Three Hundred Cases of Abortion.

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The Prevalence and Incidence of Abortion.

Much attention is being devoted at the present time to maternal mortality and morbidity, and their discussion has tended to obscure the increasing menace of abortion against health and human dignity. Attention has also been diverted by the protagonists in the birth-control controversies, so that the sad and sometimes sordid subject of abortion is forgotten.

In the adjoining table (No. 1) is shown the number of births registered in the Borough of Camberwell[1] and the number of cases of abortion admitted to St. Giles's Hospital for the last seven years. They have been contrasted with the admissions for ectopic pregnancy, which have remained approximately constant while the number of abortions has gradually increased; it happens to be by exactly 50 per cent from the figure for 1923 to that for 1928. The figures for ectopic gestation were used because the condition belongs to the same department of medicine and demands urgent operation and hence verification of diagnosis. No factors liable to influence the incidence of admission of cases of ectopic pregnancy are known. The rough constancy suggests that the population liable to accidents of pregnancy from which the hospital draws its patients has remained much the same, yet a rise in the figures for abortion by 50 per cent in seven years is surely significant as some indication of the increase of abortion. There is no reason to suppose that medical practitioners are less ready to undertake the care of aborting women in their own homes than they were a very few years ago. Nor has there been any change of hospital policy which might account for an increase in the figures, for any one hospital, of the admissions of some variety of patient because she was refused elsewhere. Cases of ectopic pregnancy would not be refused by any hospital, whether voluntary or municipal, while it has long been the policy of voluntary hospitals to refuse cases of abortion. The great majority, therefore, of cases of abortion in the Borough of Camberwell, which need hospital treatment are admitted to St. Giles's Hospital, which is controlled by the

Guardians of the Poor in Camberwell. The increase in the number of abortions is still more emphasized if the ratio between births in the Borough and abortions admitted is used as an index; for while births decrease, abortions increase. In 1923 there were 47.9 births to 1 case of abortion, while in 1929 this figure had dropped to 23.1 births to 1 abortion admitted. This ratio sets a limit in one direction to the frequency of abortion. It must really be much more frequent; some cases do not need admission to hospital, but can be recognized and treated at home, while there are others diagnosed by the patients or their friends as 'slight misses' or 'false conceptions' about which the doctor is not consulted. Certainly, also, some menstrual irregularities are really abortions and ought to be counted as such, for logic demands that an abortion is the termination of pregnancy between the moment of conception and the twenty-eighth week or thereabouts of gestation. Obstetricians have given estimates of the frequency of abortions; they seem to be based on impressions rather than actual statistics and are not necessarily less valuable on that account. Hegar[2] put the figure at one abortion to eight births, while Fairbairn,[3] writing quite lately, estimates it at one to five or six. Marshall[4] quotes similar figures from Kelly, Franz, and Williams. Krobinsky,[5] in Manitoba, concluded that abortion is the termination of 25 per cent of all pregnancies. In Germany, thirty to forty years ago, the proportion was said to be 1 : 10, but in 1926 it was reported as being 1 abortion to 2.5 births.[6]

In the absence of ability to diagnose conception and similarly the termination of early pregnancy, it is quite impossible to arrive at an exact abortion rate. The extrusion or absorption of a fertilized ovum may even be commoner than its retention.

The following experience was gained by the author during two year while he was in charge at St. Giles's Hospital of a ward devoted to gynæcology and the diseases of pregnant women.

Of 300 cases of abortion or threatened abortion in which the pregnancy was not continued, 207 had had no previous abortion, while the remaining 93 cases had had 174 abortions between them. The same 300 cases between them had had 838 children, the ratio of 174 to 838 being 1 abortion to 4.82 births. If we include in the figures the abortions for which they were being treated, the ratio becomes 174+300 or 474 : 838, which gives 1 abortion to 1.77 births. This latter ratio, of course, applies to a very special 'population' chosen at a very special time. The figures, however, ought to be subjected to a correction and stated for patients rather than for cases. One woman was admitted for three abortions, and one was admitted twice for abortion in the two years. Allowing for

these by only counting them once each, the figures for 297 women become 1 abortion to 5.36 births. Including in the figures the abortions for which the patients were being treated, the ratio is 1 abortion to 1.82 births.

The difference between 1 : 4.82 and 1 : 5.36 seems a surprisingly large correction, and is due to the remarkable record of one patient which runs as a disturbing factor through all the statistical matter, making the figures much 'rougher' than they would be if the influence of this recidivist could be omitted. Whether in another group of such 300 cases of abortion such a patient would occur is, of course, impossible to guess; but the records of the hospital show that if the list were carried back another nine months she would appear again. As her age is only 31 years, if the figures could be extended forward nine months she would probably appear again for her twelfth abortion, or, much less likely, for her fourth child.*

In trying to arrive at an abortion to children ratio there are numerous pitfalls, and the ratio found has very little meaning apart from a close specification of the population from which it is derived. Probably the ratio for the population of a gynæcologist's consulting room would be different from that of a physician's, so that in some measure the figure is really the observer's experience of the frequency of abortion rather than that applying to the general body of women. Again, the children to abortion ratio depends to some extent on the age of the women. The ratio for all parous women over 40 years of age attending a hospital department would be different from the ratio for all parous women over 20 years of age attending that department. Hence, some sort of statement about the age distribution is essential. There are, of course, some much more obvious errors. A woman of 50 who has had ten children, for instance, and who will therefore influence the

*Mrs. A. B. was born in 1898. In 1917 and 1919 children, now living, were born. In 1921 a child was born who died fifteen months later. In 1925 an ovarian cyst was removed, but between 1921 and 1926 there were seven abortions. In May, 1927, appendicectomy was performed for acute appendicitis, but in July 1927 she came back again for an 18 weeks' abortion. In August 1927 there is no doubt that she had another very early abortion followed 12 months later by an eight weeks' abortion. Then in July, 1929, she passed a macerated fœtus of about 20 weeks, this being her eleventh abortion. Her Wassermann reaction was negative on two occasions, and she always denied, probably truthfully, any interference, though she admitted she had enough children—only two living, however. The ovariotomy can hardly have decreased her fertility, and in such a woman appendicectomy had no influence whatever, for her record for foiled fecundity about that time seems incredible.

ratio considerably, may easily forget a miscarriage which twenty years before she remembered vividly. It is possible, also, that she is not quite certain of her age.

A complete specification of the cases in so far as age, children, and abortions can be given in three tables. The definition of age is simple—one must take the woman's word for it unless it can be checked from a previous admission, when, quite often, the conscientious observer is faced with an awkward choice. 'Children' as used is really a misnomer; it should be 'viable pregnancies.' Hence, twins are made to count as one, and also premature children and still-births. Abortion is taken in its usual sense—the termination of a normal pregnancy (or one in our present state of knowledge apparently so) up to the 28th week from the commencement of the last menstrual period, sometimes not an easily defined point. Hence, patients with abortion due to vesicular mole (of which there were three cases) are not included in the series. Ectopic pregnancy and vesicular mole did not occur in the histories of these 297 women.

A fourth variable was introduced, namely 'years since last pregnant.' Unfortunately, it was not realized at first that this would be of any particular interest, and the figures were only recorded latterly and known for 192 cases out of 259 who had been previously pregnant among these 300 cases of abortion. The labour of making six classified tables for four variables is sufficiently time-consuming, but it would have been more worth while if 'years since marriage' had been recorded and introduced. Then, for strict reasoning, ten tables would have been involved and made any calculation very laborious. A further improvement, and probably a valuable one, would have been to separate 'premature children' from 'children.'

If in the tables from the figures which have been outlined one is subtracted, then allowance is made for the two patients who were admitted more than once during the period of observation. In effect by this subtraction the tables are converted from 'cases' to 'persons.' This has not been done, however, for the tables involving 'years since last pregnant' which seem naturally to refer more to the actual event of miscarriage rather than to the past history of the women. One further explanation of the 'years since last pregnant' tables is necessary. In the 'less than one year' row in the distribution of 'years since last pregnant,' which contains 26 cases ranging from two cases at four months upwards to cases less than 12 months since last pregnant, it was not assumed that they would be grouped about the mean of six

months, but their actual mean was found, which is 8.5 months and which was used in the calculations.

In the calculations of standard deviations (σ) and correlation coefficients (r) the usual notation is used, numbers below the line as suffixes representing the variables.

1 connotes age.
2 ,, number of children (i.e. viable pregnancies).
3 ,, number of previous abortions.
4 ,, years since last pregnant.

