| Quiescent | 6 | 26 | 46 |
| Active | 5 | 19 | 22 |
| Dead | - | - | 2 |
| Totals | 11 | 45 | 70 |

(Table V.)

It is seen that more than half of the pregnancies were undertaken in bad social conditions. Many of the women embarked on more than one pregnancy whilst tuberculous in these adverse home conditions. Despite this, 65% of the pregnancies were

accompanied by quiescent disease at one month post-partum as against 58% in fair social conditions and 55% in good social conditions. It could be, however, that this relatively short observation period was insufficient to note the trend of the effects of social conditions.

(Outcome According to Parity.)

Table VI shows the state of the disease at one month post-partum when classified according to the number of the pregnancy.

(Table VI.)

| State at 1 mth post-partum. | Ist Preg-nancy. | 2nd Preg-nancy, | 3rd Preg-nancy. | 4th Preg-nancy. | 5th + Pregnancy. |
|-----------------------------|-----------------|-----------------|-----------------|-----------------|------------------|
| Quiescent | 30 | 17 | 21 | 4 | 6 |
| Active | 17 | 7 | 8 | 4 | 10 |
| Dead | 2 | - | - | - | - |
| Totals | 49 | 24 | 29 | 8 | 16 |

During the course of their tuberculous illness 49 of the cases had their first pregnancy whilst 52 had their second or subsequent pregnancy. With a first pregnancy 61% had quiescent disease at one month post-partum, with a second pregnancy 70% had quiescent disease, with a third pregnancy 72% had quiescent disease and with a fifth or subsequent pregnancy only 37% had quiescent disease at one month post-partum.

Up to the fourth pregnancy the multiparae appeared to fare slightly better than the primiparae probably on account of the fact that the multiparae tended to be of a higher age group with a consequently better prognosis.

The outcome from the fourth pregnancy onwards, however, would seem to be adversely affected. The causal factor might reasonably be the sharp rise in morbidity experienced by multiparous women of this degree of parity.

(Outcome According to Type of Delivery.)

The state of the lung disease at one month post-partum according to the mode of termination of the pregnancy is shown in Table VII.

(Table VII.)

| State at 1 mth. post-partum. | Type Of Delivery. | | | |
|---------------------------------|--------------------------|--------------------------|-----------|---------------|
| | Spontaneous Abortion. | Therapeutic Abortion. | Premature | Full Term. |
| Quiescent | 2 | I | 7 | 60 |
| Active | 6 | 6 | II | 23 |
| Dead | - | - | 2 | - |
| Totals | 8 | 7 | 20 | 91 |

74% of the pregnancies which terminated in a full-term delivery were associated with quiescent pulmonary disease one month after. The pregnancies which were aborted therapeutically showed the worst outcome of all, with only 14% of them being associated with quiescent disease at one month post-partum.

In 6 cases, therapeutic abortion was performed in the 7 pregnancies to which they gave rise. At the commencement of 6 of these pregnancies the lung disease was active and quiescent in the remaining one with the disease in each case being moderately advanced. Despite surgical interference with these pregnancies, the 6 active cases showed progression of the disease one month after the operation. In other words, the trend of the

disease was unaltered by disposing of the pregnancy.

In 7 cases, spontaneous abortion occurred in the 8 pregnancies to which they gave rise. Of these 8 pregnancies, 7 were associated with active lung disease at conception and one with quiescent disease. The disease was only mild or moderately advanced but despite this, early evacuation of the uterus failed to alter the trend of the lung disease as 6 still had progressive lesions one month after the abortion.

The prematurity rate was about 16% and the spontaneous abortion rate about 6%. These two rates were higher than that experienced in pregnancy generally and in this series, therefore, pregnancy in association with tuberculosis of the lungs was accompanied by a greater tendency to spontaneous abortion and premature labour.

(Summary of Findings.)

Summarising the findings in the pregnancy group at one month post-partum, we have the following:-

- (1) 77% of the pregnancy cases were undertaken at the age of 34 years and under with the greatest number in the age group 25-34 years.
- (2) 91% of the pregnancies were associated with mild or moderately advanced disease at the time of conception.
- (3) the exudative type of lesion was about twice as prevalent as the productive type, the latter being responsible for greater persistence of activity of the disease at one month post-partum.
- (4) less than half the cases (46%) had had sanatorium treatment

before the onset of pregnancy.

- (5) 59% of the pregnancies were commenced in the presence of quiescent and 41% in the presence of active disease.
- (6) with only mild or moderately advanced lung disease at conception, the outcome at one month post-partum was significantly better than with far advanced disease.
- (7) those who had had sanatorium treatment before conception fared significantly better than those who had had only domiciliary treatment.
- (8) social conditions did not seem to affect the outcome of the pulmonary disease over the observation period.
- (9) parity to the level of the third pregnancy did not affect the outcome of the pulmonary disease but with the fourth, fifth and subsequent pregnancy, the outcome appeared to be adversely affected.
- (IO) those who had a full-term delivery fared best whilst spontaneous and surgical abortion did not appear to affect the trend of the pulmonary disease for the better.
- (II) at the time of conception 59% of the pregnancies were associated with quiescent lung disease whilst by one month post-partum 61% were associated with quiescent disease, 37% with active disease and 2% with death of the patient.

On the whole it would appear in this pregnancy group that up to one month post-partum, pregnancy affected the course of the pulmonary disease very little one way or the other - those who had progressive disease with a bad prognosis continued on the downward path whilst those who had mild, healing

or stationary disease continued to improve or to be subject to relapses in a manner quite typical of pulmonary tuberculosis in non-pregnant women of child-bearing age.

Discussion.

I. Comparison with similar Investigations.

Having presented the findings in the pregnancy group and the control group it would be valuable to compare them with the findings of similar investigations. A more or less parallel and contemporary investigation was carried out in Middlesex by Stewart of Uxbridge Chest Clinic and Simmonds of Clare Hall Sanatorium. Their cases were obtained from a special central register noting pregnancies occurring in tuberculous women attending the chest clinics of the County of Middlesex during the period 1944-1946. (This period corresponded to the central portion of the period over which my own investigation was carried out.) They compiled a series of 216 pregnant tuberculous women and as controls had 259 non-pregnant tuberculous women attending the chest clinics during the same period and comparable with the pregnant group in age, activity and duration of disease, standard of treatment, social class and parity. Their area had a larger population than my own but was also mainly industrial. The County was, however, more favourably placed as regards social conditions and the availability of sanatorium treatment. Despite a large clinic population of 4,200 women of child-bearing age, Stewart and Simmonds found difficulty in obtaining a satisfactory control group and had

only a small proportion of pregnancy cases, namely 28%, with active disease at the time of conception. They assessed the lung condition of their pregnancy cases as near to conception as possible and compared it with the state obtaining 3-6 months after parturition. Their controls had an initial assessment followed by another assessment 15 months later to correspond to the period of gestation plus 3-4 months post-partum in the pregnancy cases. In my own series the pregnancy cases were assessed at one month post-partum giving an observation period of 13-16 months that corresponded roughly to that of the Middlesex cases.

Comparison of the short-term results in the pregnancy cases of the two areas is shown in the following table.

| State of Lung Disease. | Pregnancy Cases Post-partum. | | Control Cases. | |
|------------------------|------------------------------|------------|----------------|------------|
| | Middlesex. | Yorkshire. | Middlesex. | Yorkshire. |
| Quiescent | 79% | 61% | 63% | 30% |
| Active | 17% | 37% | 29% | 30% |
| Dead | 4% | 2% | 8% | 40% |

Though the control groups in the two areas are not comparable on account of the different periods of observation, we see that the pregnancy cases fared better than their corresponding control group. The Middlesex cases appeared to fare better than the Yorkshire ones in both the pregnancy and the control group but this could be accounted for by the advantage that Middlesex County enjoyed in treatment facilities, social conditions and principally in the smaller proportion of

cases who had active disease at the time of conception.

Stewart and Simmonds concluded from their findings that pregnancy occurring in the presence of pulmonary tuberculosis affected the trend of the lung disease very little. Their series contained 56 cases in whom therapeutic abortion was performed. They found that the surgical interference failed to alter the trend of the pulmonary disease for the better.

Their main findings, therefore, amongst tuberculous women in Middlesex corresponded to those obtained in this investigation in Yorkshire.

In similar investigations in America, Ornstein and Epstein found a mortality of 36% in their pregnancy cases. Mariette, Larson and Litzenberg found a mortality of 19% in their pregnancy cases and 39% in their control cases. Seeley, Siddall and Balzer also found a mortality of 19% in their pregnancy cases. The pregnancy groups in all these investigations appeared to fare better than their control groups. In my own series the pregnancy cases had an overall mortality of 19% and their control group a mortality of 40%. These figures approximate closely to those of the American authors but the control group in each of these American investigations was subject to the same discrepancies as my own and served only as a rough basis for comparison.

2. Incidence of Pulmonary Tuberculosis in Pregnancy.

Before the incidence of pulmonary tuberculosis in women of child-bearing age could be accurately assessed by the use of mass radiography surveys, a few authors

suggested that the incidence was higher in married women of child-bearing age than in the population of women as a whole. In 1939 Wolff in America and Hart and Wright in England, by correlating birth-rates and mortality from pulmonary tuberculosis concluded that married women ran a greater risk of developing pulmonary tuberculosis by virtue of the strain placed upon them through child-bearing. All the factors, however, that have a definite bearing on the incidence of pulmonary tuberculosis were not taken into full consideration and their pessimistic conclusions have happily been proved wrong.

Mass miniature radiography has enabled representative groups of the population to be x-rayed quickly, cheaply and efficiently. Surveys during the late war and in the post-war years have shown the incidence of radiologically significant lesions in women of child-bearing age to be 1-1.7%. Corresponding surveys of large numbers of pregnant women attending the ante-natal clinics in this country, Southern Ireland, America and New Zealand have demonstrated the incidence of radiologically significant lesions to be 0.28-1.7%. It has, therefore, been amply proved that the pregnant woman runs no greater risk of developing pulmonary tuberculosis than the non-pregnant woman of child-bearing age. The fact that pregnant women who constitute a special group of the population give rise to one, or at most, two cases of pulmonary tuberculosis out of every 100 examined at ante-natal clinics would appear to justify a routine miniature radiograph of the chest on the diagnosis of pregnancy.

3. Effects of Pulmonary Tuberculosis on Pregnancy.

It would appear reasonable to assume that a concurrent pathological condition such as pulmonary tuberculosis would exert some influence on conception, gestation and parturition. Except where ovulation and the menses are suppressed through grave toxæmia, active pulmonary tuberculosis does not seem to diminish fertility. Most investigators have found that the number of married tuberculous women under the age of 20 years who had a pregnancy far outnumbered the married tuberculous women under 20 years who had had no pregnancy. Stewart and Simmonds found that married women with active lung disease tended to avoid pregnancy but when the disease was dormant their rate of conception was similar to that of the normal population. It has been the general experience that spontaneous abortion and premature labour are more common in the presence of active lung disease. The causative factor in this case may be toxic action upsetting the hormonal mechanism governing the onset of labour.

With acutely active pulmonary disease labour tends to be slow and tedious because of the patient's general weakness and poor tone of the uterus and the accessory muscles of parturition. This leads frequently to excessive post-partum hæmorrhage and tardy involution of the uterus. These effects on the labour, however, are those which could be experienced with any other general toxic condition such as chronic nephritis.

In active pulmonary disease there appears to be little danger of infecting the child in utero or directly through the

mother's milk.

4. Influence of the Hormones in Pulmonary Tuberculosis

and Pregnancy.

Krause in 1939 in his editorial review in the journal "American Review of Tuberculosis." drew attention to the often forgotten fact that many women react badly to pregnancy itself regardless of the effects of any complication such as pulmonary tuberculosis. Other women appear to have their bodily economy enhanced by pregnancy and benefit both physically and psychologically from it. This reaction of the "normal" woman to pregnancy may be related to the balance of hormones.

In active pulmonary tuberculosis the menses are often scanty or completely absent suggesting primary ovarian ~~dis~~function through toxæmia. It is known that the ovaries are subject to control by other glands of internal secretion namely the pituitary, thyroid and adrenals. In the background there ^{are} is also the effects of the increased activity of the parathyroids and the pancreas. The toxæmia of active pulmonary tuberculosis may affect these controlling glands and indeed tuberculous disease itself is not uncommonly found in the adrenals. Pregnant women with active lung disease show a higher rate of spontaneous abortion and premature labour than non-tuberculous ^{and otherwise healthy} women which again is very suggestive of a hormonal disturbance.

With the onset of pregnancy many tuberculous women begin to improve and go on improving after delivery with ultimate healing of the lung disease. Others improve during the pregnancy

but deteriorate after delivery, some disastrously so. Again, there are others with active disease who become rapidly worse in the first trimester, proceed to an abortion or premature labour followed by an acceleration of the disease process and death. Women with latent lung disease may have it re-activated during a pregnancy or the disease may arise apparently de novo in the puerperium. In these latter cases, however, there is a strong suspicion that the disease is present during pregnancy but diagnosis of the condition is delayed till the puerperium.

It is possible then that the pregnant tuberculous woman who reacts well both to her pregnancy and her lung disease does so because of a good hormonal balance, the latter enhancing her healing powers and resistance to infection. Conversely if she reacts badly to her pregnancy and lung disease this may be due to hormonal ^{dist}unbalance and the toxæmia of the lung disease may further aggravate the disturbance of the hormones and so lead to a vicious circle. As an example one might quote the disturbed or unbalanced hormonal activity at puberty and the menopause which are not infrequently associated with rapidly spreading forms of pulmonary tuberculosis.

The main hormones to be considered during pregnancy are Chorionic Gonadotropin or the Anterior pituitary-like Substance, and Oestrogen. In the normal pregnant woman Chorionic Gonadotropin can first be detected in the serum about the 6th or 8th week and rapidly rises to a maximum concentration about the 10th-16th week. Thereafter it falls quickly to a lower maintenance level which, however, remains substantially above

the pre-conception level for as long as 3-4 weeks after parturition. Oestrogen becomes measurable in the serum about the 8th week of pregnancy and rises rapidly in concentration from the 14th - 20th week. This rapid increase of Oestrogen often coincides with the sharp fall in the concentration of Chorionic Gonadotropin. The amount of Oestrogen continues to rise fairly quickly throughout the rest of pregnancy, reaching a maximum about full term. After the expulsion of the placenta the Oestrogen concentration falls extremely rapidly and amounts to a virtual total withdrawal of the hormone.

Rakoff has shown that in the toxæmias of pregnancy or when a toxæmia is threatening, the serum Chorionic Gonadotropin values are unusually high for the period of gestation whilst the Oestrogen values are below the normal but as the patient recovers the serum levels of the hormones tend to return to the average levels. Which is cause and which is effect has not yet been conclusively proved. However, working on the assumption that diminished Oestrogen is the causal factor, Smith and Hurwitz in America have had good results in the prophylaxis and the treatment of pre-eclampsia and the toxæmias of pregnancy by the exhibition of the synthetic Oestrogen, Stilboestrol.

As regards tuberculosis itself, the recent investigations of Lurie and his associates have produced evidence that Chorionic Gonadotropin does in fact enhance the activity and spread of tuberculous lesions and that Oestrogen acts to a certain degree as a protective substance.

Pregnant women with pulmonary tuberculosis may show a deterioration in the lung disease about the 12th week which corresponds to the period of highest serum concentration of Chorionic Gonadotropin. There is, then, the possibility that in these tuberculous women, as in women with toxæmia of pregnancy, the Chorionic Gonadotropin level is above the normal with resultant depression of resistance and aggravation or re-activity of the lung disease. On the other hand, deterioration in the lung disease about the 12th week may be due to lack of Oestrogen. This hormone is shown to be in low concentration at this time and there is the likelihood that its production in such cases is also suppressed. Lurie has demonstrated it to have the possible role of a protective agent and its rising concentration from the 14th - 20th week till full term may account for the improvement in the lung condition frequently seen in the later months of pregnancy. After parturition, the Chorionic Gonadotropin is still in recognisable concentration but that of Oestrogen has fallen markedly with the resultant practical loss of its protective effect. This may be the factor leading to the deterioration in the lung disease encountered in the puerperium.