Numbers below the line as prefixes mean that for the cited statistical index certain variables have been reduced to, and can be taken as, constant. $r_{14} = +.24$ means that the correlation between age and time since last pregnant is $+.24$ and gives some measure of the interdependence between increase of the time between pregnancies and increase of age. In a group of women who have had the same number of children (2) the correlation between age (1) and time since last pregnant (4) is higher. ${}_2r_{14} = +.45$. In women with the same number of children (2) and who have had the same number of abortions (3) the correlation coefficient is higher still, ${}_{23}r_{14} = +.53$. Hence, the more closely the women are specified, the time since the last pregnancy increases the more closely with age. The magnitude of the coefficient shows that age is quite an important factor in the spacing of pregnancies, or, more accurately, the spacing of an abortion.

The probable errors have been calculated in the usual way and given as is customary. But it is not justifiable, for the distributions are discontinuous and by no means Gaussian, especially of the children (2) and abortions (3). This lessens the absurdity of using the correlation coefficient between children and abortions for women who had been pregnant before, namely $r_{23} = +.023 \pm .042$ for a subsequent calculation. Here the probable error is double the index and if it was to be taken at its face value would even cast doubt on the sign of the coefficient. This correlation ought certainly to be positive, however, although of very small magnitude. In fact, the partial correlation coefficient between children (2) and abortions (3) for women of the same age (1) and the same time since last pregnant (4) actually is negative ${}_{14}r_{23} = -.29$, a change of sign consonant with common sense and supported by statistical computation.

Some of the regression equations that arise have been calculated. They are rectilinear or planar and do not fit the extremities of the tables but seem reasonable where the greater numbers are

congregated. For instance, the increase of children with age as shown in the tables is small at the lower ages, reaches a maximum, and then at the higher ages becomes smaller again. The regression curve should be a rise from one level to another while the regression equation gives a uniform slope. Probably a curve without bends would more accurately represent an actual woman's experience (although a sinuous regression line would fit a population better), since the correlation between age and time since last pregnant $r_{14} = +.24$ is definitely positive, showing that the older, on the average, a number of women is the longer is the time elapsed since the last pregnancy. Such speculations could only be verified by finding curved regression lines for a larger number of cases.

Equation IV, for estimating age, contains some internal corroborative evidence. An increase of one year in the time since last pregnant (X_4) gives an increase of 0.95 years in the age (X_1). This is an error of -5 in 100 which might easily be made when a woman of say 40 estimates her age as 38.

By using equations deduced from the figures for women who were parous and applying them to the 297 aborting women, it is possible to estimate for those women the numbers of children and abortions which, on the average, they should have in the next years, if the past history of the parous women is a good measure of the future experience of the whole group of 297 patients.

Hence, it is possible to forecast the movement of the children to abortion ratio of this group of women. Obviously, the older patients are going to drop out, and for the sake of calculation it was assumed that on reaching the age of 49—the maximum age that occurs in the tables—the woman does not become pregnant again. There are fewer women at the greater ages, so that the unsuitability of the regression line at the upper limit does not make the calculation so unreliable. The ratio, children to abortions, in their past was 5.36 : 1 (much the same as the ratio accepted for the general body of women). On discharge from hospital it was 1.82 to 1. On the above assumptions, in five years' time it will have risen to 2.40 : 1 and in ten years a further rise to 2.85 : 1, when the youngest in the group of 297 women will be aged 27 and still be in a position to influence the children to abortion ratio in the direction of normality, which is said to be in the neighbourhood of five to one. The calculation and argument tend to show that this group of women have not had an experience different from the general body of women. Their ratio of children to abortions will recover from the 'accident' and regress towards normality.

Regression equations V and VI for estimating children (X_2)

and abortions (X_3) respectively are probably quite accurate for women at ages near the mean age, say from 25 to 35 years old. From equation V in this group of parous women an increase of one year in age means an increase of 0.31 children, or an increase of 3.19 years means an increase of one child, on the average. Similarly, from equation VI an increase of 10.17 years in age means an increase of one abortion, on the average. Hence, from the point of view of time in estimating the frequency of children to abortions, we have the ratio of 10.17 : 3.19 or 3.19 : 1, a proportion that well agrees with Krobinsky's statement given above that 25 per cent of pregnancies end in abortion.

Regression equation V for estimating number of children shows that an increase of one abortion means, on the average, a decrease in the number of children of 0.48 and not, as might be expected, a decrease of one child. This suggests that an abortion merely wastes the woman's time as far as child-bearing is concerned and not her fertility. If the regression coefficient had been more than one (more strictly less than -1) then there would be strong evidence that abortion has a deleterious effect on child-bearing. Perhaps this contrasts to some extent with the view of Serdukoff,[7] who says that in Russia, where induction of abortion has been practised since 1920, sterility has often followed, even when the abortion has been unaccompanied by inflammation. The contrast here is not, of course, good, because the proportion of induced abortions is not known among these women and these women were also, as a matter of fact, pregnant and aborting at the time their history was taken. It is from their past histories that the regressions are calculated. The proper proportion of women who had not aborted before must be included to allow of a base from which the regression plane may start. Any question of fertility and abortion obviously depends on the order in which the full-time births and the miscarriages happen. These equations do not depend on this sequence but rather assume nothing about the order of pregnancies. For instance, a woman who has had one abortion and then five children has the same effect on the regressions as one who has had five children and then one abortion. The disturbing effects of differing sequences are assumed to cancel one another. However, it is a very real objection that from the nature of the collection of the figures the sterile woman who has had abortions in the past cannot appear. Inspection of the table in which is plotted the number of abortions against age (Table 3) answers this partly, and also the consideration that, at any rate, the past experience of these aborting women is much the same as that of women in general. By the accident

of the method of collection of these figures the sterile woman has been ruled out. It has not happened that the patients had a much larger number of children for one abortion than the general body of women who, presumably, might include a group of women whose child-bearing was stopped by reason of an abortion producing sterility. Women sterilized or rendered infertile by abortion would heavily tilt the children to abortion ratio in the direction of few children, for abortion is a very common accident, so frequent that it borders on the physiological.

Whether the multiplication of children is desirable is very much a matter of opinion and point of view. Although these tables do not disclose much connexion between infertility and abortion in the past experience of these women, this does not mean that an abortion is a trivial occurrence, for it is quite a serious waste of time. Regression equation IV shows that whereas an increase of one child corresponds to an age increase of 1.7 years, an increase of one abortion corresponds to an age increase of 1.4 years. The difference between these figures for estimating age is not great and suggests that an abortion practically means as much time in a woman's life, as far as child-bearing goes, as a full-time birth.

From a mathematical standpoint it is easy to see why the partial correlations involving 'time since last pregnant' (4) are increased over the first order correlation coefficients, but from a biological point of view, it is very confusing. The regression coefficients seem very difficult to interpret. Some caution ought to be used, for in finding r_{14}, the correlation between age (1) and time since last pregnant (4), a part is being correlated with the whole. A woman of 42 can very well have been last pregnant 9.5 years ago and another woman of 42 may have been pregnant 1.5 years ago, as, in fact, happened; but such a range is obviously absurd when applied to a woman of 20. From the bare mathematical stratum some positive correlation is bound to appear quite apart from any biological necessity.

Equation VII for 'time since last pregnant' (X_4) gives some numerical measure of the well-known habit of fertility. In parous women of the same age in passing from one group to another group of that age but who have had one child more, the time since last pregnant is decreased by 0.62 years—a time less than, but perhaps sensibly different from the period of gestation. If it were not for a habit of fertility this figure would be expected to be considerably more. For an abortion the figure is a decrease of 0.85 years, which implies that abortion actually has some different effect from a full-time birth. The common term of

abortion is 0.25 years, whereas a normal gestation lasts 0.75 years.

The distribution of 'years since last pregnant' is, however, interesting apart from any question of correlation. The figures at the extremes of the distribution seem bizarre—for instance, one patient was last pregnant between 16 and 17 years ago. The smoothness of the distribution suggests that they are not unlikely —a statement without statistical warrant, however, and possibly wrong. Mere inspection of the table of age plotted against 'time since last pregnant' does not disclose any special group of aborting women in respect of age or 'years since last pregnant.' Some of of these extreme figures might be accounted for by second marriages, but among this group of women, although some re-marriages occur, they do not upset the table severely. This is rather fortunate, for in such a distribution it would be impossible to include such cases.

It is, of course, inevitable that any observer of abortions should think that attempts at contraception are rather hopeless. Women seldom volunteer information, and it was only asked for in cases in which there was a long lapse of years since the last pregnancy. The only method at all popular is that so disastrously used by Onan.* Information on this point when volunteered is generally in quite a different connexion. There seems to be a popular belief that coitus during pregnancy produces abortion while *coitus interruptus* does not make any difference. This is often the key to obscure phrases the patients use. They will tell one, obviously puzzled to account for the abortion and to show their innocence, that when they 'miss a monthly' the husband is always 'very careful,' the latter word having acquired almost a technical meaning.

This distribution (4) has a bearing on any tests which might be applied to methods of contraception. The mean time since last pregnant is 3.45 ± 0.14 years, but the frequency distribution is skew, and a more interesting figure from the individual point of view is the time since last pregnant at which the greatest number of women aborted. Therefore, the mode was roughly estimated by finding the maximum point of a cubic parabola going through the points 26, 42, 46, 22, allowing for the first figure 26 being at 8.5 months instead of six months. This works out at 2.19 years and may be taken as the most likely period at which a woman will abort following a previous termination of pregnancy. From the statistical point of view 50 per cent of women aborted within 2.11 years of the termination of pregnancy, and the period for 75 per cent is 4.07 years. Schemes for testing methods of contraception should, therefore, last five years. Regarded solely as a test, the

time could be shortened for young women and should be lengthened for older women.

It is not easy to grasp the tenor of a correlation table, because the mind becomes rather confused by the occurrence of outlying cases and correlation coefficients for most readers are difficult to understand and have very little bearing. Table 8 summarizes some of the correlation tables considered from the standpoint of age grouped in five-year intervals, so that the effect of the exceptional case is minimized. The outstanding group of women is in the semi-decade 45–50 years. Too much emphasis must not be laid on its figures, for it is only a small group of seven; but the mean number of children, mean number of abortions, and mean time since the last pregnancy obviously do not pass through the curves that would appear to fit the means of the other five-year intervals. Before using any of the figures in Table 8 a reference should be made to the correlation table from which they are taken, for by such means only can a fallacious argument be avoided. Taking the most obvious instance, it might appear that abortion was commoner between the ages of 15 and 20 years than between 20 and 25, but it is quite fallacious to compare one group of women, five in number (1.7 per cent), with a group numbering 44 (14.8 per cent), especially when the group of five contains one exceptional case. Reference to the basal tables is a great safeguard. The meaning of the figures in Table 8, however, is more generally obvious. It is interesting to see that they confirm the general opinion that women between the ages of 40 and 45, if they are still fertile, will have had, on the average, about one abortion between them.

Among the 44 patients between the ages of 20 and 25, 20 women had not been pregnant before and they constitute about 50 per cent of the nulliparous women at all ages, while the remaining 24, who were previously pregnant, account for about 15 per cent only of the whole group at all ages.

Table 8 well illustrates the increase of the spacing of pregnancies with increase of age. The figure for women between the ages of 20 and 25 is about two years, while between 35 and 40 it is about five years. The spacings for the fifth decade of life apparently again decrease. Women of average fecundity do not continue fertile so long, while the women of great fecundity remain fertile and still appear in the table after the 45th year and influence it with their low figures for the spacing of pregnancies. The effect of these fertile women is also seen at the ages 40 to 45, for the mean there is 4.15 years since the last pregnancy. Evidently the less fertile woman has begun to be relatively sterile at about the

age of 40, while the very few fertile women continue to bear children rapidly (besides having had fewer abortions), for the number of children for the group 40 to 45 years and 45 to 50 years of age is ludicrously different—about five children. Five years further on in the table the figure suddenly jumps to a mean number of children of about 10. It is quite plain that the individual women of the 40 to 45 years group could not again appear in five years if a similar table could be made for them then. It is safe to prophesy that only the more fertile women will continue having more children and fewer abortions. If tables similar to these could be made for a large number of women it would be possible to dissect out a group of women of fecund-diathesis in addition to groups of other types of fertility.

A more elaborate analysis of a larger number of cases would yield more interesting and certain conclusions. It would be especially valuable to collect figures year by year and find out the trend of events. It would be futile to do that for the figures of any one hospital.

Conclusions.

1. Abortion is increasing while the birth-rate decreases.

2. In these 300 cases the fate of previous pregnancies as regards abortion was the same as that in the general body of women.

3. The children to abortion ratio in these aborting women will, with the lapse of years, approach the normal ratio.

4. The tables when smoothed into regression planes suggest that about 25 per cent of known pregnancies end in abortion.

5. The average size of a family is of the same order as the average number of children to one abortion.

A fraction of an abortion has no meaning except in a statistical sense. Children being more numerous than abortions, fractions of children, if ignored when statistical results are applied to individuals, do not make so much difference to the numerical sense.

Hence, many women escape an abortion because their child-bearing period has been too short.

6. One abortion does not mean the loss of one child. That is women make up time after an abortion.

7. The birth of a child is obviously equivalent to more than nine months in a woman's life. An increase of one child corresponds to an increase of 1.7 years in age and of one abortion to an increase of 1.4 years.

The two above statements seem irreconcilable, but:—

8. There is a habit of fertility. In women of the same age previous abortion is associated with a greater decrease of the time since last pregnant than is full-time pregnancy. Hence, it would be better to say that there is a habit of conception.

9. There is not much connexion between infertility and abortion.

10. The birth-rate depends on the age of marriage, for two reasons:—

(*a*) The younger the woman, the longer time she has to bear children;

(*b*) The younger the woman, the more closely will the pregnancies be spaced.

11. A purely statistical test of a method of contraception should last five years. And, as a corollary, a test of the deleterious effects of a contraceptive method on subsequent child-bearing should last another five years. The younger the women the shorter are the necessary periods for convincing tests.

The Ætiology of Abortion.

The ætiology and causation of abortion ought to be a very wide subject. Certainly it is very confused. It depends on the attitude of the observer and his special interests and, like all questions of causation, is surrounded by all sorts of logical difficulties. The gynæcologist must obviously have most weight attached to his views, but the student of social conditions can claim a category of causes which may very well be of increasing importance.

For the sake of simplicity the views of the patients themselves were recorded, and when they have any theory as to the cause of the abortion it best fits in with the category of 'efficient' cause (Table 12). The women differ tremendously in their candour, but often a veiled cross-examination in a sympathetic manner, with as much privacy as possible, is very effective, care being taken to use the colloquial or vulgar expressions. Out of 138 patients, 36 were unaware of any cause and denied any interference. Some trivial causes have been ignored; hence, in the 14 patients who ascribed their trouble to falling down, the patients' deduction is believed to be sound. The same observation applies to the three cases in which hard work is given as the cause. One woman said she had had enemata, and her case well illustrates the fallacies which so easily arise. She had had abdominal pain and, when

she visited a welfare centre with a child, she mentioned these pains, saying she did not know whether she was pregnant or not. She was examined and told, in her own words, that she was 'all right,' the phrase meaning, of course, that she was not pregnant. The pains were thought to be due to constipation, and it was arranged that a district nurse should visit her and give her enemata on three successive days. The constipation was cured, but bleeding commenced after the second enema and, when the patient was admitted to hospital the abortion was inevitable. In the treatment of threatened abortion, enemata are used in preference to purgatives. Abortion with no known cause is a common accident. Hence, it is probable that the trouble was abortion from the start. A similar line of argument may apply to many of the patients' statements.

In the same way that many children are taught from their youth that they need a strong purgative once a week, mothers teach their daughters that a pill will bring on menstruation if it seems to be a day late. When women feel a little of the premenstrual malaise and therefore deduce the period is late and 'is going round them,' they clear it out with a strong purgative. It is not a bit surprising that faith in emmenagogues is so widespread. Women, in all innocence, apply the same test if they think they may be pregnant. Quite often, when describing the symptoms of the abortion, they add that three months ago, when a menstrual time should have arrived, they took a pill with no effect and hence knew they were pregnant. Then they go on to deny, apparently truthfully, that anything in the way of interference has since been attempted.

The favourite abortifacients are strong purgatives, especially a world-famous proprietary pill. The large doses that are often unsuccessful seem to show that abortion induced by medical measures is a very uncertain method. Generally, if pills fail, vaginal douching is tried.