In the light of the above there would appear to be a case for the prophylactic administration of Oestrogens in the puerperium the dosage probably requiring to be much higher than that given for the suppression of lactation.

Recently attention has been drawn to the effects of the hormones of the Adrenal Cortex in pregnancy. It has been shown that there is greatly increased activity of the adrenal

cortex with increased production of the sugar hormones or "corticoids". This increased activity is said to be promoted by the oestrogens of pregnancy and also by thyroxine. The concentration of the corticoids in pregnancy follows roughly that of the oestrogens. It rises till about the 4th month, falls and then rises steadily again till a maximum is reached about one month before term. Thereafter it diminishes and finally disappears in the early puerperium. The corticoids have been shown to reduce sensitivity to tuberculin which in turn depresses the destructive action of the tubercle bacillus. This might be another factor accounting for the improvement seen in tuberculous lesions during the 2nd and 3rd trimesters.

On the other hand, the corticoids have been demonstrated to delay healing and even produce breakdown of fibrous tissue. It has, therefore, been postulated that about the 4th month when the corticoid level falls the tendency to activation of the lung condition diminishes but should return with increasing degree as the corticoid level rises especially towards the end of pregnancy. This, however, is not borne out by the facts. Despite this, Morrow Brown of Edinburgh has expressed the opinion that the influence of the corticoids in pregnancy is more profound than that of the sex hormones. He believes that where the lung disease is adversely affected throughout pregnancy it is due to the depressing effects of the corticoids on healing and the breaking down of fibrous tissue overcoming any good effects which the corticoids may have in increasing the patient's resistance as measured by reduction in

sensitivity to tuberculin.

It is evident that the role of the hormones has definitely been established as important. With the study of the effects of the Oestrogens, Chorionic Gonadotropin and the Sugar Hormones of the adrenal cortex, we are entering on the stage of collecting and fitting together the main pieces of the hormone jig-saw.

5. Biochemical Factors.

In both pregnancy and pulmonary tuberculosis changes in the blood chemistry have been studied and various and old-standing hypotheses on their cause and effect put forward.

In pregnancy changes in the blood chemistry may be caused by the demands of the growing foetus. Through increased activity of the parathyroids there is a greater turn-over of calcium. If the diet is deficient in calcium-containing foods and also in Vitamin D which ^{is} required for the assimilation of calcium, the serum calcium level falls and the mineral requirements of the mother are sacrificed to supply the developing child. Kaminsky and Davidson have shown that in active pulmonary tuberculosis the serum calcium is below the normal. It is, therefore, argued that when pregnancy and pulmonary tuberculosis occur together the calcium level is kept so low that firm healing of the lesions by the laying down of lime salts cannot occur. Again it is suggested that in quiescent and calcified lesions the increased demand for calcium during pregnancy may demineralise the lesions and so allow of their reactivation. However, Kaminsky and Davidson have shown that exhibition of Vitamin D in

patients with active pulmonary tuberculosis will raise their serum calcium level above the normal suggesting that the lack of sufficient intake of Vitamin D-containing foods such as fats is probably the causal factor. To-day Vitamin D is prescribed free in pulmonary tuberculosis and in pregnancy and in each condition extra milk is supplied to provide the major calcium needs. It is unlikely then that deficiency of calcium in the tissues occurs to any significant degree in the condition of pulmonary tuberculosis complicated by pregnancy.

In pregnancy stimulation of the thyroid through the pituitary leads to a rise in the basal metabolic rate. This latter condition would be expected to produce a diminution of the serum cholesterol but in normal pregnancy the serum cholesterol is actually increased. This increase in cholesterol, it is postulated, would permit the tubercle bacillus to develop a stronger waxy envelope and so increase its chances of survival when engulfed by the phagocytes. This would then allow of persistence of activity and spread of the lung disease.

It is known that in pregnancy there is an increase of nitrogen metabolism and nitrogen storage due to the increase in the basal metabolic rate and the amount of proteolytic ferments in the blood. These findings have been presented as possible cause of deficiency in the production of fibrous tissue with consequent inability to seal off tuberculous lesions in the lungs.

Though on the whole there has been little substantial experimental or clinical proof that the alterations in the blood

chemistry occurring in pregnancy affect tuberculous lesions of the lungs, it is now becoming more evident that these changes are intimately related to the interplay of the hormones and may affect the lung condition indirectly.

6. Allergy Factor.

A number of writers have referred to the loss or diminution of tuberculin sensitivity frequently seen during pregnancy. This phenomenon is also seen in advanced pulmonary tuberculosis, miliary tuberculosis and tuberculous meningitis and assumed to indicate a diminution or loss of resistance to the tubercle bacillus. Though it seems illogical to assume that the physiological process of pregnancy is comparable with the disease process of advanced tuberculosis, one may run parallel with the other as regards hormonal balance especially with hormones such as those of the adrenal cortex. However, Lichtenstein in 1942 showed that a mild depression in sensitivity occurs in about 25% of pregnant patients with coincident active pulmonary tuberculosis but that in most instances the level of activity to tuberculin is closely comparable with similar but non-pregnant cases. None of his cases became completely insensitive to tuberculin.

Though there does not seem to be any definite evidence to indicate that changes in tuberculin sensitivity, per se, during pregnancy mean lessened resistance to tuberculosis it has been shown to be a possible indicator of increased activity of the adrenal cortex and this latter condition may have

adverse effects upon the lung disease.

7. Mechanical Factors.

The mechanical effects of changes in the level of the diaphragm during the later months of pregnancy and immediately after the second stage of labour have been much discussed. It is evident that the elevation caused by the large uterus occurs over a period which is insufficient to produce any real benefit other than a temporary amelioration of symptoms. The relaxation of the lungs so produced is not nearly so great or so therapeutically effective as that obtained by phrenic paralysis. Even a good elevation by phrenic paralysis has a dubious effect on a basal lesion which lies posteriorly in the lung as the posterior part of the diaphragm rises relatively little.

It is more likely that the diaphragm exerts an influence on the pulmonary disease during the strong expulsive efforts of the second stage of labour. Deep, forced respiration occurs at this stage with stretching of the lung tissue and possible aspiration of the infected material into parts of the lung which have formerly been poorly aerated. By the third stage of labour any damage that is going to be done to the lungs by parturition has already been done and it would seem illogical to attempt prophylaxis at this stage by inducing a pneumoperitoneum. It would appear more reasonable in cases where the disease is active or very liable to breakdown to have the lung protected in some way before labour either by phrenic paralysis or artificial pneumothorax. In all such cases it would be a wise precaution to

conduct the labour in such a way as to avoid the deep forced respirations induced by the strong expulsive efforts of the second stage.

8. Social and Environmental Factors.

Hart and Wright in their statistical monograph in 1939 demonstrated the adverse effects of poverty, bad housing, substandard nutrition and unsatisfactory working conditions on the decline in tuberculosis mortality especially in young women. Lyman in 1943 in his statistical analysis of 1,818 tuberculous women made the striking point that women marrying after treatment had a prognosis four times better than unmarried tuberculous women and three times better than those married before treatment. That marriage tends to improve prognosis in quiescent cases has been noted by several writers. Edson in New Zealand and Dingle in England showed that the mortality from pulmonary tuberculosis was higher amongst single women than in married women, most noticeably in the age groups above 25 years. This more favourable prognosis for married women is attributed to marital selection, tuberculous women not marrying so freely or delaying marriage until the disease is quiescent.

Despite having a young family the younger married tuberculous woman would appear to be more favourably placed in that the present housing shortage necessitates many of them lodging with their mothers or mothers-in-law. These older women take upon themselves many of the heavy household duties and care of the children. Even with a home of her own such relief can be given to the married woman with a family in the form of a home

help through the Local Authority, school meals for the children and a works' canteen for the husband's mid-day meal.

On the other hand the unmarried tuberculous woman especially over the age of 25 years is commonly the financial and domestic stay of aging or ailing parents. Economic necessity, even in these days of the Welfare State, forces her to return to work before she is really fit or to carry on at work long after she should have sought medical aid.

The married tuberculous woman, however, with three or more children, living in overcrowded conditions and with a husband who is frequently unfit for work on account of some chronic ailment is probably the worst situated of all. Such families are relatively common in this mining area of the West Riding where housing conditions are bad and the men are subject to pneumoconiosis with disabling dyspnoea and bronchitis. Domestic help tends to be only of a temporary nature, the family income is subject to frequent fluctuations and the constant worry of children and trying to make ends meet, a positive drain on her vitality. When such a mother is recommended for sanatorium treatment she frequently postpones admission until she is too ill to carry on. Once in sanatorium she seeks her discharge as soon as she begins to feel well and takes her leave against medical advice on the grounds that she is worrying about her children or her husband. Return to her bad social and economic conditions leads again to a breakdown and all too frequently at the cost of infection of one or more of her children. Each chest clinic and sanatorium can produce many such cases and unfortunately through

the lack of provision of adequate housing and facilities for the boarding of potentially infected children, the problem lingers on without a solution.

The nutrition of the tuberculous and the pregnant woman is all important and the authorities have made far-sighted provision for each. Protective substances such as Vitamin A and D tablets, orange juice, cheap or free milk and extra eggs, meat and fats are available for the pregnant tuberculous woman. Despite this, many women do not avail themselves of these necessities or pass them into the family pool where their real purpose is lost. Though available on the ration card, extra nourishment in the form of eggs, meat and fats is all too often unobtainable because of rationing through the purse. Education of the pregnant tuberculous mother in her nutritional needs would go a long way to help but relative poverty is still an unsurmounted obstacle.

9. Type and Extent of Pulmonary Disease.

Various authors have pointed out the importance of the type of lung disease in determining the outcome of pulmonary tuberculosis complicated by pregnancy. Three main types of disease were considered to occur, namely (i) caseous-pneumonic with open cavities (ii) resolving exudative type, and (iii) chronic productive type. Of all three the caseous-pneumonic type was found to be associated with the greatest destruction of tissue and the greatest degree of toxæmia. The addition of pregnancy appeared rarely to alter the basic type of lung disease and it was concluded by most workers that

the prognosis for the pregnant tuberculous woman was more or less the same as that of the non-pregnant tuberculous woman. Caseous-pneumonic disease carried the worst prognosis especially where it could not be controlled by some form of collapse therapy. If, however, it could be brought under control the prognosis was about the same as with the other types of disease.

Many investigators tended to disregard the extent of the lesions but this would appear to be unjustified. Disease confined to a lobe or part of a lobe of one lung will be more amenable to collapse therapy than disease which is definitely bilateral. The favourable response of caseous-pneumonic disease to Streptomycin and P.A.S. frequently reduces bilateral disease to apparent unilateral disease and so permit of surgical intervention for the more obstinate lesions. All too frequently, however, the apparently clear lung breaks down again whilst the side protected by some form of collapse therapy remains satisfactory. In other words, the anti-biotics may clear the lung radiologically but do not guarantee firm healing.

The chronic productive type of lesion would seem to have the best natural prognosis when complicated by pregnancy. As it is seen most in the late twenties and over, it is the type most frequently encountered in multiparae. With the exception perhaps of thoracoplasty, it is the lesion least amenable to collapse therapy or treatment by the anti-biotics and tends to maintain a smouldering degree of activity. It produces a chronic debility but is often associated with periods of well-being and freedom from symptoms though the woman is almost constantly a

danger to her family circle.

The resolving exudative type of lesion occurs in women of lower age group who possess a fair degree of natural resistance. The advent of pregnancy and parturition usually does not interfere with the degree of resistance and bed-rest alone appears to be sufficient to produce improvement and ultimate quiescence. Collapse therapy is rarely required and the anti-biotics serve only to shorten the period necessary to secure control of the disease.

10. Treatment of the Lung Disease.

Commencing with the work of Rist in 1927 and followed by that of Alice Hill, Seeley, Siddall and Balzer, it has been demonstrated that control of the lung disease is the all-important factor in the management of pulmonary tuberculosis complicated by pregnancy. These authors and many others have shown that the most efficient method of securing control is by the use of collapse therapy. This may take the form of major surgical procedures such as thoracoplasty or extra-pleural pneumothorax but pregnancy would not appear to be the period of choice in which to carry them out. There is now a tendency to use thoracoplasty more and more as the initial form of collapse therapy or to combine it with or even to use in its stead, radical procedures such as the various forms of lung resection.

Artificial pneumothorax with adhesion section and phrenic nerve interruption are relatively minor operations and can be performed as safely and satisfactorily during pregnancy

as at any other time.

In pulmonary tuberculosis followed by a pregnancy, the time of diagnosis and institution of suitable sanatorium treatment are most important. The best results are undoubtedly seen in those cases where quiescence of the lung disease has been secured before the onset of pregnancy. Cohen, however, in his series of 177 cases confined at Black Notley Sanatorium found the surprising fact that the interval of quiescence before conception did not appear to be a significant factor in determining the short-term effects following pregnancy. He was of the opinion and I think wisely, that one should hesitate to advise pregnancy soon after quiescence has been established. On the other hand, Cutler suggested that the interval of quiescence secured during treatment by artificial pneumothorax was the safest period for a tuberculous woman to marry, have children and rear a family. Despite the apparent logic of this suggestion, most physicians would be loathe to consent to a patient undertaking the strain of a pregnancy during the period of active treatment for the lung disease. However, it commonly happens that the physician has to accept the conditions of pregnancy and active collapse therapy occurring together.

The question arises of the advisability of giving a prophylactic course of P.A.S. or some similar drug in doubtfully quiescent disease during the periods of pregnancy when reactivation is most prone to occur, namely about the 3rd-4th month and the early puerperium. Where satisfactory collapse measures are being applied it should be unnecessary to do more

then lengthen the period of post-partum bed-rest to 4-6 weeks. Where the lungs, however, are not protected by suitable collapse measures and the disease is thought to be unstable, there would appear to be a case for commencing a prophylactic course of P.A.S. about 3-4 weeks before term and to lengthen the period of post-partum bed-rest to 6-8 weeks.

As pregnancy on the whole has been shown to affect the pulmonary disease very little, it would be unjustifiable to use Streptomycin prophylactically. This drug must be reserved at all costs for the planned treatment of active disease.

II. Therapeutic Abortion.

From the middle of the 19th century until the twenties of the present century, treatment for pulmonary tuberculosis consisted of bed-rest and general building up of the patient. Under this form of treatment many cases did well but most cases with cavitating, caseous-pneumonic type of disease had little hope of substantial benefit. Any additional burden to such a patient such as pregnancy was considered to greatly diminish her hopes of recovery still more. It seemed only logical in the face of these difficulties for the physician to advise removal of this additional strain to the patient by aborting her pregnancy therapeutically.

It was later realised from the work of Bridgman and Norwood in 1926 that performance of therapeutic abortion after the 14th week constituted a greater danger to the tuberculous woman than a spontaneous delivery at or near term. Also, about this time the prognosis in pulmonary tuberculosis was

substantially improved by the introduction of collapse therapy and it became possible to review the position regarding the advisability of performing therapeutic abortion. After many investigations the conclusion was reached that in the presence of quiescent lung disease therapeutic abortion was not justified and in the presence of active disease it effected no alteration of the lung condition for the better. It was further shown that the primary object in the management of pulmonary tuberculosis complicated by pregnancy was to secure adequate control of the lung disease and that when this had been brought about, interference with the pregnancy except on purely obstetrical grounds was only rarely to be contemplated.

Unfortunately the problem is not so simple as this would suggest as the number of cases that cannot be brought under control is still painfully large. Though dangerous to the tuberculous woman, the performance of therapeutic abortion during the first 14 weeks of pregnancy would appear in some instances to be the lesser of two evils.

In the advanced uncontrollable case with a poor social and economic environment it would seem unjustifiable to allow a pregnancy to continue with the birth of a possibly premature and weakly infant who will in a very short time become an orphan. Should the pregnancy in such a case be allowed to run its course and the mother survive a few months after parturition, she must be denied the handling of her child or accept the grave risk of it becoming infected. On humanitarian rather than medical grounds, therapeutic abortion would appear to be

the more charitable course.