Only two women said that they had injected the os uteri externum. One also spoke of the 'little hole at the top' and then said too much, for she showed her deformed right elbow as proof that she could not efficiently interfere with herself. Knowledge of anatomy is very deficient. One woman intent on aborting had the misfortune to squirt lysol into her bladder, producing an intractable hæmorrhagic cystitis. She was admitted with that diagnosis but eventually aborted completely about four weeks after the accident, making it rather difficult to assess the efficiency of such administration of lysol as an abortifacient. The caprice of the aborting uterus is amazing. An unmarried girl was admitted with suppurative appendicitis. When her drained

wound had healed she was allowed to sit out, and the same night she aborted completely. There had been no suspicion of threatened abortion. The sitting out seemed to have precipitated the emptying of the uterus. The opposite extreme is illustrated by the case of a married woman, about five months pregnant, who had bled *per vaginam* for two days but had had no pains. After admission the bleeding continued and seemed to verge on the serious, but examination made it no easier to decide whether the abortion was inevitable or not. The vagina was packed without anæsthesia, and ½ c.c. of pituitrin was injected intramuscularly. Twelve hours later, after very little further bleeding, the packing was removed. There was no subsequent bleeding, and eleven days later she decided to go home, still pregnant.

In Camberwell, lead seems to have lost its reputation, or else it cannot be procured easily. One patient had used mercury and was successfully treated for mercurial stomatitis without aborting. However, she came back in six weeks with an incomplete abortion but denied any further interference. Perhaps the abortion may be assumed to have been mercurial in origin.

Induced abortion is certainly much less frequent than these figures at their face value would suggest. Idiopathic abortion is so common and the human characteristic of rationalization so strong that any estimation of the proportion of criminal abortion is well-nigh impossible. Many of the noxious things were taken or done in innocence, sometimes the woman not knowing she was pregnant. Probably there is, therefore, a small proportion of abortions, especially early ones, which, although self-induced, is not criminal according to law. This group of cases would be eliminated by the spread of knowledge of the physiology of menstruation and gestation.

When skill in sympathetic cross-examination has become sufficient, the patients will often make illuminating remarks which, in the case of induced abortion, are the 'final' causes (Table 13). It is surprising that 15 only out of 300 women should have been unmarried. This proportion of 5 per cent has decreased very markedly since the war. Abortion in the unmarried is not always artificially induced. In one patient the excitement of arranging her wedding caused the abortion, the marriage already having been postponed once because of an attack of influenza. Only 25 per cent of 84 patients definitely said they wanted a child. Generally, in this class, there is more mental suff ring than in patients who desire an abortion. The list of 'final' causes discloses a tremendous amount of misery. Its implications are obvious and comment is unnecessary.

In abortion, the most talked-of ætiological factor, after accidental injuries and criminal procuration, is syphilis. Unfortunately for the whole series the proportion of syphilitic women has not been found. Reliable information as to the proportion of children to abortions in women with a positive Wassermann reaction would have been valuable. The results, as far as they go, seem rather surprising. When this was first suspected an attempt was made at a more systematic investigation.

The serum was tested in 78 cases of abortion in 77 patients: about 60 cases were consecutive (Table 14). It is only safe to compare the syphilitic cases against the whole group. The small number of patients with positive Wassermann reactions makes any analysis as to age, etc., rather futile. The figures suggest, however, that in these 14 syphilitic cases there was no significant difference between the histories of, at least, some of the syphilitics and those of the whole group. The figures for the women with a negative Wassermann reaction merely illustrate the dangers of using a non-consecutive series. There is an overwhelming temptation to ascertain the Wassermann reaction of a woman who has had a sequence of abortions. Such reactions almost always prove negative. If any further work on the connexion between abortion and syphilis were attempted, it would be necessary to make a distinction between syphilitic abortion and abortion in the syphilitic; this might be done by histological examination of the products of conception. In only one case was it possible to make a definite diagnosis of syphilis because the woman had well-marked congenital signs. Usually, a positive reaction came as a complete surprise, and consideration of the sequence of births and abortions seems only misleading. It is sometimes possible, however, to make a tentative diagnosis of syphilis. Syphilitic women seem to become more anæmic during an abortion than the amount of bleeding would warrant. After this observation was first made, the next unaccountable anæmia prompted the remark that the abortion was probably due to syphilis. In a few days the Wassermann reaction was found to be positive. Subsequently, the woman informed the sister privately that her abortion was due to pills and not to a blood disorder. Hence, though the diagnosis of syphilis was correct, the implied causation of the abortion was apparently wrong.

That deficiency of some element or substance in the human diet can lead to abortion is very probable, judging by analogy with other mammals. Such deficiencies might easily be found in a London Borough. In fact, during the time that these cases were observed a pregnant woman, nearing her full time, was

admitted. Some teeth had just been extracted. Her bleeding, spongy gums, vague rheumatism, and rough skin yielded quickly to plenty of fresh food.[9, 10] She undoubtedly suffered from mild scurvy. Her labour followed soon and was uneventful. Her food had been mainly carbohydrate. She had fried fish twice a a week and bacon at the week-ends. Her tea was made with tinned milk. More than one variety of abortion in experimental animals is due to deficiencies or excesses of some substances in their food. The dietary details of the above patient show that such errors may occur in human adults under present conditions.

The physiology of the onset of labour which, superficially at least, seems such a cataclysmic affair is sufficiently obscure. It is known that the uterine muscle is played upon by hormones and various ions.[11, 12, 13] Presumably, the same factors play on the aborting uterus and some lack of harmony allows the abortion to commence. Probably, abortion is more complicated than full-time labour, for the nervous system directly, or via the endocrines, seems to play a bigger part.

Abortion is not only a human problem. Domestic animals have a pre-natal death-rate of the same order as women but generally a little greater. Domestic animals can be investigated more closely and are of more direct economic interest. In particular, the fact and date of conception may be known. And not only in mammals is this the case. A kind of abortion—or at any rate pre-natal death—occurs in marsupials. Paul Kammerer[14] described 'induction of abortion' in salamanders by artificially changing their environment. The Alpine salamander produces two young, one from each oviduct; while the spotted salamander of the plains produces many. If the environment is reversed, then the Alpine salamander produces many young because many of the fertilized eggs do not die. On the other hand, the majority of the fertilized ova die if the spotted salamander from the plains is put in an environment like that of the Alpine salamander.

The maternal side may, of course, be only half the problem. Galen[15] blamed the fœtus. Arthur Robinson[16] goes further back and says that gametes from certain individuals cannot unite, while other gametes can only unite to form an abnormal zygote which will die and be absorbed or else aborted. Abnormalities of the human fœtus leading to abortion are not commonly recognized (except the hydatidiform mole), though sometimes when, from its size, a complete sac is expected to contain an easily recognizable fœtus, careful search with the naked eye fails to find any trace of it. However, suspicion of the degeneration of the human fœtus cannot become a fact unless a prolonged microscopic examination

was made for its remnants. There is a late form of abortion about the fifth month, in which the liquor amnii becomes brown, although the membranes are intact. Two cases only were observed; one of these was a twin pregnancy. The second ovum in a separate sac had clear fluid and was still alive when delivered. Unfortunately, no immediate examination was made of the first fœtus with the brown liquor, but it appeared to be exactly like its twin. It could not have been dead very long.

No micro organism seems yet to have developed the habit of causing a specific abortion in the human being. Epidemic abortion comparable to the B. abortivo-equinus infection of mares and the B. abortus infection of cattle is not known, although both organisms belong to groups pathogenic to man. An epidemic of abortion would be very difficult to recognize because of the great mobility and varied food supply of the human being. Also, in civilized man there is no sexual season, and hence at any one time, and in any one district, there must be few women at the optimum time for abortion to take place.

In aborting women it is reported that complement fixation with B. abortus antigen is commoner than complement fixation with Wassermann substance. All speculation in that direction is idle, for abortion in Malta fever is no more common than in other fevers. Among serums examined at random many (12 per cent) have been found to give a positive reaction to B. abortus antigen.[17,18]

The Treatment of Abortion.

The amazingly varied amount of morbidity caused by abortion, which can be the most trivial illness or one involving life, is disconcerting. It was hoped that by statistical analysis the figures of morbidity might be made to show some underlying uniformity. The correlations between the time of gestation,[19] number of days of symptoms, and number of days in hospital necessary for recovery are insignificant and "all seems unlinked contingency and chance." Morbidity evidently depends mainly on some factors other than duration of symptoms and time. Even these figures are not always determinate and hence are impossible of statistical treatment. Many cases have to be dropped out of the correlation tables because the number of days of treatment is the only certain figure known for the case. Infection with organisms is obviously an important factor. Unfortunately, infection is by no means synonymous with fever. Inevitably, if the infected cases were to be chosen, the length of time taken in recovery would be the most important

criterion of infection. Bacteriological tests of infection are hopeless, for the bacteriology of the vagina and of puerperal states is notoriously in an unsatisfactory condition. It has been found that the question, "Is this organism virulent?" has to be refined to, "Is this organism virulent to this patient in the clinical state in which she is to-day?"[20]

Fever, however, remains the best objective test of infection and division into the two cases of febrile and non-febrile has the advantage of custom. All cases with temperatures above 100.4° were classed as febrile; cases with temperatures of 99.4° or above on three successive days were also classed as febrile. If fever is taken as a guide to the extent of the infection, the classification errs in both directions. A patient who says she has shivered and has a temperature considerably above 100.4° on admission, may, and frequently does, even before her uterus is completely empty, regain her normal temperature and her illness apparently runs an aseptic course. Her influence is to lower the average time of stay in hospital for the febrile patients. In the other direction is the case of the woman who has an enlarged, flabby uterus which discharges foul, purulent lochia and who suffers from hypogastric pain and tenderness. She is undoubtedly infected. She may give no history of having felt feverish. She may not have any rise of temperature, or only irregular spikes below 100.4° on widely separated occasions. This type of case increases the mean number of days of stay for non-febrile patients. If she recovers quickly, the diagnosis is sapræmia; if slowly, the diagnosis is metritis. The same sort of fallacy enters into the well-known classification of complicated and uncomplicated abortion. Who can say where metritis ends and parametritis begins? However clear this may be anatomically, it is impossible clinically. The diagnosis depends on other than anatomical grounds, chiefly on the length of the illness and the degree of fever, and hence the whole question is begged. Not all complicated cases are even feverish. In two cases of apparent salpingitis there was no fever, as defined above. These infected, complicated cases were kept in the hospital 26 days and 17 days before they were judged to be fit for discharge. This length of stay was much above the average for the non-febrile class in which they are included for statistical purposes. The mean length of stay in the non-febrile class is influenced rather heavily and misleadingly by the inclusion of such cases.

There is another difficulty which ought to be surmounted if the figures are to be dealt with logically. Some women are admitted for abortion and it is judged that the abortion is not inevitable. Such a hopeful diagnosis is usually wrong or else the

orthodox treatment is inefficacious. Pregnancy continued in 15 cases only during the same time that 300 cases of completed abortion were treated. The 15 patients who were discharged still pregnant do not, of course, come into the numerical discussion at all. The cases of threatened abortion after a few days usually become cases of inevitable abortion. They belong to the non-febrile class, and when the abortion is completed, spontaneously or artificially, their stay in hospital has been lengthened by the number of days during which the diagnosis became established. Hence, the mean number of days in hospital for non-febrile abortion is raised.

The advocated treatment of abortion,[21] and especially of post-abortum sepsis, seems to be very varied and is urged with a fervour and dogmatism almost theological. Some advise the sole use of serums and vaccines without any local treatment in febrile cases. Others go to the other extreme and advise the use of the sharp curette in all cases, because it presses less on the uterus and, hence, they say, causes less damage and lymphatic absorption. Some use quinine, ergot, or pituitrin, with or without packing the vagina, combined sometimes with partial packing of the uterus. Different disinfectants again are variously rated and applied in all sorts of ways. The explanation, of course, is that abortion presents all sorts of pathological conditions. The various treatments reflect the varied states of the uterus.

The natural course of post-abortum sepsis is not known. Certainly in some cases of febrile abortion there occurs a crisis comparable with that of erysipelas, but this crisis, to the writer's mind at least, does not seem to depend on any recognizable stage in the disease nor on any specific treatment. However, it occurs not necessarily, though sometimes, when the uterus is completely emptied spontaneously or artificially. The fever and crisis of erysipelas show the same waywardness. Often with changes in the fever there is no very obvious concomitant change in the rash of erysipelas, which is yet the diagnostic and main manifestation of the disease. The variability of post-abortum fever and the fairly common occurrence of a crisis make the valuation of various forms of treatment a statistical problem. The parallel between erysipelas and post-abortum sepsis may very well be apt in a fundamental sense, for puerperal sepsis, scarlet fever, and erysipelas follow the same waves of mortality year by year and post-abortum fever doubtless has the same epidemiology.

The examination and diagnosis of women suffering from abortion was treated, as much as seemed expedient, as a routine. A rule, as long as it is designed to be elastic, is very valuable.

Abortion may be a dramatic illness, and, by the use of a routine, both the medical and, that which is just as important, the nursing staff recognize at the first opportunity when something unusual has happened. Immediately on admission the history of the illness was written out and the patients were generally examined, but no pelvic examination was made. They were put to bed in Fowler's position if there was any fever or suggestion of sepsis. In the evening they were given an enema which sometimes causes an abortion. The majority benefit from a dose of chloral during the night. In the morning the vulva was clipped free of hair and the catheter urine examined. In privacy the history was verified and made clearer, if possible. After a peaceful and comfortable night, the woman feels she is in a friendly atmosphere and is inclined to more confidence. A certain interval of a few hours is very valuable for observation of the pulse-rate and the degree of fever, if any. It is well to approach the aborting uterus fearing that the patient is shivering on the brink of a 'streptococcal flood.' Any pelvic examination ought, therefore, to be carried out with the utmost gentleness. A small dose of morphine was often injected. With aseptic precautions the vagina was douched copiously with eusol and a digital examination and an examination with the speculum made. By this time the need for general anæsthesia in any further procedure could be assessed. With these precautions there is little chance of making a bad diagnosis and, in particular, of mistaking ectopic pregnancy for abortion. In fact, the reverse seemed to be the more usual mistake, judging from the presumed maladies with which these patients were admitted. Careful watch was kept for any sign of trauma to the vagina or cervix. In these 300 patients no injuries were seen except in one case in which there was a lysol burn of the vagina. By a careful and routine examination it was possible to get a very good idea of, first, the stage of the abortion and, second, the amount of sepsis and its anatomical spread.

The aborting uterus is a thoroughly unreliable organ. It will neither retain the fœtus nor expel it completely; hence, the weeks or months of bleeding and eventual sepsis to which it condemns its owner.

Treatment is governed by the fear of sepsis and by the fear of hæmorrhage. The latter is of very little moment once the patient is warded. Hæmorrhage and sepsis are both cardinal indications for the emptying of the uterus. In the presence of either it is almost certain that the uterus is not empty. In the case of sepsis, however, the problem is not easy. The dead fœtus and, in practice, much more the dead placenta, forms a rich nidus for the growth of all

kinds of organisms. The defence against them may only too easily be broken down. Every manipulation of a potentially infected uterus ought to be regarded as a vaccination with living organisms. And the dose of organisms depends on the roughness with which the uterus is treated. This is obviously a somewhat exaggerated statement, but a useful attitude of mind. By using this conception it is possible to feel the way just as one judges the dose of vaccine by the reaction produced. In practice it can be taken as axiomatic that, in cases of abortion or post-abortum sepsis, the uterus is not empty. Fortunately, septic uteri do not bleed severely, so that there is no need to indulge in such heroic measures as packing or squeezing an infected uterus.

In the most anxious case of all, with high fever and rigors, the simplest initial manœuvre is an intrauterine douche with a uterine catheter passed very gently through the softened cervix. It is highly improbable that the cervix in such a case would need any stretching. Eusol is acidic and strong eusol is hypertonic. It has the advantage that, when diluted in the cavity of the uterus, as all hypertonic or hygroscopic substances must be very soon, it will not form an enriched medium to increase the head of cocci tending to infect the body. Patents do not find intrauterine douches exhausting even if a large volume, such as three pints of eusol, is injected. Generally there is an immediate subjective improvement which is partly accounted for by the lessening of the fœtor and partly by the soothing properties of the warmth. During the next twenty-four hours the pulse and temperature are watched and give an indication of how drastic any further manœuvre should be. If, however, there is no objective improvement, the next day another hot, copious, strong eusol intrauterine douche should be given.