Again, in the case of the tuberculous woman with infectious fibroid disease and who has at least three children, interruption of the pregnancy and the performance of sterilisation would appear to be the treatment of choice. This, of course, on both points runs counter to the religious belief of many but the moral duty, I think, is to prevent further strain on an already unfortunate family.

These two examples would call for clear cut advice to the patient and her relatives. The greatest difficulty, however, arises in the intermediate cases where stability of the disease is uncertain or where quiescence has only recently been attained after a long illness. In the case of a young primipara to whom the latter circumstances apply, therapeutic abortion cannot guarantee prevention of reactivation whilst continuation of the pregnancy may be attended by improvement in the disease or disastrous breakdown, depending perhaps on how the patient reacts generally to pregnancy itself. With such a young patient there is no urgency about child-bearing and postponement for 2-3 years will make no material difference to her fertility or increase the obstetrical risk. The tendency nowadays is to allow the pregnancy to continue but in my opinion, if the patient and relatives wished it, therapeutic abortion would be justified.

In a young pregnant woman with active pulmonary tuberculosis, Jameson and Cohen consider that the decision on the course to adopt should be delayed until the third month by which time ample opportunity should be afforded to determine the

course of the lung disease. If at the end of this time, the lesion is such that the prognosis would be good if the patient were not pregnant and provided proper treatment were available and acceptable to the patient, they advise continuation of the pregnancy. However, pregnancy is often not discovered until the third month or later and a decision has to be made there and then. In such a case where the social and economic background is bad and the pregnancy has not advanced beyond the 14th week, it would seem best to carry out therapeutic abortion if the patient so desired it and treat the lung disease with full vigour. If, however, the pregnancy had advanced beyond the 14th week it would be far the best course to allow the pregnancy to continue and proceed with full treatment for the lung disease. In the case of the young pregnant woman with active lung disease but whose social and economic environment is good, the position could be fully explained to herself and her relatives and their wishes on the matter followed.

Though on purely medical grounds there is little justification for the performance of therapeutic abortion, the following factors in each case would appear worthy of consideration before coming to a decision. They are (i) age of the patient (ii) state of the pulmonary disease (iii) parity of the patient (iv) co-operation of the patient in her treatment for the lung disease and (v) social and economic environment.

Whether pregnancy has a deleterious effect or not on pulmonary tuberculosis it is a complication of treatment which is more convenient to avoid until definite quiescence of the

disease is attained. In the presence of active disease, especially in the case of a young married woman, there is a strong case for the education of the patient in the practice of birth-control.

I2. Other Methods of Delivery.

Caesarean Section appears seldom to find a place in the management of pulmonary tuberculosis complicated by pregnancy except on purely obstetrical grounds.

Barone, Fino and Heatherington have shown that when caesarean section is performed in the presence of active lung disease it is attended by a higher overall mortality than spontaneous delivery.

On the other hand, Cohen advises caesarean section in severe tuberculous laryngitis complicating advanced lung disease where the pregnancy is too far advanced for therapeutic abortion. Most cases of tuberculous laryngitis can now be greatly improved by the use of Streptomycin and on purely medical grounds spontaneous delivery is to be preferred to caesarean section.

All writers are agreed that the labour should be made as easy as possible with the minimum of shock and blood loss. The method of conducting the labour is in each case in the hands of the obstetrician. Induction of labour about the 36th-38th week is sometimes advocated but the most popular measure is episiotomy with the application of low forceps often routinely in the second stage. Others prefer to withhold the use of forceps unless the patient has been about two hours in the second stage with signs of impending fatigue and with unsatisfactory

advance of the foetal head.

As regards the use of anaesthetics in pregnancy in the presence of tuberculous disease of the lungs, Minnitt's gas and air apparatus can be used with safety to produce analgesia during a normal delivery and gas with oxygen possibly aided with cyclopropane for any manipulation or operation. Even with quiescent lung disease ether is contra-indicated on account of the bronchial irritation it produces and its liability to be followed by pulmonary complications.

After much controversy and repeated investigations it has now been firmly established that the management of pulmonary tuberculosis complicated by pregnancy hinges on the treatment and control of the lung condition. Interference with the pregnancy, in the opinion of many authors, is still indicated in selected cases but these will steadily diminish as our knowledge of the control of pulmonary tuberculosis increases.

Conclusions.

From this investigation I arrived at the following conclusions:-

- (1). Pregnancy affects little, for better or for worse, the course of pulmonary tuberculosis either at one month post-partum or at periods varying from a few months to nine years post-partum.

The IOI pregnancy cases studied had an overall mortality of 19% ; the control group an overall mortality of 40% and tuberculous women of child-bearing age in this area as a whole a mortality of 32%.

- (2). Therapeutic **abortion** does not alter the trend of the lung disease for the better or guarantee freedom from reactivation.

With full-term spontaneous delivery 74% of the pregnancies were associated with quiescent lung disease at one month post-partum whilst of those pregnancies which were aborted therapeutically only 14% were associated with quiescent disease at one month post-partum.

- (3). Pulmonary tuberculosis complicated by pregnancy is subject to the same factors and influenced by them in the same way as pulmonary tuberculosis uncomplicated by pregnancy.

The final outcome of the pulmonary disease would appear to be more intimately related to these factors than to a coincidental complication such as pregnancy.

These factors are:-

- (a) age at first diagnosis of pulmonary disease.
 - (b) type and extent of disease at first diagnosis.
 - (c) availability and quality of sanatorium treatment.
 - (d) social and economic conditions.
- (4). The management of pulmonary tuberculosis complicated by pregnancy centres on the control of the lung condition though in special circumstances interference with the pregnancy is also indicated.

Recommendations.

From my findings I put forward the following recommendations for the general management of pulmonary tuberculosis complicated by pregnancy:-

- (1). Pregnant women constitute a special group of the population and as such justify a miniature radiograph of the chest as soon as pregnancy is diagnosed.
- (2). The diagnosis of pulmonary tuberculosis during pregnancy should ensure early admission to a sanatorium where the lung disease should be treated with full vigour.
- (3). Full consideration should be given to all the circumstances of the patient as there may be strong indications for interference with the pregnancy other than on purely medical grounds.
- (4). Facilities should be made available for the observation and delivery of pregnant tuberculous women in obstetric units set up in selected sanatoria so that the general condition of the patient can be built up if necessary, transference to a maternity hospital avoided and continuation of adequate care for the lung condition ensured after delivery.
- (5). Adequate domestic help should be provided for the families of such women throughout the period of their stay in sanat-

-orium and on their return home if necessary.

- (6). Facilities should be made available in the selected sanatoria for the care of the infants born there until their mothers are fit to return to their domestic duties.
- (7). Where it does not conflict with religious beliefs, married tuberculous women should be instructed in birth-control.

Summary.

I. Preface.

Pulmonary tuberculosis in married women of child-bearing age is not infrequently complicated by a pregnancy and the successful management of the combined condition is becoming an increasingly common problem.

An industrial area such as the West Riding of Yorkshire where the incidence of pulmonary tuberculosis is relatively high and where the birth-rate is also high provides material for the study of the effects of a complicating pregnancy on the lung disease. I therefore decided to carry out such an investigation in my clinic area which is situated mainly in the industrial West Riding and contains an increasing population of over 209,000.

It was hoped from this study to assess the effects of a complicating pregnancy and subsequent child-rearing and from the information obtained to put forward recommendations for the general management of the combined condition in women living in an industrial area.

All married women of child-bearing age who were notified in the clinic area as suffering from pulmonary tuberculosis

during the 10 year period January 1940 - January 1950 and whose tuberculous illness was complicated by a pregnancy within that period were studied. It was decided to observe the early effects of pregnancy at 1 month post-partum and to observe the late effects by following-up the cases as near to January 1950 as possible. Pregnancy was taken to include conception, gestation, parturition and early infant-rearing when the early effects were assessed and to include in addition the rearing of children and the running of a home when the late effects were assessed.

A control series was also studied in order to find a base line upon which to judge the long-term effects of pregnancy. The findings in both the pregnancy and the control series were compared with those of similar investigations carried out in other areas.

2. Review of the Literature.

Before proceeding to the investigation a review was made of the literature on the subject.

A great deal has been written about pulmonary tuberculosis complicated by pregnancy. As far back as the pre-Christian and early Christian eras, the writings of Hippocrates and Galen reveal that pregnancy was believed to have a beneficial effect on pulmonary tuberculosis. This belief was maintained until the 19th century when the influence of Louis, Ortega and DuBois brought about a complete reversal of medical opinion and the advocacy of termination of the pregnancy in every case.

Towards the end of the century, however, the work of Rist of Paris made the outlook more hopeful through his improvement of

the treatment of the lung condition by the introduction of collapse therapy.

From this time onwards, emphasis became placed more and more on the control of the tuberculosis and the avoidance of interference with the pregnancy.

The introduction of pneumoperitoneum by Banyai and the use of phrenic paralysis and thoracoplasty further improved the prognosis for the lung disease.

In the twenties of the present century Bridgman and Norwood demonstrated the ill effects on the lung disease that could arise from surgical interference with the pregnancy, especially after the 14th week. Many authors have since confirmed these results and shown the ineffectiveness of therapeutic abortion in influencing the lung disease for the better.

Experiments on laboratory animals such as those conducted by Skillen and Bogen and Steinbach and Klein brought into prominence the possible role of the pregnancy hormones on the combined condition. The protective effect of Oestrogens on the lung disease and the adverse effect of Chorionic Gonadotropin were demonstrated to be important factors. Of recent years the work of Lurie, Abramson and Turner have brought another series of hormones into the picture, namely, the hormones of the adrenal cortex and A.C.T.H. (adrenocorticotrophic hormone). The depressing effect of these hormones on the healing processes and on sensitivity to tuberculin have given a new aspect to the subject and opened up a wide field for investigation.

The general conclusion reached in the description

of recent investigations on pulmonary tuberculosis complicated by pregnancy is that pregnancy exerts little influence on the pulmonary disease. Most authors are of the opinion that the tuberculosis should be treated with full vigour and the pregnancy allowed to run its course. Some, however, still believe that the pregnancy should be interrupted in certain individual cases and especially where there is little or no hope of bringing the pulmonary disease under reasonable control.

From the review of the literature one gains the overall impression that after a great deal of controversy, muddled thinking and unwarranted conclusions from ill-planned investigations, the problem is at last being subjected to proper scientific study. Due allowance must, however, be made for the difficulty of the subject and a rule of thumb method for the management of the combined condition is not to be expected.

3. The Investigation.

In my clinic area I personally examined or studied the case records, radiographs, and laboratory findings of IOI tuberculous women who were notified during the period January 1940 to January 1950 and whose tuberculous illness was complicated by a pregnancy during that period. These IOI cases gave rise to 126 pregnancies.

Information was obtained on the date, age group of the patient and extent of the disease at notification with, in addition, notes on the type of treatment received before conception, state of the disease at conception, at one month post-partum and at the end of the observation period. The period of gestation,

type of delivery and general social conditions of the patients were also noted. The cases were divided into the age groups 17-24 years, 25-34 years and 35-45 years.

The reaction of the lung disease to the complicating pregnancy at one month post-partum and at the end of the observation period were studied in relation to age group, type and extent of disease, type of treatment, type of delivery, parity and social conditions.

The short term effects of pregnancy were assessed by comparing the state of the lung disease at conception with that at one month post-partum. The long-term effects were observed over periods varying from a few months to nine years post-partum and were assessed by comparing the state of the lung disease at January 1950 or as near to that date as possible with the state as assessed at the time of conception. The state of the pregnancy cases at or near January 1950 was also compared with the state of the lung disease in the control group at January 1950.

From the age distribution and extent of the lung disease at first diagnosis it was seen that married tuberculous women of the lowest age group (17-24) in whom the disease carried a good prognosis tended to embark on a pregnancy, whilst those falling into a higher age group and in whom the disease carried a bad prognosis tended to avoid pregnancy. The pregnancy cases thus became, on the whole, a self-selected group whose disease was such that it would have a good prognosis were it uncomplicated by pregnancy.

4. Controls.

An attempt was made to obtain a control series from

the married women of child-bearing age in the clinic area who were notified as suffering from pulmonary tuberculosis during the period January 1940- January 1950 but whose tuberculous illness was not associated with a pregnancy. A total of 167 control cases was obtained but this was found inadequate to compile a series that was statistically satisfactory. It became evident that a number at least two or three times greater would be required to obtain a "twin" for each pregnancy case that would be comparable in age-grouping, type and extent of disease, treatment received and in social conditions.

As mentioned above, it was noted that women falling into the higher age groups and who had a bad prognosis for their lung disease, tended to avoid pregnancy and so became relegated to the control group. The control group was thus biased in an opposite manner to the pregnancy group and could serve only as a rough and pessimistic guide to the outcome of pulmonary tuberculosis in married women of child-bearing age in this industrial area.

Apart from details relating to pregnancy, the same information was obtained for the control cases as for the pregnancy cases and the outcome of their disease studied in relation to the same factors.

5. Results in Pregnancy and Control Series.

Of the pregnancies 77% were undertaken below the age of 34 years with the greatest number in the age group 25-34 years. At conception 91% of the pregnancies were associated with only mild or moderately advanced disease and

more than half of the pregnancies, namely 59%, were commenced with the lung disease in a quiescent state.

By one month post-partum, that is approximately 10-12 months after the pre-conception assessment, 62% of the pregnancies were associated with quiescent lung disease, 36% with active disease and approximately 2% with death of the patient.

In 7 pregnancies the disease by one month post-partum had become reactivated whilst 10 pregnancies which were commenced with active lung disease were associated with quiescent disease at one month post-partum.

Of the pregnancies which resulted in a full-term delivery, 74% were associated with quiescent disease at one month post-partum whilst only 14% of those which were aborted therapeutically were associated with quiescent disease at one month post-partum.

38% of the pregnancy cases were followed-up post-partum for periods varying from a few months to 4 years whilst the bulk of the cases, 62%, were followed-up for periods varying from 5-9 years. At the end of this observation period it was found that 62% of the pregnancies were associated with quiescent lung disease, 19% with active disease and 19% with death of the patient.

Thus at one month post-partum and at the end of the observation period the same proportion, namely 62%, of the pregnancies were associated with quiescent lung disease. By the end of the observation period, however, 19% of the pregnancies were associated with death of the patient as compared with 2% at one month post-partum.

In the control group it was found that 71% had moderately or far advanced disease at the time of first diagnosis. By the end of the observation period only 30% of the group had their lung disease in a quiescent state, whilst 30% still had active disease and 40% were dead. The findings are summarised in the following table:-

| State of Lung Disease. | Pregnancies. | | | Control Cases. |
|------------------------|----------------|-------------------------|------------------------|------------------------|
| | At conception. | At 1 month post-partum. | At end of obs. period. | At end of obs. period. |
| Quiescent | 59% | 62% | 62% | 30% |
| Active | 41% | 36% | 19% | 30% |
| Dead | - | 2% | 19% | 40% |

6. Comparison with Other Investigations.

A similar investigation was carried out by Stewart and Simmonds of Clare Hall Sanatorium and the Middlesex Chest Clinics during the period 1944 - 1946. They compiled a series of 216 cases of pregnant tuberculous women from a central register noting all pregnancies amongst notified cases in their area. A control series of 259 cases was obtained from tuberculous women of child-bearing age whose tuberculous illness during the period under review was not complicated by a pregnancy. Their control series was subject to much the same discrepancies as my own.

Their pregnancy and control cases were observed over a period of 15 months which corresponded to the period of gestation plus 3-4 months post-partum. 72% of their cases commenced pregnancy with quiescent lung disease and 28% with

active lung disease. In my own series a higher proportion of the pregnancies, namely 41%, were commenced in the presence of active lung disease.

By 3-4 months post-partum 79% of the Middlesex cases had attained quiescence of their disease, 17% were still active and 4% were dead. At the end of the same observation period, their control series showed 63% with quiescent disease, 29% with active disease and a mortality of 8%.

The pregnancy cases, therefore, fared better than the control cases. My own pregnancy cases when observed over a similar period did not fare quite so well as the Middlesex pregnancy cases but fared better than the Middlesex control group.

In the Stewart and Simmonds series there were 56 cases on whom therapeutic abortion had been performed. These cases showed a mortality of 7% at the end of the observation period as compared with a mortality of under 3% for those who had a full-term delivery.

These authors concluded from their findings that pregnancy had little or no effect upon the pulmonary disease and that therapeutic abortion was unsuccessful in affecting the trend of the lung disease for the better.

Investigations carried out by American workers gave rise to similar findings. Marriette and his co-workers found a mortality of 19% in their pregnancy cases and 39% in their control cases after follow-up for 12 years. Seeley, Siddall and Balzer found a mortality of 19% in their pregnancy cases by one year post-partum and in all instances there was use of a control

group, the pregnancy cases fared better.

7. Conclusions.

From my findings I concluded that

- (a) pregnancy occurring in the course of pulmonary tuberculosis did not affect the lung condition for better or for worse in the majority of cases by one month post-partum;
- (b) when the lung disease was observed over periods varying from a few months to 9 years post-partum, pregnancy and subsequent child-rearing appeared to give rise to no worse an outcome than would be expected had the patient's illness not been complicated by a pregnancy;
- (c) therapeutic abortion appeared to be ineffective in altering the trend of the lung disease for the better;
- (d) the outcome of pulmonary tuberculosis complicated by a pregnancy was influenced by the same factors as the disease in women whose illness was not complicated by a pregnancy; these factors were;-

- (i) age of the patient and type and extent of disease at first diagnosis,

- (ii) availability and quality of sanatorium treatment,

- (iii) social and economic conditions.

- (e) the management of the combined condition centred on the control of the lung disease but in certain circumstances interference with the pregnancy would also be indicated.

8. Recommendations.

From my findings and the conclusions derived from

then I put forward the following recommendations for the management of pulmonary tuberculosis complicated by pregnancy in women in an industrial area.

- (a) In an industrial area where poor social conditions prevail arrangements should be made for the routine miniature radiography of the chest of each pregnant woman.
- (b) The diagnosis of pulmonary tuberculosis during a pregnancy should be followed by early admission of the patient to a selected sanatorium where the lung disease can be treated with full vigour.
- (c) Full consideration should be given to all the circumstances of the patient as there may be strong indications for interference with the pregnancy in the ultimate interest of the patient and her family.
- (d) Obstetrical units should be set up in these selected sanatoria for the observation and delivery of pregnant tuberculous women. Transference of tuberculous patients to the obstetric units of other hospitals should be avoided.
- (e) Adequate domestic help should be provided for the families of such women throughout their stay in sanatorium and on their return home if necessary.
- (f) Facilities should be available in the selected sanatoria for the care of the infants born there until they have been vaccinated with B.C.G. and until their mothers are fit to return to their domestic duties.
- (g) Facilities should be provided for the instruction of married tuberculous women in the methods of birth control.

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PULMONARY TUBERCULOSIS AND PREGNANCY.

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-

APPENDIX A.

Abbreviations.

The following are the abbreviations used in the case histories given in Appendix A and Appendix B.

RUZ. --- Right upper zone.

RMZ. --- Right middle zone.

RLZ. --- Right lower zone.

LUZ. --- Left upper zone.

" --- "

RU. lobe. - Right upper lobe.

RL. lobe. - Right lower lobe.

" - "

Exud. --- Exudative lesion.

Fib. --- Fibrotic or Productive lesion.

Ministry of Health classification of extent of pulmonary disease.

Group A --- Sputum negative for Tubercle Bacilli.

Group B --- Sputum positive for Tubercle Bacilli.

RA.1. --- Sputum negative and infiltration involving an area no greater than one zone.

RA.3. --- Sputum negative and infiltration involving an area greater than two zones or any extent of infiltration plus complication such as diabetes or laryngitis.

RA.2. ---- Sputum negative and extent of infiltration somewhere between RA.1. and RA.3.

RB.1. ---- Sputum positive etc.

Abbreviations (contd.)

Rt. AP. ----- Right artificial pneumothorax.

P.P. ----- Artificial pneumoperitoneum.

F.T. ----- Full-term delivery.

Prem. ----- Premature delivery.

Spont. ----- Spontaneous delivery.

Therap. abortion --- Therapeutic abortion.

APPENDIX B.

Case Histories - Pregnancy Series.

PREGNANCY CASES (PRITPARAJ)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | PARITY | STATE BEFORE PREGNANCY & DURATION | AGE AT DELIVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|-----------------|----------------------|-------------------------------------|--------------------|--------|-----------------------------------|-----------------|----------------------------|--------------------------------|--------------------------------|
| (1) | 9/42 (23) | Fib. (RB.2.) RUZ & LUZ. | Good | 10/42-4/43 | Bed-rest | Q'scent | 0 | Q'scent 16 mon. | 26 | F.T. (spont) 6/45 | Q'scent | 4½ years Q'scent |
| (3) | 10/42 (20) | Exud. (R.B.3.) RU. lobe | Fair | 10/42-11/43 | Rt. AP. 1½ yr. Rt. phrenic evulsion | Active | 0 | Q'scent 2 years | 25 | F.T. (spont) 7/47 | Q'scent | 3½ years Q'scent |
| (4) | 2/44 (18) | Exud. (R.B.1.) LUZ. | Fair | 10/47-2/48 | Bed-rest | Active | 0 | Active 5 years | 23 | F.T. (spont) 7/49 (P.P.H.) | Active | 5 months Active |
| (5) | 9/41 (18) | Fib. (RB.2.) LU. lobe | Very poor | 3/42-12/42 | Bed-rest | Active | 0 | Q'scent 6 years | 25 | F.T. (spont) 2/48 | Q'scent | 2 years Q'scent |
| (6) | 1/41 (31) | Fib. (RB.3.) RU. & LU. lobes (7 months preg.) | Fair | 6/41-9/41 | Bed-rest (After delivery) | Active | 0 | ?Active (some months) | 31 | F.T. (spont) 3/41 | Active | 8 years Active |
| (7) | 8/48 (22) | Exud. (RB.2) LUZ. (7 months preg.) | Fair | 2/49-12/49 | Lt. phrenic-crush 4/49 | Q'scent | 0 | ?Active (some months) | 22 | F.T. (spont) twins 10/48 | Active | 1 year Q'scent |
| (11) | 6/48 (22) | Exud. (RA.1.) RUZ. | Over-cw'd | 11/48-4/49 | Rt. AP. - 12/48 | Q'scent | 0 | Active 3 mon. | 23 | F.T. (spont) 3/49 | Q'scent | 9 months Q'scent |

PREGNANCY CASES (PRIMIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | PARITY | STATE BEFORE PREGNANCY & DURATION | AGE AT DELIVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|--|-----------------|---------------------------------|--------------------------------|--------------------|--------|-----------------------------------|-----------------|---|--------------------------------|--------------------------------|
| (13) | 2/41 (33) | Fib. (Ra. 2.) RUZ & LUZ. | Good | 4/41 - 9/41 | Bed-rest | Q'scent | 0 | Active 6 mon. | 37 | Therap. abortion at 10 wks. & Sterilised 4/45 | Active | 5 years Active |
| (14) | 2/43 (23) | Exud. (RB2) RUZ. | Pair | 9/43 - 4/44 | Rt. AP. 9/43 | Active | 0 | Active <i>1 1/2 years.</i> | 24 | Therap. abortion at 12 wks. 8/44 | Active | 5 years <i>Active</i> |
| (16) | 10/40 (21) | Exud. (RB. 3.) RU. & LU. lobe | Pair | 12/40 - 6/41 | Myo- crisis | Q'scent | 0 | Q'scent 2 years | 24 | F.T. (spont) 12/43 | Q'scent | 6 years Q'scent |
| (21) | 4/47 (21) | Exud. (RA. 2.) RUZ & LUZ. (2 mon. preg.) | Over- cw'd | 8/47 - 3/48 | Bed- rest | Q'scent | 0 | Active 3 mon. | 21 | F.T. (spont) 12/47 | Q'scent | 2 years Active |
| (24) | 1/45 (18) | Exud. (RA. 1.) RUZ | Over- cw'd | Refused San. | Dom- iliary bed- rest | - | 0 | Q'scent <i>3 1/2 years.</i> | 21 | F.T. (spont) 11/48 | Q'scent | 5 years Q'scent |
| (28) | 4/47 (21) | Exud. (RA. 2.) RUZ & LUZ. (2 mon. preg.) | Over- cw'd | 8/47 3/48 4/48 - 10/48 | Bed- rest Bed- rest | Q'scent Q'scent | 0 | Active 2 mon. | 21 | F.T. (spont) | Q'scent | 2 years Q'scent |

PREGNANCY CASES (PRIMITIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|------------------|--------------------------------|-------------------------------|--------------------|------------------|------------------------------------|--------------------------------|--------------------------------|
| (29) | 6/43 (25) | Fib. (RA.2) RUZ. & LUZ. | Good | 2/44-7/44 | Bed-rest | Q' scent | 27 | F.T. (spont) 6/45 | Q' scent | 4½ yrs Q' scent |
| (32) | 7/43 (26) | Fib. (RA.2) RUZ. | Fair | Refused | Domini-ciliary bed-rest | - | 28 | F.T. (spont) 1/46 | Q' scent | 4 yrs. Q' scent |
| (34) | 3/41 (28) | Exud. (RA.1) ILZ. | Good | 3/41- 9/41 | Bed-rest | Q' scent | 30 | F.T. (spont) 3/43 | Q' scent | 8 yrs. Q' scent |
| (35) | 10/40 (22) | Exud. (RA.1) ILZ. | Over-cw'd | 11/40- 5/41 | Bed-rest | Q' scent | 25 | F.T. (spont) 5/43 | Q' scent | 6½ yrs. Q' scent |
| (36) | 5/40 (25) | Fib. (RA.1) Rt. apex. | Very poor | Refused | Domini-ciliary bed-rest | - | 27 | F.T. (spont) 11/42 | Q' scent | 2 yrs. Q' scent |
| (39) | 8/41 (20) | Exud. (RB.2) RUZ. & ILZ. (2 mon. preg) | Good | Refused | Domini-ciliary bed-rest | - | 21 | Prem. (7 mon) 2/42 | Active | 2½ yrs. Died |
| (43) | 4/45 (29) | Exud. (RB.3) RU. & LU. lobe (6 mon. preg) | Very poor | 5/45- 6/45 | Bed-rest | Dead | 29 | Prem. (7½ mon) 6/45 | Died 1 week post partum | 1 wk. Died |
| (44) | 3/42 (18) | Fib. (RB.2) LU. lobe & RMZ. | Fair | 8/42- 5/43 9/43- 4/44 | Lft. AP. (failed) Bed-rest | Active Active | 0 21 | Spont. abortion 4 mon. 10/44 | Active | 4 mon. Died. |

PREGNANCY CASES (PRIMIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SAMATORIUM | TREATMENT IN SAMATORIUM | STATE ON DISCHARGE | PERIOD IN BED | STATE BEFORE PREGNANCY & DURATION | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|------------------|-----------------------------|---|--------------------|---------------|-----------------------------------|------------------|---------------------------------|--------------------------------|--------------------------------|
| (45) | 3/43 (24) | Fib. (RB.2.) RU. & LU. lobe (8 mon. preg.) | Very poor | Refused | Dom. bed-rest | - | 0 | Active (? some months) | 24 | F.T. (spont) 5/43 | Active | 3 years Died |
| (46) | 9/43 (20) | Fib. (RB.3.) RU. & LU. lobe | Very poor | 3/44-8/44 4/46-Died 5/46 | Bed-rest Bed-rest | Active Dead | 0 | Active 2 years | 23 | Prem. (8 mon) 4/46 | Died 3 post-partum | 3 wks. Died |
| (47) | 6/43 (34) | Fib. (RB.1) RU. (2 mon. preg.) | Fair | Refused | Dom-iciliary bed-rest | - | 0 | Active ? 3 mon. | 34 | Spont. abortion (5 mon.) 9/43 | Active | 3 years Died |
| (49) | 1/40 (23) | Exud. (RB.2) RU. | Fair | 1/40-6/40 4/41-11/41 | Rt.AP. 1/40 Rt.AP. still present | Active Active | 0 | Active 2½ years | 25 | Prem. (induced at 36 wks.) 9/42 | Active | 5 years Died |
| (50) | 4/44 (21) | Exud. (RB.2.) RUZ & LUZ. | Very poor | 7/44-6/45 | Lt.AP. (failed) 4/44 2 stage lft th' plasty 3/45 | Active | 0 | Active 3 years. | 24 | Therap. abortion (14 wks) 7/47 | Active | 2 years Died. |
| | | | | 6/49-Died 7/49 | Bed- | Dead | | | | | | |

PREGNANCY CASES (PRIMI-PARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | LENGTH OF TIME | STATE BEFORE PREGNANCY & DURATION | AGE AT DELIVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|-----------------|---------------------------------------|------------------------------|--------------------|----------------|-----------------------------------|-----------------|---------------------------|--------------------------------|--------------------------------|
| (54) | 12/44 (18) | Exud. (RB.2.) RU.1lobe | Fair | 4/45- 12/45 | Rt. AP. 6/45 | Active | 0 | Q' scent 2 years | 23 | F.T. (spont) 5/49 | Q' scent | 7 months Q' scent |
| (57) | 5/41 (18) | Exud. (RA.1) RUZ. | Fair | Refused | Domi- ciliary bed-rest | - | 0 | Q' scent 6 mon. | 19 | Prem (8 mon.) 10/46 | Q' scent | 3 years Q' scent |
| (62) | 11/48 (20) | Exud. (RA.1) RLZ. | Fair | Not recommen- ded | Domi- ciliary bed-rest | - | 0 | Q' scent 6 mon. | 21 | F.T. (spont) 10/49 | Q' scent | 2 mon. Q' scent |
| (64) | 8/44 (20) | Fib. (RA.1.) LUZ. | Over- cw'd | Refused | Domi- ciliary bed-rest | - | 0 | Q' scent 3 years | 25 | F.T. (spont) 7/49 | Q' scent | 6 mon. Q' scent |
| (69) | 3/41 (19) | Exud. (RA.1.) RLZ. | Fair | Not recommen- ded | Domi- ciliary bed-rest | - | 0 | Q' scent 3 years | 23 | F.T. (spont) 12/45 | Q' scent | 4 years Q' scent |
| (70) | 2/40 (24) | Exud. (RA.1.) RLZ. | Good | 3/40 - 7/40 | Bed-rest | Q' scent | 0 | Q' scent 4 years | 28 | F.T. (spont) 6/44 | Q' scent | 5½ years Q' scent |
| (72) | 10/40 (18) | Exud. (RA.1.) LUZ. | Fair | 10/40- 3/41 | Bed-rest | Q' scent | 0 | Q' scent 3 years | 23 | F.T. (spont) 4/45 | Q' scent | 4½ years Q' scent |
| (73) | 4/41 (31) | Exud. (RA.1)RLZ (6 mon. preg.) | Fair | 4/41- 6/41 (Own dis- charge) | Bed-rest | Active | 0 | ? Healthy | 31 | F.T. (spont) 7/41 | Q' scent | 8½ years Q' scent |