When emptying a uterus, the hands ought to be used as much as possible and the instruments as little as possible. Frequently the fingers can be used as dilators and are much more sensitive than the dilator held in the fingers or hand. A cervix or internal os uteri split by dilators may give quite troublesome bleeding. If the split is carried too far there is a risk of an abscess forming in the broad ligament, as happened, indeed, in one case. However, in that case the fingers would not have been nearly strong enough to have at all stretched the cervix. Volsella cannot be dispensed with very often. They do comparatively little damage unless they take an inefficient bite of the cervix and are pulled out during the stretching of the cervix with metal dilators. Mere dilatation of the cervix will confer some benefit. Quite a stream of purulent lochia may escape from a septic uterus with a soft cervix, if the

index finger is passed in. The aborting uterus which is septic is never a potential space; it always contains a considerable amount of fluid besides, and perhaps fœtal remnants. Digital examination of the uterine cavity, the size of which can be judged by the amount of movement allowed at the knuckle, gives definite information as to the whereabouts of the fœtal remains. A complete, rather early and collapsed sac can be removed entire with the finger. However, it is better not to attempt tearing off a sessile mass of placenta with the finger. Less damage is done to the uterine wall if the situation of the remains is noted and they are removed with ovum forceps passed into the ascertained site. If necessary, one finger can be used as a guide to the forceps, which finger must be introduced last, for the forceps cannot generally be introduced past a finger. It is quite exceptional not to be able to empty the septic uterus in this way. Any loose detritus left behind can then be washed out with another douche. Whether a general anæsthetic is necessary depends as much on the patient's mentality as on the softness of the cervix. Often a small injection of morphine is all that is needed. If there is any anxiety about the patient's resistance to infection, the steps are spaced out at daily, or longer, intervals according to the amount of reaction. The less infection or reaction, if any, that there seems to be, the more may be done at one sitting and the sooner will the patient recover.

A non-infected uterus can be emptied at once, and offers no problems. If the abortion is late and will resemble a miniature labour it is wise to use bougies and packing to allow of gradual dilatation of the cervix.

It is very difficult to estimate the adjuvant value of drugs in combating post-abortum sepsis. This infection is like erysipelas in that it runs an ill-defined course and sometimes ends with a crisis. With any serious infection, which has no clear therapeutic indications, it is well-nigh impossible not to indulge in fashions or even to rush from one drug to another. Euflavine intravenously, antistreptococcal serum (puerperal), and antistreptococcal globulin (scarlet fever) have been used, and in each case dramatic results could be shown, but of what real value it is impossible to guess.

Concentrated antiscarlatina globulin seems to produce more consistently favourable results, but certainly not consistently dramatic. However, it was the last drug to be tried. The well-known efficiency of new drugs is difficult to explain, and unfortunately tends to diminish.

Ecbolics, such as ergot, quinine, and pituitrin were only used on special occasions. They seemed to be very uncertain in action. It is difficult to persevere in the use of a drug that fails to act

consistently. Quinine, on the aborting uterus, has nothing like the effect that its reputation for inducing full-time labour has imputed to it. Also, the partly hypertrophied uterine muscle appears to be much less sensitive to pituitrin. The effect of the pituitrin may be antagonized by other circulating hormones.

Hæmorrhage during the various phases of abortion may be persistent or severe. A woman who has bled persistently before the abortion became inevitable, frequently will have severe post-abortum hæmorrhage. The indication for emptying the uterus is more urgent in hæmorrhage than in sepsis. The uterus will contract much more efficiently once it is completely emptied. Unfortunately, not all hæmorrhage is controllable in this simple way. A uterus that has been threatening to abort for a month or more seems exhausted and remains flaccid in spite of being efficiently compressed bi-manually. Even if a mild contraction can be induced it fades away and the flaccidity and hæmorrhage continue. The uterus before full time does not respond very well to the intra-muscular injection of pituitrin even if large doses of pituitrin are injected. The smaller post-abortum uterus requires more stimulant than the larger post-partum uterus. If the pituitrin is injected directly into the flaccid uterine muscle the uterus contracts vigorously. The uterine muscle itself is not exhausted. In the physiological train leading to contraction the exhaustion lies further back than the motor tissues themselves. If a finger is in the uterus when the injection is made into the uterine muscle the contraction can be felt to spread through the uterine wall, first as a hard disc about the site of the needle, and then involving the whole uterus. A spontaneous contraction of the uterus is quite different. The uterus seems to harden as a whole and no point of origin of the wave of contraction can be recognized. This suggests that the nervous ganglia take some part in producing contraction. Perhaps uterine flaccidity is not the exhaustion of the uterine muscle but the fatigue of the uterine nervous mechanism. Such a view assumes that when much diluted injected pituitrin arrives by the uterine arteries the uterine contraction is somehow spoilt by the non-participation of the exhausted nerves or, perhaps, by some abnormal state of the vascular endothelium.

Intra-fundal injection of pituitrin was practised many times with uniform success and great relief of mind to those in charge of the patient. Great care was always taken. The uterus was always known to be empty, by digital exploration. The risk of rupturing an empty uterus by a pituitrin contraction is probably infinitesimal. Presumably the risk of rupture would mount tre-

mendously with the volume of contained material—a consideration following immediately from hydrostatic principles.

Intra-fundal injection is easily carried out. In practice, with the patient in the lithotomy position, part of one hand in the vagina presents the fundus of the uterus above the pubes against the abdominal wall. The uterus is pressed with the other hand against the symphysis so that the fundus of the uterus stands out as a small rounded prominence or at least is palpable as such. There can be hardly any risk of omentum or small gut intervening between the uterus and anterior abdominal wall. It is reassuring to make a milking action with the external hand to insure the absence of gut. The hypogastric skin is disinfected and the needle is thrust into the uterine fundus. The skin and the anterior sheath of the rectus form the only obstructions. The uterine muscle is entered with a peculiar grating sensation which is also transmitted to the hand pushing up the uterus from the vagina. Within ten seconds, the uterus, however flaccid, contracts and the bleeding stops. The manœuvre involves some compression but not nearly enough to stop bleeding. Confessedly, control injections of saline have not been tried and, in fact, would have been unjustifiable.

The injection can be given to unanæsthetized patients, and is no more painful than any other subcutaneous injection. An intra-fundal injection induces no painful uterine contraction. But injection of pituitrin into the cervix *per vaginam* produces a painful contraction which is said to be like a miniature labour pain. The fundal injection produces a sustained contraction and bleeding does not recur. Involution seems to proceed normally with a natural discharge of lochia. This method of giving pituitrin has obviated the need for packing the vagina or uterus for hæmorrhage, a procedure that seems so very undesirable and apparently does not become necessary if intra-fundal pituitrin is used.

In gynæcology this method of administering pituitrin has a use in the treatment of sub-involution of the uterus. After dilatation and curettage the cavity of a sub-involuted uterus is often found to be a space larger than a hen's egg. Intra-fundal pituitrin will cause the uterus to contract and stop the bleeding. The uterine muscle is shocked into reacquiring its habit of rhythmic contraction. There must, of course, be some time limit to this reaction of the sub-involuted uterus to intra-fundal pituitrin. The contraction will depend on the amount of elastic tissue that has replaced uterine muscle.

Table 15 is a statistical statement of the number of days of symptoms, the term of gestation, and the length of time in

hospital. The cases have been divided into three categories and then separated into febrile and non-febrile cases. There is no unnecessary complication, and many misapprehensions of the figures would take place if the cases were grouped with any less precision. Below the mean figures is another set of figures in italics showing the root mean square deviation of the observations from their average value. An idea of variability of the cases can be obtained from these figures. It would be dangerous to argue from any of the means, which show a large root mean square deviation, as to the value of treatment, especially if the mean is based on a small number of observations. In the writer's view, the best method of treatment is early and gentle evacuation of the uterus, if possible without an anæsthetic. The figures do not consistently support this opinion. That was the method chosen for the more serious cases.

I have to thank Mr. E. W. G. Masterman, F.R.C.S., the Medical Superintendent of St. Giles's Hospital, for permission to use this material. It is with great pleasure I acknowledge his encouragement and help and also that of my former colleagues, especially Miss E. J. Legerton Smith, M.B., and Miss M. A. Baker, M.B., who took down so many of the records.

APPENDIX.

A. Five patients admitted twice for the same abortion.

52824 and 52103:

1. A married woman of 29 who had had five children and two previous abortions. Her last menstrual period was 75 days before admission. Thirteen, nine, and six days before admission she bled *per vaginam*. Seven days after admission she decided to go home; bleeding had stopped. Thirty days after discharge and 102 days from the last menstrual period she was readmitted, having passed a fœtus at home that day. The next day an adherent placenta was removed under general anæsthesia. Her second period of admission lasted seven days and was non-febrile.