PREGNANCY CASES (PRIMITIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | TIME ELAPSED | STATE BEFORE PREGNANCY & DURATION | AGE AT DELIVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|-----------------|----------------------|----------------------------|--------------------|--------------|-------------------------------------|-----------------|-------------------------|--------------------------------|--------------------------------|
| (74) | 8/40 (19) | Exud. (RB.3) RUZ. & LMZ. | Over-cw'd | 9/40-4/42 | Myocrisis & bed-rest | Active | 0 | Active 3 years | 23 | F.T. (spont) 4/44 | Active | 2 years Active |
| (75) | 7/45 (19) | Exud. (RB.3) RUZ. & LU. jobs (7 mon. preg.) | Fair | Refused | Domiliary bed-rest | - | 0 | ? Active (some months) | 19 | F.T. (spont) 9/45 | Active | 2 months Died |
| (78) | 5/45 (27) | Exud. (RB.2) RU. & LU. lobes | Over-cw'd | 5/47-12/47 | Bed-rest | Active | 0 | Active 1 year | 28 | Prem (37 wks) 9/46 | Active | 2 years Died |
| (80) | 6/46 (22) | Exud. (RB.2) RU. lobe & LUZ. (8 mon. preg.) | Fair | 7/46-9/46 (Died) | Bed-rest | Dead | 0 | Active (at about 3rd mon. of preg.) | 22 | F.T. (spont) 7/46 | Active | 2 months Died |
| (99) | 5/47 (22) | Exud. (RB.2) RU. lobe & LUZ. | Fair | 12/47-11/48 | Rt. & Lft. AP. 3/48 & 4/48 | Q'scent | 0 | Q'scent 1½ years | 26 | F.T. (spont) 9/50 | Q'scent | 3 mon. Q'scent |
| (83) | 6/40 (22) | Exud. (RA.2) RUZ. & LUZ. | Very poor | 7/40-10/40 | Bed-rest | Q'scent | 0 | Q'scent 2½ years | 25 | F.T. (spont) 12/43 | Q'scent | 6 years Q'scent |
| (84) | 4/42 (25) | Fib. (RB.1) LU. jobs | Good | 4/42-10/42 | Lft. AP. 11/42 | Active | 0 | Active 1 year | 26 | F.T. (spont) 12/43 | Active | 3¼ years Active |
| | | | | 2/46-1/47 | Lft. phrenic crush 9/46 | Active | | | | | | |

PREGNANCY CASES (PRIMITIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | AGE AT DEATH | STATE BEFORE PREGNANCY & DURATION | AGE AT DELIVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|-----------------|----------------------|-------------------------------|--------------------|--------------|-----------------------------------|-----------------|---------------------------------|--------------------------------|--------------------------------|
| (88) | 6/40 (20) | Exud. (RA.1) ILZ. | Over-cw'd | Not recommended | Domiciliary Bed-rest | - | 23 | Q' scent 2 years | 23 | F.T. (spont) 5/43 | Q' scent | 6½ years Q' scent |
| (89) | 11/47 (21) | Exud. (RA.1) IUZ. | Good | Refused | Domiciliary bed-rest | - | 21 | Healthy ? | 21 | F.T. (spont) 7/48 | Q' scent | 1½ years Q' scent |
| (90) | 6/40 (35) | Fib. (RB.2) RU. lobe | Fair | 2/42-4/42 | Bed-rest | Active | 37 | Active 1¼ years | 37 | F.T. (spont) 7/42 | Active | 5½ years Died |
| (94) | 1/45 (20) | Exud. (RB.1) ILZ. | Fair | 7/45-11/45 | Bed-rest | Q' scent | 24 | Q' scent 3½ years | 24 | F.T. (spont) 12/49 | Q' scent | 1 mon. Q' scent |
| (96) | 1/40 (20) | Exud. (RA.1) RMZ. | Good | 1/40-4/40 | Bed-rest | Q' scent | 25 | Q' scent 5 years | 25 | F.T. (spont) 5/46 | Q' scent | 3½ years Q' scent |
| (42) | 3/48 (19) | Exud. (RB.1) RLZ. | Good | 8/48 - 3/49 | Rt. phrenic crush & P.P. 9/48 | Q' scent | 21 | Q' scent 6 mon. | 21 | Therap. abortion (12 wks) 12/49 | Q' scent | 1 years Q' scent |
| (98) | 5/48 (20) | Exud. (RB.2) RUZ. & IUZ. | Very poor | 3/49 - 11/49 | Rt. & Lt. AP. 4/49 & 5/49 | Q' scent | 22 | Q' scent 5 mon. | 22 | F.T. (spont) 10/50 | Q' scent | 1 mon. Q' scent |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|------------------|-----------------------------------|---|--------------------|------------------|--------------------------------------|--------------------------------|--------------------------------|
| | | | | | | | | | | |
| (81) | 4/40 (30) | Exud. (RA.1) ILZ. | Fair | Not recom-mended | Domi-ciliary bed-rest | - | 32 | Spont. abortion (16 wks) 4/42 | Q' scent | 7 years Q' scent |
| | | | | | | | 3 | Q' scent 1½ years | 4 | Q' scent 2 years |
| (82) | 5/40 (23) | Exud. (RA.1) RUZ. | Fair | Refused | Domi-ciliary bed-rest | - | 28 | F.T. (spont) 1/45 | Q' scent | 5 years Q' scent |
| (85) | 8/46 (36) | Fib. (RB.2) Rt. upper lobe & Lt. apex | Fair | 2/47- 8/47 | Bed-rest | Active | 38 | Therap. abortion (12 wks) 9/48 | Active | 1½ years Q' scent |
| | | | | | | | 3 | Active 2 years | 3 | Q' scent 6 mon. |
| (86) | 6/46 (29) | Fib. (RB.1) RLZ. | Fair | 11/46- 3/47 | Bed-rest | Q' scent | 31 | F.T. (spont) 7/48 | Q' scent | 1½ years Q' scent |
| (87) | 7/46 (31) | Exud. (RB.2) RU. lobe | Good | 6/47- 12/47 | 2-stage rt. thor' plasty 11 & 12/47 | Active | 33 | Prem. (33 wks) 1/49 | Active | 1 year Active |
| | | | | | | | 2 | Active 2 years | 3 | Q' scent 3 years |
| (91) | 5/45 (32) | Exud. (RA.1) ILZ. | Fair | 5/45- 6/45 (own dis-charge) | Bed-rest | Active | 36 | F.T. (spont) 11/49 | Q' scent | 1 mon. Q' scent |

PREGNANCY CASES

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | ALITRY | STATE BEFORE PREGNANCY & DURATION | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|------------------|---------------------------|------------------------------|--------------------|--------|-----------------------------------|------------------|---|--------------------------------|--------------------------------|
| | | | | | | | | | | | | |
| (92) | 5/41 (32) | Fib. (RA.2) RU.1lobe | Over-cw'd | 1/50- still in San. | Bed-rest | - | 3 | Active 1 year | 34 | F.T. (spont) 1/45 | Active | 7 mon. Active |
| | | | | | | | 4 | Active 3 years | 36 | Prem. (37 wks) 3/45 | Active | |
| (93) | 1/40 (30) | Fib. (RB.2) RU.1lobe | Fair | 1/41- Died 2/42 | Bed-rest | Dead | 2 | Active 4 mon. | 30 | Therap. abortion (10 wks) 8/40 | Active | 1 year Died |
| | | | | | | | 5 | Q'scent 2 years | 40 | F.T. (spont) 5/49 | Active | |
| (100) | 3/46 (23) | Exud. (RB.2) RUZ. & LUZ. | Very poor | 9/46- 8/47 | Bed-rest | Active | 2 | Q'scent 6 mon. | 26 | F.T. (spont.) 6/49 | Q'scent | 1½ years Q'scent |
| (95) | 3/41 (31) | Exud. (RA.1) LUZ. | Fair | Not recommended | Domi- ciliary bed-rest | - | 2 | Q'scent 7 mon. | 33 | F.T. (spont.) 10/42 | Q'scent | 7 years Q'scent |
| (97) | 11/43 (23) | Exud. (RB.1) RUZ. & LUZ. | Fair | 11/43- 2/44 | Bed-rest | Q'scent | 2 | Q'scent 2½ years | 27 | F.T. (spont) 5/47 | Q'scent | 1 year Q'scent |
| | | | | | | | 3 | Q'scent 4 years | 29 | F.T. (spont) 2/49 | Q'scent | |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CONDITIONS | PERIOD IN SAMATORIUM | TREATMENT IN SAMATORIUM | STATE ON DISCHARGE | NO. OF PARI | STATE BEFORE PREGNANCY & DURATION | AGE AT DELIVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|-----------------|-------------------------------------|-------------------------|--------------------|-------------|-----------------------------------|-----------------|-------------------------|--------------------------------|--------------------------------|
| (101) | 3/49 (28) | Fib. (RB.2.) Ruz. & LMZ. | Very poor | Refused | Domiciliary bed-rest | - | 4 | Active 1 year | 30 | F.T. (spont) 12/50 | Active | 1 mon. Active |
| (19) | 3/46 (36) | Exud. (RA.2) RLZ. (6 mon. preg.) | Over-cw'd | Refused | Domiciliary bed-rest | - | 4 | Healthy | 36 | F.T. (spont) 6/46 | Q'scent | 3½ years Q'scent |
| (20) | 12/46 (23) | Exud. (RA.1) LMZ. | Very poor | 12/48 - (own discharge in few days) | Domiciliary bed-rest | - | 2 | Q'scent 5 mon. | 24 | F.T. (spont) 1/48 | Active | 2 years. Active |
| (12) | 4/40 (24) | Exud. (R.A.2) LU. lobe | Very poor | 6/49 - 7/49 | Bed-rest | Active | 2 | Active 2 months | 25 | F.T. (spont) 2/41 | Q'scent | 6 years Q'scent |
| | | | | | | | 3 | Q'scent 1½ years | 26 | F.T. (spont) 11/42 | Q'scent | |
| | | | | | | | 4 | Q'scent 2½ years | 27 | F.T. (spont) 8/43 | Q'scent | |
| (22) | 11/43 (35) | Exud. (R.A.1) ILZ. | Fair | 5/44 - 8/44 | Bed-rest | Q'scent | 3 | Q'scent 2 mon. | 37 | F.T. (spont) 2/45 | Q'scent | 5 years Q'scent |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|------------------|----------------------|-------------------------|--------------------|------------------|-------------------------|--------------------------------|--------------------------------|
| (23) | 1/40 (19) | Fib. (RA.1) LMZ. | Over-cw'd | 6/40-9/40 | Bed-rest | Q'scent | 21 | F.T. (spont) 12/42 | Q'scent | 3 years Q'scent |
| (25) | 10/40 (27) | Fib. (RA.1) RU.1obe | Fair | 10/40-4/41 | Bed-rest | Q'scent | 35 | Prem (32 wks) 2/48 | Q'scent | 2 years Q'scent. |
| | | | | 9/42-4/43 | Rt. AP. 10/42 | Active | 2 years | | | |
| (26) | 9/42 (28) | Fib. (RA.1) RUZ. | Very poor | Not recommen-ded | Dami-ciliary bed-rest | - | 29 | F.T. (spont) 9/43 | Q'scent | 3 years Q'scent. |
| (2) | 6/49 (24) | Exud. (RB.3) RU. & IU.1obe (7 mon. preg.) | Fair | 9/49-10/49 | Bed-rest | Active | 24 | F.T. (spont) 8/49 | Active | 4 months Active |
| | | | | (own discharge) | | | 2 | Active (? few months) | 31 | Q'scent 2½ years |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | Age at birth | STATE BEFORE PREGNANCY & DURATION | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|------------------|---------------------------------------|-------------------------|--------------------|--------------|-----------------------------------|------------------|---|--------------------------------|--------------------------------|
| | | | | | | | | | | | | |
| (8) | 2/40 (30) | Fib. (RB.2) RUZ. & LUZ. | Over-cw'd | 5/39- 9/39 | Bed-rest | Q'scent | 5 | Active 3 mon. | 30 | F.T. (spont) 2/41 | Active | 4 years Active |
| | | | | | | | 6 | Active 11 mon. | 31 | Spont. abortion (10 wk) 11/41 | Active | |
| | | | | | | | 7 | Active 3 1/2 years | 35 | Prem. (32 wks) 3/45 | Active | |
| (9) | 3/40 (38) | Fib. (RB.2) RUZ. | Over-cw'd | 5/40 - (own discharge in few days) | Domi-ciliary bed-rest | - | 7 | Active 6 mon. | 39 | F.T. (spont) 6/41 | Active | 8 1/2 years Active |
| | | | | | | | 8 | Active 4 years | 35 | Therap. abortion (12 wks) & sterilised 12/45 | Active | |
| (10) | 2/40 (33) | Fib. (RB.1) LU. lobe | Over-cw'd | 6/36 - 12/36 | Lft. AP. 7/36 | Q'scent | 3 | Q'scent 3 1/2 years | 34 | F.T. (spont) twins 1/41 | Q'scent | 9 years Q'scent |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | AGE AT DELIVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|-----------------|----------------------------|-------------------------|--------------------|-----------------|-------------------------|--------------------------------|--------------------------------|
| (15) | 3/40 (38) | Fib. (RB.2) RU. lobe | Fair | 1/38-10/38 | Rt. AP. (failed) | Active | 39 | F. T. (spont) 3/41 | Active | 9 years Q' scent |
| (17) | 2/41 (25) | Exud. (RB.1) RUZ. & ITZ. | Fair | 12/41-1/42 (own discharge) | Domi-ciliary bed-rest | - | 29 | Prem. (32 wks) 1/45 | Active | 5 years Active |
| (18) | 6/44 (34) | Fib. (RA.1) RUZ. (5 mon. preg.) | Fair | Refused | Domi-ciliary bed-rest | - | 34 | F. T. (spont) 11/44 | Active | 5 years Q' scent |
| (27) | 2/45 (26) | Fib. (RA.1) LUZ | Over-cw' d | Refused | Domi-ciliary bed-rest | - | 28 | F. T. (spont) 7/47 | Q' scent | 2½ years Q' scent |
| (30) | 6/44 (32) | Exud. (RA.1) ITZ. | Over-cw' d | Not recommended | Domi-ciliary bed-rest | - | 34 | F. T. (spont) 2/46 | Q' scent | 2½ years Q' scent |
| (31) | 3/42 (33) | Fib. (RA.1) RUZ. | Over-cw' d | Refused | Domi-ciliary bed-rest | - | 36 | F. T. (spont) 5/45 | Q' scent | 4½ years Q' scent |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CONDITIONS | PERIOD IN SAMATORIUM | TREATMENT IN SAMATORIUM | STATE ON DISCHARGE | PARITY | STATE BEFORE PREGNANCY & DURATION | AGE AT DELIVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|-----------------|------------------------------|-------------------------|--------------------|--------|-----------------------------------|-----------------|-------------------------|--------------------------------|--------------------------------|
| (33) | 3/43 (18) | Exud. (RA.2) RMZ. | Very poor | Refused | Domiciliary bed-rest | - | 2 | Q'scent 2 years | 21 | F.T. (spont) 6/46 | Q'scent | 2 years Q'scent |
| (37) | 9/40 (35) | Fib. (RB.2) RU.lobe | Over-cw'd | 11/40-2/41 | Bed-rest | Q'scent | 3 | Q'scent 3 years | 22 | F.T. (spont) 9/47 | Q'scent | 1½ years Died |
| | | | | | | | 6 | Q'scent 6 mon. | 37 | F.T. (spont) 6/42 | Active | |
| (38) | 4/43 (28) | Exud. (RB.2) RUZ. & LUZ. (7 mon. preg) | Over-cw'd | Refused at first 10/43-11/43 | Bed-rest | Dead | 3 | Active ? onset during pregnancy | 28 | Prem. (32 wks) 5/43 | Active | 7 mon. Died |
| | | | | | | | 2 | Q'scent 6 mon. | 39 | F.T. (spont) 5/42 | Q'scent | 2 years Q'scent |
| (40) | 1/40 (37) | Fib. (RB.2.) RU.lobe | Very poor | 1/40-2/41 | Rt.AP. 1/40 | Q'scent | 2 | Q'scent 6 mon. | 39 | F.T. (spont) 5/42 | Q'scent | 2 years Q'scent |
| (41) | 5/42 (35) | Fib. (RB.2) RUZ. & LUZ. | Very poor | 5/42-2/43 | Bed-rest | Active | 3 | Q'scent 6 years | 44 | Prem. (36 wks) 2/48 | Q'scent | 2 mon. Died |
| | | | | | | | 8 | Active 1 year | 36 | Prem. (36 wks) 11/43 | Active | |
| (48) | 1/47 (29) | Exud. (RB.3) RUZ. & LU.lobe (5 mon. preg.) | Good | 3/47-Died 7/47 | Bed-rest | Dead | 2 | Active ? few months | 29 | Prem. (37 wks) 4/47 | Active | 3 mon. Died |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SAMATORIUM | TREATMENT IN SAMATORIUM | STATE ON DISCHARGE | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|------------------|----------------------|--------------------------------|--------------------|-------------------|------------------------------|--------------------------------|--------------------------------|
| (51) | 5/43 (18) | Exud. (RB.3) RU. & LU. lobe | Very poor | 8/43-5/44 | Bed-rest | Active | 21 | F.T. (spont) 5/46 | Q'scent | 1 1/2 years Active |
| (52) | 7/44 (26) | Exud. (RB.1) RMZ. & RLZ. | Very poor | 11/46 - 7/47 | Lt. phrenic crush 4/47 | Q'scent | 27 | Spont abortion (5 mon.) 9/45 | Active | 1 mon. Q'scent |
| | | | | 3 | Q'scent 2 years | 23 | F.T. (spont) 5/48 | Active | | |
| (53) | 11/40 (30) | Fib. (RA.1) RUZ. (1 mon. preg) | Very poor | 11/40-4/41 | Bed-rest | Q'scent | 31 | Prem. (28 wks) 12/49 | Q'scent | 8 years Active |
| | | | | 10/47-4/48 | Bed-rest | Q'scent | 31 | F.T. (spont) 7/41 | Q'scent | |
| (55) | 10/44 (25) | Exud. (RB.2) RUZ. & LMZ. | Very poor | 10/45-2/47 | Rt. 7-rib th' plasty 2/46-3/46 | Q'scent | 29 | Spont. abortion (8 wks) 8/48 | Q'scent | 1 year Q'scent |
| | | | | 2 | Q'scent 4 mon. | 29 | Sterilised 9/48 | Q'scent | | |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | PARITY | STATE BEFORE PREGNANCY & DURATION | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE | | |
|-------------|----------------------|---|------------------|----------------------|--------------------------|--------------------|----------------|-----------------------------------|------------------|----------------------------|--------------------------------|--------------------------------|---------------------------|----------|
| (56) | 10/41 (24) | Exud. (RB.2) LU. lobe | Over-cw'd | 2/42- 9/42 | Lt. AP. 3/42 | Q' scent | 2 | Q' scent 3½ years | 29 | Prem. (32 wks) 11/46 | Q' scent | 1½ years Q' scent | | |
| (58) | 10/43 (38) | Exud. (RA.1) LLZ. | Fair | Refused | Domi-ciliary bed-rest | - | 3 | Q' scent 5 years | 42 | F. T. (spont) 6/48 | Q' scent | 3 years Q' scent | | |
| | | | | | | | 7/46- 11/46 | Bed-rest | | | | | Q' scent | |
| (60) | 5/48 (28) | Exud. (RA.1) RUZ. | Over-cw'd | 9/48- 11/48 | Bed-rest | Q' scent | 3 | Active 2 mon. | 28 | F. T. (spont) 3/49 | Q' scent | 9 mon. Q' scent | | |
| (61) | 9/48 (22) | Exud. (RA.1) RUZ. | Fair | 11/48- 3/49 | Bed-rest | Q' scent | 2 | Q' scent 4 mon. | 23 | F. T. (spont) 9/49 | Q' scent | 3 mon. Q' scent | | |
| (63) | 4/42 (30) | Exud. (RA.1) RLZ. | Over-cw'd | Refused | Domi-ciliary Bed-rest | - | 9 | Q' scent 6 mon. | 31 | F. T. (spont) 9/43 | Q' scent | 1½ years Q' scent | | |
| | | | | | | | 10 | Q' scent 3½ years | | | | | Prem. (32 wks) 9/46 | Q' scent |
| | | | | | | | 11 | Q' scent 5 years | | | | | | |

PREGNANCY CASES (MULTIPARAE)

| NO. OF CASE | DATE OF NOTIF. & AGE | TYPE AND EXTENT OF DISEASE AT NOTIFICATION. | HOME CON-DITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | PERIOD | STATE BEFORE PREGNANCY & DURATION | AGE AT DEL-IVERY | TYPE OF DELIVERY & DATE | STATE ONE MONTH AFTER DELIVERY | FOLLOW-UP PERIOD & FINAL STAGE |
|-------------|----------------------|---|------------------|----------------------|-------------------------|--------------------|--------|-----------------------------------|------------------|-------------------------------------|--------------------------------|--------------------------------|
| (65) | 6/44 (26) | Exud. (RA.1) Luz. | Very poor | Refused | Domi-ciliary bed-rest | - | 2 | Q'scent 1 year | 29 | F.T. (spont) 3/47 | Q'scent | 2½ years active |
| (66) | 8/43 (28) | Exud. (RA.2) RLZ. | Very poor | Refused | Domi-ciliary bed-rest | - | 2 | Q'scent 2 years | 31 | Prem. (32 wks) 3/47 | Q'scent | 1½ years Q'scent |
| | | | | | | | 3 | Q'scent 3 years | 32 | F.T. (spont) 3/48 | Q'scent | |
| (67) | 11/44 (22) | Exud. (RA.1) LIZ. (3 mon. preg.) | Very poor | Not recom-mended | Domi-ciliary bed-rest | - | 2 | ? Healthy | 22 | F.T. (spont) 4/45 | Q'scent | 3 years Q'scent |
| | | | | | | | 3 | Q'scent 1 year | 24 | F.T. (spont) 2/47 | Q'scent | |
| (68) | 1/41 (32) | Fib. (RA.1) IMZ. | Fair | Refused | Domi-ciliary bed-rest | - | 2 | Active 1 mon. | 32 | Spont. abortion (6½ mon) 8/41 | Active | 1 year Active. |
| | | | | | | | 3 | Active 4½ years | 38 | Spont. abortion (5 mon.) 3/47 | Active | |
| | | | | | | | 4 | Active 6 years | 39 | F.T. (spont) 8/48 | Active | |

APPENDIX C.

Case Histories - Control Series.

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|---|-----------------|-----------------------|---|--------------------|-----------------|----------------------------------|
| (1) | 1/45 | 19 | Exud. (RB.2) R.U. & L.U. Lobe | Good | 6/45-11/45 | Bed-rest | Active | 0 | 4 years - Died |
| (2) | 6/44 | 22 | Exud. (RB.3) R.U.Z. & L.U. Lobe | Fair | Refused | Domiciliary bed-rest | - | 0 | 3½ yrs - Died |
| (3) | 8/44 | 36 | Fib. (RB.2) R.U.Z. & left apex | Fair | 10/44-5/45 | Bed-rest | Active | 0 | 5 yrs. - Active |
| (4) | 11/43 | 17 | Exud. (RB.2) R.U.Z. & R.M.Z. | Over-cw'd | 11/43-8/44 | Rt. AP. (2 years) Rt. Phrenic evulsion | Active | 0 | 6 yrs. - Active |
| (5) | 8/44 | 24 | Exud. (RB.3) L.U. Lobe & R.M.Z. | Over-cw'd | 11/46-4/47 | Bed-rest | Active | 0 | 5 yrs. - Active |
| (6) | 8/40 | 41 | Fib. (RA.1) R.U.Z. | Fair | Refused | Domiciliary Bed-rest | - | 0 | 9 yrs. - Q'scent |
| (7) | 9/42 | 39 | Fib. (RA.1) R.U.Z. & L.U.Z. | Fair | Refused | Domiciliary Bed-rest | - | 0 | 7 yrs. - Q'scent |
| (8) | 9/43 | 20 | Exud. (RA.2) L.L.Z. | Good | 1/44-4/44 | Bed-rest | Q'scent | 0 | 6 yrs. - Q'scent |
| (9) | 8/43 | 34 | Exud. (RB.3) R.U. Lobe, L.U. Lobe | Over-cw'd | 1/44- 1/44 Died | Bed-rest | Dead | 0 | 5 mon. - Died |
| (10) | 8/41 | 17 | Exud. (RB.1) L.U.Z. & L.L.Z. | Over-cw'd | 3/44-8/44 | Bed-rest | Active | 0 | 8 yrs. - Died |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|---|-----------------|-------------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (11) | 7/46 | 22 | Exud. (RA.1) L.L.Z. | Poor | 5/47-1/48 Died | Bed-rest | Dead | 0 | 1½ years - Died |
| (12) | 8/44 | 34 | Exud. (RA.2) R.L.Z. | Good | Refused | Domiciliary Bed-rest | - | 0 | 3 yrs. - Died |
| (13) | 3/46 | 22 | Exud. (RB.2) R.U.Z. - L.U. lobe | Over- cw'd | 10/46-Died 4/47 | Bed-rest | Dead | 0 | 1 yr. - Died |
| (14) | 3/46 | 26 | Fib. (RB.1) L.U.Z. | Over- cw'd | 8/46-1/47 | Left phrenic crush | Active | 0 | 2 yrs. - Died |
| (15) | 5/47 | 24 | Exud. (RB.2) R.U.Z. & L.U.Z. | Fair | 5/47-10/47 | Bed-rest | Active | 0 | 2½ yrs. - Active |
| | | | | | 3/49 - still in San. | Bed-rest | - | | |
| (16) | 9/42 | 22 | Exud. (RA.2) L.U.Z. & L.L.Z. | Over- cw'd | 3/43-7/43 | Bed-rest | Q'scent | 0 | 7 yrs. - Q'scent |
| (17) | 8/47 | 26 | Fib. (RB.2) L.U.Z. | Poor | 9/47-3/48 | If't. AP.10/47 | Active | 0 | 8 mon. - Active |
| (18) | 2/44 | 27 | Exud. (RB.3) R.U.Z. & all left lung | Fair | 10/44-5/45 | Bed-rest | Active | 0 | 3 yrs. - Died |
| (19) | 3/43 | 18 | Exud. (RB.3) R.U. lobe & L.U. lobe | Poor | Not recommended | - | - | 0 | 5 mon. - Died |
| (20) | 3/41 | 41 | Exud. (RB.2) R.U. lobe & L.U.Z. | Good | Refused | Domiciliary bed-rest | - | 0 | 6 mon. - Died |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|---|-----------------|---------------------------------------|--|--------------------|-----------------|----------------------------------|
| (21) | 6/46 | 26 | Exud. (RB.3) Acute miliary caviatation | Fair | 7/46-Died 7/46 | - | Dead | 0 | 1 mon. - Died |
| (22) | 9/43 | 28 | Fib. (RB.2) R.U.lobe & LUZ. | Fair | 11/43-4/44 | Bed-rest | Active | 0 | 4 yrs. - Died |
| (23) | 12/44 | 19 | Exud. (RB.2) L.U.lobe | Fair | 12/44-Died 10/47 | Ift. AP.5/45 Pyo-pneumo- thorax. | Dead | 0 | 3 yrs. - Died |
| (24) | 11/44 | 20 | Exud. (RB.3) R.U.lobe & L.U.lobe | Fair | 12/44-own discharge in few days | Domiciliary bed-rest | - | 0 | 2½ yrs. - Died |
| (25) | 11/44 | 23 | Exud. (RB.3) R.U.lobe & L.U.Z. | Good | 5/45-5/46 10/46-12/47 | Rt. A.P.-5/45 Rt. Phrenic Crush 7/47 | Active Active | 0 | 3½ yrs. - Died |
| (26) | 1/40 | 26 | Exud. (RB.2) R.U.lobe | Poor | 12/47-1/48 (Own discharge) | A.P.P. (12/47) | Active | 0 | 2 yrs. - Died |
| (27) | 4/49 | 28 | Fib. (R.B.2) RUZ. & LUZ. | Fair | 6/49-11/49 | Bed-rest | Active | 0 | 8 mon. - Active |
| (28) | 8/44 | 44 | Fib. (RB.2) RU.lobe & LMZ | Fair | 1/45-6/45 | Bed-rest | Active | 0 | 5 yrs. - Active |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|-------------------------------------|-----------------|-------------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (29) | 2/40 | 26 | Fib. (RB.2) Ll.Lobe | Fair | 3/40-7/40 | Bed-rest | Active | 0 | 1 yr. - Died |
| (30) | 2/44 | 23 | Exud. (RB.2) All zones left Lung | Over-cw'd | 6/44-2/45 | Lft. AP. 11/44 | Q'scent | 0 | 6 yrs. - Q'scent |
| (31) | 8/41 | 17 | Exud. (RB.1) LlUZ. | Poor | 9/41-4/42 | Lft. AP. 9/41 | Q'scent | 0 | 8 yrs. - Died |
| (32) | 2/49 | 43 | Exud. (RA.1) RlZ & LlUZ. | Poor | Refused | Domiciliary bed-rest | - | 0 | 1 yr. - Active |
| (33) | 9/41 | 24 | Exud. (R ^A .1) RlUZ. | Good | Refused | Domiciliary bed-rest | - | 0 | 8 yrs. - Q'scent |
| (34) | 3/49 | 27 | Exud. (RA.1) RlZ. | Poor | 3/49-5/49 | Bed-rest | Q'scent | 0 | 9 mon. - Q'scent |
| (35) | 3/43 | 28 | Exud. (RA.2) RlUZ. & RlZ. | Over-cw'd | 6/43-8/43 | Bed-rest | Q'scent | 0 | 7 yrs. - Q'scent |
| (36) | 10/41 | 30 | Fib. (RA.2) RlUZ. & LlUZ. | Fair | 9/41-7/42 | Bed-rest | Active | 0 | 9 yrs. - Active |
| (37) | 2/44 | 26 | Exud. (RA.1) RlUZ. | Good | 5/44-9/44 | Bed-rest | Q'scent | 0 | 6 yrs. - Q'scent |
| (38) | 7/43 | 39 | Fib. (RB.2) Rl.Lobe | Good | 6/45-11/45 | Bed-rest | Active | 0 | 6 yrs. - Active |
| (39) | 4/44 | 20 | Exud. (RA.1) | Fair | 8/44-5/45 2/49-12/49 | Bed-rest Bed-rest | Q'scent Active | 0 | 5½ yrs. - Active |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|--|-----------------|--------------------------|--|--------------------|-----------------|----------------------------------|
| (40) | 7/49 | 25 | Exud. (RA.2) RLZ. | Over- cw'd | Refused | Domiciliary bed-rest | - | 0 | 6 mon. - Q'scent |
| (41) | 11/44 | 42 | Exud. (RA.1) LLZ | Good | Not recommended | Domiciliary Bed-rest | - | 0 | 5 yrs. - Q'scent |
| (42) | 8/49 | 21 | Exud. (RB.3) RU.lobe & LU. lobe | Over- cw'd | 11/49 - Still in San. | Bed-rest | - | 0 | 4 mon. - Active |
| (43) | 1/45 | 20 | Exud. (RB.3) RU.lobe & Lu. lobe | Poor | 3/45-3/46 6/46-8/47 | Rt. AP. - 4/45 Bed-rest | Active Active | 0 | 5 yrs. - Active |
| (44) | 10/44 | 25 | Exud. (RB.3) RU.lobe & LU. lobe. | Fair | 2/45-7/45 | Bed-rest | Active | 0 | 5 yrs. - Active |
| (45) | 10/44 | 22 | Exud. (RB.3) RU.lobe | Fair | 6/45-5/47 | Rt. Phrenic evulsion. 7/45 APP. 2/46 | Active | 0 | 5 yrs. - Active |
| (46) | 4/40 | 35 | Fib. (RB.2) LU.lobe | Poor | 4/40-2/41 | Lft. AP. -5/40 | Q'scent | 0 | 9½ yrs. - Active |
| (47) | 5/44 | 24 | Exud. (RB.3) RU.lobe & LU. lobe | Fair | 9/44-12/46 | Extra-pleural pneumothorax 5/45-2 stage. thoracoplasty 10/45 | Q'scent | 0 | 5½ yrs. - Active |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|-------------------------------------|-----------------|------------------------------|--|--------------------|-----------------|----------------------------------|
| (48) | 6/44 | 28 | Fib. (RB.2) RU. lobe | Fair | 8/45-9/46 | Rt. AP. -12/45 Rt. phrenic crush - 4/46 (failure) | Active | 0 | 5½ yrs. - Active |
| (49) | 4/44 | 22 | Exud. (RB.2) LUZ. | Over-cw'd | 5/44-5/45 | Lft. AP. - 6/44 Lft. Phrenic evulsion 3/45 | Q'scent | 0 | 5½ yrs. - Q'scent |
| (50) | 9/42 | 17 | Exud. (RB.2) RU. lobe & LU. lobe | Over-cw'd | 5/43-2/44 9/45-10/46 | Lft. AP. - 7/43 Lft. 2-stage thoracoplasty 12/45-1/46 | Q'scent | 0 | 7 yrs. - Q'scent |
| (51) | 1/45 | 32 | Exud. (RA.1) LIZ. | Good | Not recommended | Domiciliary Bed-rest | - | 0 | 5 yrs. - Q'scent |
| (52) | 2/49 | 27 | Exud. (RA.1) RUZ. | Fair | 6/49-7/49 (Own discharge) | Bed-rest | Active | 0 | 1 yr. - Active |
| (53) | 11/44 | 42 | Exud. (RA.1) LIZ. | Poor | Not recommended | Domiciliary | - | 0 | 5 yrs. - Q'scent |
| (54) | 9/44 | 24 | Exud. (RA.2) - RU. lobe | Poor | 3/45-12/45 5/49 - 9/49 | Rt. AP. - 7/45 Bed-rest | Q'scent | 0 | 5 yrs. - Q'scent |
| (55) | 4/44 | 28 | Exud. (RA.2) LUZ. | Poor | 6/44-12/44 | Bed-rest | Q'scent | 2 | 6 yrs. - Q'scent |
| (56) | 1/43 | 37 | Fib. (RA.1) LUZ. | Very poor | 11/43-2/44 | Bed-rest | Q'scent | 6 | 7 yrs. - Q'scent |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|------------------------------------|-----------------|--|---------------------------------------|--------------------|-----------------|----------------------------------|
| (57) | 11/43 | 25 | Exud. (RA.1) LUZ. | Good | 11/43-5/44 | Bed-rest | Q'scent | 1 | 6 yrs - Q'scent |
| (58) | 3/42 | 35 | Exud. (RA.1) RUZ. | Fair | Refused | Domiciliary Bed-rest | Q'scent | 2 | 7½ yrs. - Q'scent |
| (59) | 2/44 | 27 | Fib. (RA.2) LUZ. | Very | Refused at first 5/49-6/49 (Own discharge) | Bed-rest | Active | 3 | 6 yrs. - Active |
| (60) | 5/43 | 41 | Fib. (RA.1) RUZ. | Fair | Refused | Domiciliary Bed-rest | Active | 1 | 6½ yrs. - Active |
| (61) | 5/49 | 25 | Exud. (RA.2) RU.lobe & left apex. | Over-cw'd | 5/49-Still in San. | Bed-rest | - | 1 | 7 mon. - Active |
| (62) | 10/44 | 24 | Exud. (RB.3) RU.lobe & LU.lobe | Poor | 11/44-8/45 | Bed-rest | Active | 1 | 5 yrs. - Active |
| | | | | | 12/49 - Still in San. | Bed-rest | - | | |
| (63) | 11/49 | 21 | Exud. (RB.3) LU.lobe | Over-cw'd | 12/49- Still in San. | RT. AP. | - | 1 | 1 mon. - Active |
| (64) | 7/49 | 24 | Exud. (RB.2) LU.lobe | Over-cw'd | 10/49- Still in San. | Bed-rest | - | 1 | 6 mon. - Active |
| (65) | 5/42 | 34 | Fib. (RA.2) LU.lobe | Poor | 12/45-1/46 | Bed-rest | Active | 3 | 7½ yrs. - Active |
| (66) | 5/44 | 28 | Exud. (RB.2) RUZ. & LU.lobe. | Fair | 5/44-5/46 | Lft. phrenic crush - 10/46 APP-11/46. | Active | 2 | 5½ yrs. - Active |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|--|-----------------|----------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (67) | 9/44 | 21 | Exud. (RA.2) RUZ. | Fair | Refused | Domiciliary Bed-rest | - | 1 | 5 yrs. - Q'scent |
| (68) | 8/42 | 24 | Exud. (RA.2) RU lobe | Poor | 2/43-6/43 | Bed-rest | Active | 3 | 6 yrs. - Died |
| (69) | 3/43 | 39 | Fib. (RA.1) ILZ. | Poor | Not recommended | Domiciliary Bed-rest | - | 5 | 6 yrs. - Q'scent |
| (70) | 12/48 | 31 | Fib. (RA.1) LUZ. | Fair | Not recommended | Domiciliary Bed-rest | - | 2 | 1 yr. - Active |
| (71) | 8/42 | 38 | Fib. (RB.3) RU. lobe & LU. lobe | Fair | 12/42-Died 1/43 | Bed-rest | Dead | 3 | 5 mon. - Died |
| (72) | 6/43 | 42 | Fib. (RB.3) RU. lobe & all zones left lung. | Poor | 7/43-Died 8/43 | Bed-rest | Dead | 2 | 2 mon. - Died |
| (73) | 8/42 | 31 | Exud. (RB.3) RU. lobe & LU. lobe | Fair | 10/42-2/43 | Bed-rest | Active | 3 | 7 mon. - Died |
| (74) | 6/42 | 25 | Exud. (RB.3) RUZ. RLZ. & LU. lobe | Over-cw'd | 7/42-2/43 | Bed-rest | Active | 2 | 9 mon. - Died |
| (75) | 1/45 | 27 | Exud. (RB.3) All zones each lung | Fair | 2/45-Died 9/45 | Bed-rest | Dead | 2 | 9 mon. - Died |
| (76) | 5/44 | 44 | Fib. (RB.3) RU. lobe & LU. lobe | Poor | Refused | Domiciliary Bed-rest | - | 7 | 10 mon. - Died |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|---|-----------------|----------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (77) | 4/41 | 29 | Fib. (RB.2) RUZ. & LUZ. | Over- cw'd | 1/43-5/43 | Bed-rest | Active | 2 | 3 yrs. - Died |
| (78) | 10/42 | 41 | Fib. (RB.2) RUZ. & LUZ. | Poor | 5/43-7/43 | Bed-rest | Q'scent | 2 | 1½ yrs. - Died |
| (79) | 6/43 | 30 | Exud. (RB.3) All zones left Lung & RUZ. | Fair | 8/43-Died 1/44 | Bed-rest | Dead | 1 | 6 mon. - Died |
| (80) | 9/43 | 26 | Exud. (RB.3) All zones Rt. Lung | Poor | 10/43-Died 4/44 | Bed-rest | Dead | 2 | 7 mon. - Died |
| (81) | 3/43 | 38 | Fib. (RB.2) RUZ. & RMZ. | Very poor | Refused | Domiciliary Bed-rest | - | 11 | 2½ yrs. - Died |
| (82) | 11/41 | 24 | Exud. (RB.2) RU. lobe & LUZ. | Poor | 6/42-8/42 | 1ft. AP.-3/42 | Active | 1 | 3½ yrs. - Died |
| (83) | 4/44 | 38 | Fib. (RB.3) All zones Rt. Lung, LUZ & Tb. larynx | Fair | Not recommended | Domiciliary Bed-rest | - | 2 | 10 mon. - Died |
| (84) | 9/44 | 40 | Fib. (RB.1) RUZ. | Very poor | Refused | Domiciliary Bed-rest | - | 6 | 1 yr. - Died |
| (85) | 8/44 | 23 | Exud. (RB.3) RU. lobe & all zones left lung | Poor | 11/44-5/45 | Bed-rest | Active | 1 | 1 yr. - Died |
| (86) | 3/44 | 40 | Fib. (RB.2) RUZ. & LUZ. | Over- cw'd | Not recommended | Domiciliary Bed-rest | - | 4 | 2 yrs. - Died |