54143 and 54709:

2. A married woman of 28 who had had five children and not any previous abortions. Her last menstrual period was three months before admission; she had had pain and a brownish discharge

for two days. On the day after admission she passed a placenta without help other than that of an enema. She was discharged 12 days later, apparently cured, after a non-febrile course. Twenty-two days after discharge she returned for bleeding *per vaginam*. The next day she was curetted under general anæsthesia and small placental remains were found. She was discharged cured in 11 days after a non-febrile course.

56282 and 56951 :

3. A single woman of 35 who had had six children and not any previous abortions. Her last menstrual period was 22 weeks before admission. Eight weeks before admission she had been admitted for treatment for gonorrhœa. Her Wassermann reaction was found to be positive. Two days after admission she aborted completely and was judged to be cured 12 days later, when she was discharged. Sixteen days later she returned, saying she had been bleeding for 13 days. She did not receive any local treatment for her uterus. She was discharged, 15 days after her admission, after having been treated for anæmia and syphilis.

61043 and 61712 :

4. A married woman of 26 who had had one child. For five days she had had a yellow discharge and pain. On admission she passed a sac the size of about a six weeks' gestation. Six days after admission she still had a brown discharge but she insisted on going home. She returned with bleeding 24 days later and was curetted the next day. Nine days after the second admission she left hospital. Her illness was non-febrile throughout.

63466 and 64622 :

5. A married woman of 40 with four children and six previous abortions. Two days before admission bleeding commenced, 13 weeks after the last menstrual period. The next day the placenta was removed with ovum forceps under general anæsthesia. On the eleventh day she was discharged, apparently cured, after a non-febrile course. Twelve days after discharge she returned with rigors and an apparent violent septicæmia. The Wassermann reaction was negative and her blood was sterile. Her uterus was bulky and very soft. It was douched on the second day of readmission and 40 c.c. of 0.5 per cent euflavine were injected intravenously. On the fourth day her temperature was below 100.4 for the first time and was normal after the sixth day. As a precautionary measure she was not discharged until 36 days after readmission.

B. Two patients died.

58895 and 58979:

A married woman of 40 who had had eight children and not any previous abortions. She was 21 weeks pregnant, and three months before admission she had lost a little blood. On the day of admission she had lost a teacupful of blood before admission. Examination disclosed no sign of placenta prævia, though, of course, that was the most probable diagnosis. The bleeding rapidly ceased, but on the tenth day recurred, and stopped at once. On three separate days before sitting out on the thirty-first day she bled a very little. On the thirty-second day she got up, and her exercise was gradually increased until the thirty-ninth day, when she was discharged. She was given a card and a telephone number so that she could return by ambulance without any formalities. Four days after discharge her husband returned at noon to find her bed soaked in blood. She died at 5 p.m., one hour after admission, during which time the fœtus was passed. The placenta was removed manually from a site about midway up the anterior wall of the uterus. There was a black clot adherent to part of it.

No use had been made of the special facilities for rapid readmission.

57677:

A married woman of 27 who had had four children and not any previous abortions. For four days before admission she bled and had rigors. Immediately on admission, before reaching the ward, she aborted. On the third day after admission she was curetted and died three days later.

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TABLE 1.—Number of Cases of Abortion admitted to St. Giles's Hospital.

Year	Births (Borough of Camberwell)	Abortions (St. Giles's Hospital)	Proportion Births to Abortions	Ectopic Pregnancy (St. Giles's Hospital)
1923	5657	118	47.9 : 1	3
1924	5146	130	39.6 : 1	11
1925	4877	116	42.0 : 1	7
1926	4584	147	31.2 : 1	12
1927	4232	144	29.4 : 1	7
1928	4135	177	23.4 : 1	11
1929	3934	170	23·1 : 1	5

TABLE 4.—Showing number of children (2) and number of previous abortions (3)

Number of previous abortions (3)	Number of children (2)															Total.
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
0	41	49	38	28	18	8	8	6	3	2		4	1	1			207
1	6	8	9	10	10	6	3			2	1			1		1	57
2	2	5	5	3	2	2		1			1						21
3		1	1	2		2	1						1				8
4																	0
5		1			1												2
6					1												1
7																	0
8			1	1													2
9				1													1
10				1													1
Total	49	64	54	46	32	18	12	7	3	4	2	4	2	2	0	1	300

TABLE 6.—Showing number of children (2) and years since last pregnant (4)

Years since last pregnant (4)	Number of children (2)																Total.
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
0—1	3	5	4	6	3	3	1							1			26
1—	2	11	7	5	8		6	2					1				42
2—		16	8	5	5	6		1		3		1				1	46
3—		5	7	4	2	2		1				1					22
4—		5	2	5	2	2								1			17
5—		3	4	1	2						1						11
6—		8	1														9
7—		3	2	4													9
8—																	0
9—				1													1
10—	1			1													2
11—			1														1
12—		2	1														3
13—																	0
14—			2														2
15—																	0
16 - 17		1															1
Total ...	6	59	39	32	22	13	7	4	0	3	1	2	1	2	0	1	192

TABLE 7.—Showing number of abortions (3) and years since last pregnant (4)

Years since last pregnant (4)	Number of previous abortions (3)											Total
	0	1	2	3	4	5	6	7	8	9	10	
0—1	11	8	3	1			1			1	1	26
1—	23	11	5	3								42
2—	24	16	4	1		1						46
3—	18	2	1	1								22
4—	13	4										17
5—	8	2	1									11
6—	9											9
7—	9											9
8—												0
9—		1										1
10—		1	1									2
11—	1											1
12—	3											3
13—												0
14—	2											2
15—												0
16—17	1											1
Total ...	122	45	15	6	0	1	1	0	0	1	1	192

TABLE 8.– A summary of some of the Correlation Tables.

		Age groups (semi-decades)								
	Age in years	15—	20—	25—	30—	35—	40—	45—	Total	Mean
Whole group of women	Number of women	5	44	82	74	59	26	7	297	
	,, ,, ,, (percentage)	1.7	14.8	27.6	24.9	19.9	8.7	2.4		31.48 years
	Mean number of children	0.00	0.61	1.68	2.96	3.88	3.57	10.29		2.79 children
	Mean number of abortions	0.20	0.14	0.32	0.61	0.75	1.08	0.71		0.52 abortions
Women not pregnant before	Number of women	4	20	11	5	1	0	0	41	
	,, ,, ,, (percentage)	9.8	48.8	26.8	12.2	2.4	0	0		24.74 years
Women pregnant before	Number of women	1	20	59	52	38	17	5	192	
	,, ,, ,, (percentage)	0.5	10.4	30.7	27.1	19.8	8.9	2.6		31.95 years
	Mean number of years since last pregnant	1.08[1]	2.15	2.87	3.31	4.89	4.15	2.10		3.40[2] years

1. Actual observation of 1 case — not a mean.

2. The small discrepancy between this average 3.40 years and the estimate of the same average $M_4 = 3.45$ years arises because in the preparation of this table the group of women who were pregnant less than one year before were assumed to have been pregnant 0.5 years before and not 0.85 years as they were more accurately assumed to be for the calculation of the mean M_4.

TABLE 9.

Correlations for 300 cases admitted :—

$M_1 = 31.47 \pm 0.26$ $\quad \sigma_1 = 6.65 \pm 0.18$
$M_2 = 2.79 \pm 0.10$ $\quad \sigma_2 = 2.67 \pm 0.073$
$M_3 = 0.58 \pm 0.051$ $\quad \sigma_3 = 1.30 \pm 0.036$

$r_{12} = +0.666 \pm 0.022$
$r_{13} = +0.187 \pm 0.038$
$r_{23} = +0.085 \pm 0.039$

$X_1 = 26.5 + 1.6X_2 + 0.67X_3$
$X_2 = -5.66 + 0.27X_1 - 0.083X_3$
$X_3 = -1.28 + 0.046X_1 - 0.034X_2$

Correlations for 297 women admitted :—

$M_1 = 31.48 \pm 0.26$ $\quad \sigma_1 = 6.68 \pm 0.18$
$M_2 = 2.79 \pm 0.11$ $\quad \sigma_2 = 2.68 \pm 0.074$
$M_3 = 0.52 \pm 0.044$ $\quad \sigma_3 = 1.13 \pm 0.031$

$r_{12} = +0.667 \pm 0.022$
$r_{13} = +0.231 \pm 0.037$
$r_{23} = +0.097 \pm 0.039$

$X_1 = 26.4 + 1.6X_2 + 1.0X_3$ I
$X_2 = -5.74 + 0.27X_1 - 0.14X_3$ II
$X_3 = -0.95 + 0.051X_1 - 0.043X_2$ III

TABLE 10.