CONTROLS

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|-------------|----------------|---------------|--------------------------------------|-----------------|----------------------|---|--------------------|-----------------|----------------------------------|
| (87) | 6/44 | 31 | Fib. (RB.3) | Fair | 6/45-10/45 | Bed-rest | Active | 1 | 2½ yrs. - Died |
| (88) | 11/44 | 28 | Exud. (RB.2) R.U.Z. & L.U.Z. | Poor | 9/45-Died 10/45 | Bed-rest | Dead | 4 | 11 mon. - Died |
| (89) | 63/43 | 31 | Fib. (RB.2) L.U. lobe & RLZ. | Fair | Refused | Domiciliary Bed-rest | - | 4 | 3 yrs. - Died |
| (90) | 4/40 | 30 | Exud. (RB.3) R.U. lobe & LMZ. | Good | 6/40-Died 2/41 | Bed-rest | Dead | 3 | 10 mon. - Died |
| (91) | 5/44 | 30 | Fib. (RB.1) | Fair | 1/46-6/47 | 2-stage left thoracoplasty 2/46 & 3/46 | Q'scent | 2 | 5½ yrs. - Q'scent |
| | | | | | 8/47-10/47 | Str'mycin for sinus | Q'scent | | |
| (92) | 9/48 | 26 | Exud. (RA.1) RLZ. | Fair | 10/48-11/48 | Bed-rest | Q'scent | 2 | 1½ yrs. - Q'scent |
| (93) | 9/44 | 32 | Fib. (RA.1) R.U.Z. & Left apex. | Good | 5/45-10/45 | Bed-rest | Q'scent | 1 | 5 yrs. - Q'scent |
| (94) | 3/40 | 27 | Fib. (RB.2) L.U. lobe | Good | 4/40-8/40 | Bed-rest & course of Myocristin | Active | 2 | 8 yrs. - Died |
| (95) | 8/44 | 41 | Fib. (RB.3) R.U. lobe & L.U. lobe | Good | Refused | Domiciliary bed-rest | - | 3 | 1½ yrs. - Died |

CONTROLS

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|-------------|----------------|---------------|-------------------------------------|-----------------|----------------------|---------------------------|--------------------|-----------------|----------------------------------|
| (96) | 3/48 | 29 | Exud. (RB.3) All zones Rt. Lung. | Fair | 5/48-Died 4/49 | Bed-rest | Dead | 1 | 1 yr. - Died |
| (97) | 9/40 | 38 | Fib. (RB.2) RU. lobe | Fair | 9/40-5/41 | Bed-rest | Q' scent | 1 | 9 yrs. - Q' scent |
| (98) | 3/44 | 44 | Fib. (RB.2) RU. lobe | Very poor | 10/45-3/46 | Rt. Parench evulsion 1/46 | Active | 6 | 5½ yrs. - Active |
| (99) | 1/43 | 43 | Fib. (RB.2) RUZ. & LUZ. | Fair | 8/43-8/44 | Lft. Parench evulsion | Active | 1 | 7 yrs. - Active |
| (100) | 6/48 | 29 | Exud. (RB.2) LU. lobe | Over-cw'd | 11/48-6/49 | Streptomycin | Q' scent | 3 | 1½ yrs. - Q' scent |
| (101) | 3/49 | 33 | Fib. (RB.2) RU. lobe | Poor | 8/49-12/49 | Bed-rest | Active | 2 | 9 mon. - Active |
| (102) | 3/43 | 26 | Exud. (RA1) LUZ. | Good | 3/43-6/43 | Bed-rest | Q' scent | 2 | 6½ yrs. - Q' scent |
| (103) | 3/44 | 36 | Exud. (RA.1) LUZ. | Poor | Refused | Domiciliary Bed-rest | - | 4 | 5½ yrs. - Q' scent |
| (104) | 9/44 | 35 | Exud. (RA.1) RUZ. & LUZ. | Fair | Not recommended | Domiciliary Bed-rest | - | 2 | 5 yrs. - Q' scent |
| (105) | 5/48 | 39 | Exud. (RA.1) RUZ. | Good | Refused | Domiciliary bed-rest | - | 1 | 1½ yrs. - Q' scent |
| (106) | 4/43 | 22 | Exud. (RB.3) RU. lobe & LU. lobe | Fair | 4/43-12/44 | Bed-rest | Active | 1 | 2 yrs. - Died |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|--|-----------------|----------------------|--|--------------------|-----------------|----------------------------------|
| (107) | 10/41 | 34 | Fib. (RB.2) RU. lobe & LMZ. | Over- cwt'd | 2/42-Died 9/42 | Bed-rest | Dead | 5 | 1 yr. - Died |
| (108) | 7/48 | 31 | Exud. (RB.2) RUZ. & LUZ. | Fair | 7/48-10/48 | Bed-rest | Active | 1 | 7 mon. - Died |
| (109) | 11/44 | 30 | Fib. (RB.1) RUZ. | Poor | Refused | Domiciliary Bed-rest | - | 2 | 2 yrs. - Died |
| (110) | 12/44 | 31 | Fib. (RB.1) RT. apex & LUZ. | Good | 7/45-Died 9/46 | lft. Phrenic crush - 8/46 APP. 8/46 (failure) | Dead | 2 | 1 $\frac{3}{4}$ yrs. - Died |
| (111) | 3/48 | 26 | Exud. (RB.3) RU. lobe & LUZ. | Very | 6/48-Died 7/48 | Bed-rest | Dead | 3 | 4 mon. - Died |
| (112) | 7/44 | 35 | Fib. (RB.3) RU. lobe & all zones lft. lung | Over- | 11/44-7/45 | Bed-rest | Active | 6 | 3 yrs. - Died |
| (113) | 5/44 | 31 | Fib. (RB.3) All zones Rt. lung & LU. lobe | Fair | Not recommended | Domiciliary Bed-rest | - | 3 | 8 mon. - Died |
| (114) | 2/43 | 34 | Fib. (RB.3) RU. lobe & Tb. Larynx. | Poor | 10/43-6/44 | Rt. AP. 10/43 | Active | 2 | 2 yrs. - Died |
| (115) | 12/44 | 44 | Fib. (RB.3) RU. lobe & LU. Lobe | Fair | Not recommended | Domiciliary Bed-rest | - | 2 | 8 mon. - Died |
| (116) | 10/41 | 38 | Fib. (RB.2) RUZ. & LUZ. | Fair | 1/44-5/44 | Bed-rest | Active | 2 | 5 yrs. - Died |

CONTROLS

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|-------------|----------------|---------------|--------------------------------------|-----------------|--------------------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (117) | 7/44 | 26 | Exud. (RB.3) All zones lft. lung. | Good | Not recommended | Domiciliary Bed-rest | - | 1 | 6 mon. - Died |
| (118) | 1/45 | 28 | Exud. (RB.3) All zones each lung | Over- cw'd | 10/45-11/45 (Own discharge) | Bed-rest | Active | 4 | 1 yr. - Died |
| (119) | 7/44 | 34 | Fib. (RB.3) RU. & LU. lobe | Good | 6/45-12/45 | Bed-rest | Active | 2 | 3 yrs. - Died |
| (120) | 11/46 | 25 | Exud. (RB.2) RUZ. & LMZ. | Over- cw'd | Refused | Domiciliary Bed-rest | - | 1 | 7 mon. - Died |
| (121) | 10/44 | 37 | Fib. (RB.3) RU. lobe & LUZ. | Fair | 1/45-8/45 | Bed-rest | Active | 1 | 3 yrs. - Died |
| (122) | 5/43 | 43 | Fib. (RB.2) RUZ. & LUZ. | Poor | Refused | Domiciliary Bed-rest | - | 1 | 2 yrs. - Died |
| (123) | 1/48 | 31 | Exud. (RB.2) LU. lobe | Fair | Not recommended | Domiciliary Bed-rest | - | 3 | 10 mon. - Died |
| (124) | 2/48 | 45 | Fib. (RB.3) RU. lobe & LU. lobe. | Fair | Not recommended | Domiciliary Bed-rest | - | 1 | 4 mon. - Died |
| (125) | 1/48 | 32 | Fib. (RB.2) All zones left lung. | Poor | 1/48-Died 11/48 | Bed-rest | Dead | 2 | 10 mon. - Died |
| (126) | 11/47 | 23 | Exud. (RB.2) LU. lobe | Over- cw'd | 3/48-2/49 | Bed-rest | Active | 1 | 1½ yrs. - Died |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|------------------------------------|-----------------|------------------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (127) | 10/41 | 41 | Fib. (RA.2) RUZ. & IMZ. | Over- crow'd | 11/41-2/42 | Bed-rest | Q'scent | 5 | 8 yrs. - Active |
| (128) | 9/44 | 26 | Exud. (RA.1) RLZ. | Fair | Not recommended | Domiciliary Bed-rest | - | 1 | 5 yrs. - Q'scent |
| (129) | 2/44 | 23 | Exud. (RA.1) RLZ. | Poor | Not recommended | Domiciliary Bed-rest | - | 1 | 6 yrs. - Q'scent |
| (130) | 4/42 | 33 | Fib. (RA.1) LUZ. | Poor | Refused | Domiciliary Bed-rest | - | 3 | 8 yrs. - Q'scent |
| (131) | 4/44 | 24 | Exud. (RA.1) Rt. apex & RLZ. | Poor | 8/44-11/44 | Bed-rest | Q'scent | 2 | 5½ yrs. - Active |
| (132) | 1/45 | 36 | Fib. (RA.1) Rt. apex | Fair | Not recommended | Domiciliary Bed-rest | - | 2 | 5 yrs. - Q'scent |
| (133) | 9/48 | 34 | Fib. (RA.1) RMZ. & IMZ. | Poor | 10/48-3/49 | Bed-rest | Q'scent | 3 | 1 yr. - Q'scent |
| (134) | 6/42 | 39 | Fib. (RA.1) RUZ. & LUZ. | Fair | 6/42-7/42 (Own discharge) | Bed-rest | Active | 2 | 7½ yrs. - Active |
| (135) | 1/45 | 32 | Exud. (RA.1) Rt. & If't. apex. | Fair | 4/45-8/45 | Bed-rest | Q'scent | 1 | 5 yrs. - Q'scent |
| (136) | 10/44 | 39 | Fib. (RA.1) Rt. & If't. apex. | Fair | Not recommended | Domiciliary Bed-rest | - | 1 | 5 yrs. - Q'scent |
| (137) | 6/42 | 42 | Fib. (RA.1) RUZ. | Good | 8/42-11/42 | Bed-rest | Q'scent | 2 | 7½ yrs. - Q'scent |
| (138) | 8/44 | 29 | Fib. (RA.1) RUZ. | Good | 5/45-10/45 | Bed-rest | Q'scent | 1 | 5 yrs. - Q'scent. |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|------------------------------------|-----------------|----------------------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (139) | 5/40 | 40 | Fib. (RA.1) RUZ. | Poor | Refused | Domiciliary Bed-rest | - | 4 | 9½ yrs. - Q'scent |
| (140) | 7/43 | 39 | Exud. (RA.1) LLZ. | Good | Not recommended | Domiciliary Bed-rest | - | 2 | 6½ yrs. - Q'scent |
| (141) | 8/42 | 30 | Exud. (RA.1) LUZ. | Poor | Refused | Domiciliary | - | 2 | 7 yrs. - Q'scent |
| (142) | 6/44 | 38 | Fib. (RB.2) RUZ. & LUZ. | Fair | 12/44-6/45 | Bed-rest | Active | 2 | 5½ yrs. - Active |
| (143) | 2/43 | 43 | Fib. (RB.2) LMZ. & LLZ. | Good | 2/45-6/45 | Bed-rest | Q'scent | 1 | 7 yrs. - Q'scent |
| (144) | 10/43 | 36 | Fib. (RB.3) RU. & LU.Lobe | Over-cw'd | 3/44-8/44 | Bed-rest | Active | 1 | 6 yrs. - Active |
| (145) | 4/49 | 28 | Exud. (RB.2) RUZ. | Good | 5/49-12/49 | Rt. AP. -6/49 | Q'scent | 1 | 8 mon. - Q'scent |
| (146) | 4/44 | 28 | Exud. (RB.1) LUZ. | Over-cw'd | 1/45-5/45 | Bed-rest | Q'scent | 3 | 5½ yrs. - Q'scent |
| (147) | 8/43 | 29 | Fib. (RB.2) RUZ. & RMZ. | Fair | 9/43-4/44 | Rt. AP. - 9/43 | Q'scent | 1 | 6 yrs. - Q'scent |
| (148) | 8/43 | 31 | Fib. (RB.2) LUZ. & LMZ. | Good | 11/43-12/44 | Lft. AP. -12/43 | Active | 2 | 6½ yrs. - Active |
| | | | | | 6/49-(Own discharge in few days) | Bed-rest | Active | | |
| (149) | 4/49 | 27 | Fib. (RB.2) RUZ. & LUZ. | Fair | 5/49- Still in San. | Bed-rest | - | 1 | 7 mon. - Active |

CONTACTS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|------------------------------------|-----------------|------------------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (150) | 6/49 | 28 | F1b. (RB.2) RUZ. | Over-cw'd | 7/49-Still in San. | Bed-rest | - | 1 | 6 mon. - Active |
| (151) | 3/44 | 29 | F1b. (RB,1) RUZ. | Over-cw'd | 4/44-2/45 | Bed-rest | Active | 2 | 6½ yrs. - Q'scent |
| (152) | 1/49 | 28 | F1b. (RB.2) RU.1lobe & IUZ. | Good | 1/49-4/49 (Own Discharge) | Domiciliary Bed-rest | - | 1 | 1 yr. - Active |
| (153) | 8/44 | 32 | F1b. (RB.2) RU.1lobe & IMZ. | Good | 7/45-2/46 | Bed-rest | Active | 1 | 5 yrs. - Active |
| (154) | 11/48 | 29 | Exud. (RB.2) RU.1lobe | Over-cw'd | 12/48-7/49 | Bed-rest | Q'scent | 1 | 1 yr. - Q'scent |
| (155) | 3/49 | 29 | F1b. (RB.1) IU.1lobe | Good | 4/49-6/49 (Own discharge) | Bed-rest | Active | 1 | 9 mon. - Active |
| (156) | 3/44 | 33 | F1b. (RB.3) RU.1lobe | Good | Refused | Domiciliary Bed-rest | - | 1 | 6 yrs. - Active |
| (157) | 10/44 | 27 | F1b. (RB.2) RU.1lobe | Good | 12/40-11/41 | Bed-rest | Active | 3 | 9 yrs. - Q'scent |
| (158) | 3/49 | 23 | Exud. (RB.2) RMZ. & IUZ. | Over-cw'd | 7/49-Still in San. | Bed-rest | - | 1 | 9 mon. - Active |
| (159) | 10/48 | 29 | Exud. (RB.3) RU.1lobe & IUZ. | Over-cw'd | 4/49-Still in San. | Bed-rest | - | 1 | 1½ yrs. - Active |
| (160) | 10/44 | 27 | Exud. (RB.2) IU.1lobe | Very poor | 10/45-11/46 | Ift. AP.11/46 | Active | 3 | 5 yrs. - Active |
| | | | | | 4/49-Still in San. | Bed-rest | - | 1 | |

CONTROLS

| NO. OF CASE | DATE OF NOTIF. | AGE AT NOTIF. | TYPE & EXTENT OF DISEASE AT NOTIF. | HOME CONDITIONS | PERIOD IN SANATORIUM | TREATMENT IN SANATORIUM | STATE ON DISCHARGE | NO. OF CHILDREN | FOLLOW-UP PERIOD AND FINAL STAGE |
|-------------|----------------|---------------|------------------------------------|-----------------|-----------------------------------|-------------------------|--------------------|-----------------|----------------------------------|
| (161) | 6/49 | 28 | Fib. (RB.1) IUZ. | Fair | 7/49 - Still in San. | Bed-rest | - | 1 | 6 mon. - Active |
| (162) | 3/49 | 27 | Exud. (RB.2) RUZ. & IUZ. | Fair | 4/49 - Still in San. | Bed-rest | - | 2 | 9 mon. - Active |
| (163) | 7/43 | 36 | Fib. (RB.2) RU.1lobe | Over-cw'd | 8/44 - (Own Discharge in few days | Domiciliary Bed-rest | - | 5 | 6 yrs. - Active |
| (164) | 5/44 | 30 | Fib. (RB.2) RU.1lobe & IUZ. | Over-cw'd | 5/46-12/46 | Bed-rest | Active | 4 | 5½ yrs. - Active |
| (165) | 10/42 | 38 | Fib. (RB.3) Each upper lobe | Good | 3/43-Died 5/43 | Bed-rest | Dead | 2 | 7 mon. - Died |
| (166) | 7/42 | 39 | Fib. (RB.3) RU.1lobe & IU.1lobe | Over-cw'd | 10/42-12/42 | Bed-rest | Active | 6 | 6 mon. - Died |
| (167) | 6/44 | 24 | Exud. (RB.2) RUZ. & IU.1lobe | Fair | Refused | Domiciliary Bed-rest | - | 1 | 9 mon. - Died |

APPENDIX D.

Identity of Patients. (Pregnancy Cases.)

| | | |
|-------------------|--------------------|----------------------|
| (I) Horne A. | (27) Haddock D. | (53) Thomas A. |
| (2) Allan B. | (28) Bell M. | (54) Shillito A. |
| (3) Martin S. | (29) Hammill M. | (55) Scheidweiler H. |
| (4) Bensted C. | (30) Harrison E. | (56) Rose D. |
| (5) Beek M. | (31) Sanderson S. | (57) Williams W. |
| (6) Bastow C. | (32) Thompson P. | (58) Banton S. |
| (7) Wassel E. | (33) White M. | (59) Craig G. |
| (8) Griffiths B. | (34) Thompson M. | (60) Jones A. |
| (9) Chew A. | (35) Mason B. | (61) Taylor D. |
| (10) Atkinson G. | (36) Branton M. | (62) Taylor M. |
| (11) Buxton C. | (37) Redman F. | (63) Hewitt M. |
| (12) Winn B. | (38) Hughes C. | (64) Laughton S. |
| (13) Watts D. | (39) Chambers B. | (65) Roach N. |
| (14) Townsley A. | (40) Speight C. | (66) Simm B. |
| (15) Harwood P. | (41) Nelson B. | (67) Simmons K. |
| (16) Harbin B. | (42) Gent K. | (68) White D. |
| (17) Ball L. | (43) Jones C. | (69) Kay R. |
| (18) Firth I. | (44) Palfreyman P. | (70) Fisher K. |
| (19) Farrer J. | (45) Winterburn M. | (71) Dickenson H. |
| (20) Longfield S. | (46) Longley P. | (72) Hall S. |
| (21) Bell D. | (47) Little J. | (73) Royston B. |
| (22) Buttler M. | (48) Evans E. | (74) Hart M. |
| (23) Bird R. | (49) Wonnack M. | (75) Denton E. |
| (24) Goodall S. | (50) Edwards L. | (76) Pinnell D. |
| (25) Morris M. | (51) Swaby L. | (77) Hope J. |
| (26) Mattick H. | (52) Ball A. | (78) Roger H. |

Identity of Patients. (Pregnancy Cases)

(continued.)

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|-------------------|------------------|
| (79) Burton C. | (91) Brooks C. |
| (80) Shaw S. | (92) Bird M. |
| (81) Pickering L. | (93) Williams M. |
| (82) Clements C. | (94) Yelland S. |
| (83) Fretwell A. | (95) Thompson R. |
| (84) Ghent S. | (96) Denton P. |
| (85) Guest M. | (97) Robinson B. |
| (86) Hunt R. | (98) Blackie A. |
| (87) Hockney F. | (99) Harvey M. |
| (88) Ellis D. | (100) Vollans E. |
| (89) Dickonson K. | (101) Scholes M. |
| (90) Ella B. | |
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Identity of Patients. (Control Cases.)

| | | |
|-------------------|--------------------|---------------------|
| (I) Machin M. | (27) Acaster S. | (53) Gilliott S. |
| (2) Carr I. | (28) Denby E. | (54) Flower F. |
| (3) Briskham E. | (29) Knox E. | (55) Shepherd J. |
| (4) Widdensot M. | (30) Wilson L. | (56) Shaw E. |
| (5) Millward E. | (31) Hardy M. | (57) Shobbrook L. |
| (6) Hickling D. | (32) Cresswell E. | (58) Swinscoe L. |
| (7) Hickling E. | (33) Rogers E. | (59) Thompson H. |
| (8) Taylor E. | (34) Rank H. | (60) Weald R. |
| (9) Hirst N. | (35) Jones P. | (61) Willet M. |
| (10) Lawton M. | (36) Hammond M. | (62) Green M. |
| (II) Oblison E. | (37) Healy K. | (63) Hollinworth H. |
| (12) Tyrrel E. | (38) Higgins E. | (64) Mackintosh I. |
| (13) Foster W. | (39) Stephenson P. | (65) Choles E. |
| (14) Tredgold C. | (40) Slack N. | (66) Wilkinson D. |
| (15) Mattison D. | (41) Ward G. | (67) Wilde E. |
| (16) Whittles J. | (42) Gott M. | (68) Atha E. |
| (17) Gates E. | (43) Kearsley C. | (69) Rollinson H. |
| (18) Robinson J. | (44) Coulter R. | (70) Smith F. |
| (19) Taylor M. | (45) Cookson E. | (71) Temple J. |
| (20) Connell M. | (46) Forsythe F. | (72) Mawson H. |
| (21) Turner I. | (47) Hunter I. | (73) Hancock E. |
| (22) Stewart E. | (48) Stott B. | (74) Hawkhead B. |
| (23) Roberts G. | (49) Taylor M. | (75) Wyatt F. |
| (24) Greenwood H. | (50) Townsend S. | (76) Smith E. |
| (25) Smith P. | (51) Beecher E. | (77) Ripley E. |
| (26) Allington F. | (52) Baker D. | (78) McHugh C. |

Identity of Patients. (Control Cases.)

(continued.)

| | | |
|-------------------|--------------------|--------------------|
| (79) Mason M. | (I04) Baxter E. | (I29) Crossland S. |
| (80) Hall G. | (I05) Lishman M. | (I30) Clark D. |
| (81) Ryans N. | (I06) Hall V. | (I31) Smith C. |
| (82) Peacock J. | (I07) Connolly A. | (I32) Jenkinson D. |
| (83) Haggerty M. | (I08) Tiffany Z. | (I33) Hopson A. |
| (84) West C. | (I09) Poulter F. | (I34) Osborne P. |
| (85) Saunders S. | (I10) Brown M. | (I35) Merrick K. |
| (86) Rickwood K. | (I11) Housman A. | (I36) Mason E. |
| (87) Walton L. | (I12) Todd M. | (I37) Marsh E. |
| (88) Taylor M. | (I13) Jones K. | (I38) Leach E. |
| (89) Dutton L. | (I14) Wright E. | (I39) Knowles W. |
| (90) Smith A. | (I15) Platts E. | (I40) Keighley L. |
| (91) Collier P. | (I16) Hawes A. | (I41) Hanson E. |
| (92) Sanderson D. | (I17) Hodgson M. | (I42) Corrigan M. |
| (93) Braham A. | (I18) Denman C. | (I43) Columbine H. |
| (94) Duffin P. | (I19) Gilligan M. | (I44) Burdon V. |
| (95) Bateman A. | (I20) Stainton R. | (I45) Ferguson G. |
| (96) Easton M. | (I21) Mason D. | (I46) Schofield F. |
| (97) Tasker M. | (I22) Halliday D. | (I47) Hobman W. |
| (98) Bennet M. | (I23) Dawson D. | (I48) Hunt J. |
| (99) Owen M. | (I24) Knight E. | (I49) Parkin M. |
| (I00) Nippers A. | (I25) Smith B. | (I50) Major E. |
| (I01) Rowley J. | (I26) Wilkinson L. | (I51) Sanderson A. |
| (I02) Thomas M. | (I27) Wakefield W. | (I52) Stevens W. |
| (I03) Venables F. | (I28) Guillon S. | (I53) Wright A. |

Identity of Patients. (Control Cases.)

(continued.)

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|--------------------|------------------|
| (I54) Wright C. | (I61) Morgan J. |
| (I55) Wood M. | (I62) Whalley D. |
| (I56) White S. | (I63) Perry M. |
| (I57) Hebden R. | (I64) Edwards C. |
| (I58) Longfield A. | (I65) Fenton H. |
| (I59) Bramham E. | (I66) Elliot E. |
| (I60) Dodson D. | (I67) Proctor M. |

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