Correlations for women who had been pregnant before :—

$M_1 = 32.03 \pm 0.26$ $\quad \sigma_1 = 6.32 \pm 0.19$
$M_2 = 3.23 \pm 0.11$ $\quad \sigma_2 = 2.61 \pm 0.077$
$M_3 = 0.61 \pm 0.50$ $\quad \sigma_3 = 1.19 \pm 0.036$
$M_4 = 3.45 \pm 0.14$ $\quad \sigma_4 = 2.83 \pm 0.097$

$r_{12} = +0.621 \pm 0.026$ $\quad {}_{34}r_{12} = +0.722$
$r_{13} = +0.183 \pm 0.041$ $\quad {}_{24}r_{13} = +0.377$
$r_{14} = +0.236 \pm 0.046$ $\quad {}_{23}r_{14} = +0.529$
$r_{23} = +0.023 \pm 0.042$ $\quad {}_{14}r_{23} = -0.286$
$r_{24} = -0.174 \pm 0.047$ $\quad {}_{13}r_{24} = -0.484$
$r_{34} = -0.251 \pm 0.046$ $\quad {}_{12}r_{34} = -0.397$

$X_1 = 22.5 + 1.7X_2 + 1.4X_3 + 0.95X_4$ IV
$X_2 = -5.21 + 0.31X_1 - 0.48X_3 - 0.38X_4$ ... V
$X_3 = -1.35 + 0.10X_1 - 0.17X_2 - 0.19X_4$ ... VI
$X_4 = -5.92 + 0.37X_1 - 0.62X_2 - 0.85X_3$ VII

TABLE 11.—Showing the observed frequency distribution of abortions contrasted with the expected calculated from Poisson's series.

Number of previous Abortions	Frequency					
	Number of Patients			Number of Cases		
	Observed		Expected Poisson Series	Observed		Expected Poisson Series
0	207		176.26	207		167.97
1	57		91.96	57		97.42
2	20		24.00	21		28.25
3	8		4.17	8		5.46
4	0		0.54	0		0.79
5	2			2		
6	1			1		
7	0	5 and over	0.07	0	5 and over	0.11
8	1			2		
9	0			1		
10	1			1		
Totals	297		297.00	300		300.00

TABLE 12.

Causes to which patients attributed their abortions: generally the "efficient" cause of the abortion.

A.	Unaware of any cause, and denied interference		36
B.	Shocks or non-local injury.		
	Fell down	14	
	Motor accident	3	
	Works hard	3	
	Lifted heavy weight	2	
	Fit of temper	1	
	Made a serious mistake in employer's cheque	1	
		—	24
C.	Physical disabilities.		
	Cough	3	
	Cough and constipation	1	
	Pneumonia	2	
	Prolapse of uterus	1	
	Influenza and pessary	1	
	Sea-sickness	1	
		—	9
D.	Local injuries.		
	Vaginal douche	14	
	Vaginal douche combined with salts, female pills and ergot	4	
	Enemata	1	
	Married six days before abortion	1	
	Glycerine injection into cervical canal	1	
	"Instrumental." Not confessed	3	
	Wooden knitting needle	1	
	Crotchet hook	1	
	Slippery elm	1	
		—	28
E.	Poisons or other noxious things.		
	World famous proprietary pill alone	8	
	,, ,, ,, ,, and salts	4	
	,, ,, ,, ,, and douches	4	
	,, ,, ,, ,, and enemata	1	
	,, ,, ,, ,, and a fall	1	
	Mercury blue pills	1	
	Quinine and eau de Cologne	1	
	Salts	4	
	Salts and senna	1	
	Castor oil pills	2	
	Castor oil	2	
	Female pills	5	
	Liver pills	1	
	"Acochia" pills and salts	1	
	Large white special pills	1	
	Black pills called No. 17	1	
	Occasional pills	1	
	Aloes and myrrh pills	1	
	Gin for stomach-ache	1	
		—	41
			138

TABLE 13.

Remarks made by patients: sometimes the "final" cause of the abortion.

Child not wanted	12
Indifferent to children	8
Poverty.	
Husband out of work	4
Cannot afford	3
Only two rooms	2
Only one room	1
Marital troubles.	
Unmarried. (N.B.—out of 300 cases)	15
Separated	4
Deserted	1
Too many children; husband unkind	1
Married after pregnancy began	1
Obstetric fears.	
Continual vomiting	1
Repeated instrumental deliveries	1
Husband out of work; adherent placenta twice	1
Too frightened to syringe this time	1
Youngest child is 14; afraid of ridicule	1
Too busy nursing mother	1
Child not wanted so soon after other child	3
No more children wanted, but unaware of pregnancy	2
Wanted a child	21
	84

TABLE 14.—Showing number of children and abortions of some syphilitic patients.

	Number of patients	Number of children	Children per patient	Number of Abortions	Abortions per patient	Ratio of children to abortions.
Whole group	297	830	2.80	155	0.52	5.36 : 1
Wassermann positive	14	35	2.50	6	0.43	5.83 : 1
Wassermann negative	63	176	2.79	55	0.87	3.20 : 1

TABLE 15.—Durations of symptoms and number of days in hospital.

		Treatment.	Number of Cases.	Time in weeks.	Days of symptoms before admission.	Days elapsed between abortion and admission.	Days after admission when uterus was finally emptied.	Days in hospital.	Days in hospital after emptying uterus.
Abortion of fœtus before admission	Afebrile 100	Anæsthetic	73	10.7 *3.8*	18.1 *15.7*	17.8 *25.2*	1.6 *3.3*	11.6 *5.8*	10.0 *4.3*
		No anæsthetic	14	9.9 *4.1*	12.9 *16.0*	3.7 *5.7*	1.4 *1.2*	10.6 *5.2*	9.2 *5.1*
		Expectant	13	11.5 *3.6*	15.7 *21.1*	12.7 *20.3*	—	10.6 *2.9*	—
	Febrile 69	Anæsthetic	52	12.1 *3.5*	14.5 *15.8*	9.5 *16.7*	2.8 *5.2*	16.6 *10.4*	13.8 *9.1*
		No anæsthetic	11	10.8 *3.9*	7.7 *6.5*	11.5 *10.3*	6.7 *14.6*	21.8 *17.7*	15.1 *7.3*
		Expectant	6	18.0 *4.4*	4.2 *1.6*	2.5 *2.8*	2.0 *3.1*	12.8 *5.4*	14.8 *6.2*
Abortion of fœtus on day of admission	Afebrile 51	Anæsthetic	30	14 3 *5.3*	6.7 *11.4*	—	1.6 *2.4*	10.4 *2.0*	8.8 *1.7*
		No anæsthetic	8	15.5 *7.1*	0.9 *0.6*	—	1.9 *2.5*	13.5 *5.4*	11.6 *5.6*
		Expectant	13	17.0 *5.7*	3.1 *5.5*	—	0.1 *0.0*	9.6 *1.6*	9.5 *1.4*
	Febrile 13	Anæsthetic	8	15.0 *5.6*	6.3 *9.7*	—	1.3 *1.9*	16.9 8.4	15.6 *6.1*
		No anæsthetic	3	13.0 *3.7*	5.0 *6.4*	—	2.3 *1.7*	17.3 *6.5*	15.0 *5.1*
		Expectant	2	20 0 *4.0*	2.0 *2.0*	—	0 *0*	19.0 *5.0*	19.0 *5.0*
Abortion of fœtus after admission	Afebrile 36	Anæsthesic	22	14.9 *4.4*	14.6 *16.8*	−3.4 *3.7*	4.2 *4.9*	14.2 *6.4*	10.0 *3.0*
		No anæsthetic	2	14.5 *3.5*	6.5 *3.5*	−1.0 *0.0*	4.0 *3.0*	16.5 *2.5*	12.5 *0.05*
		Expectant	12	18.2 *7.3*	8.5 *16.2*	−2.8 *2.4*	2.8 *2.4*	12.8 3.7	10.0 *3.8*
	Febrile 21	Anæsthetic	10	16.6 *5.3*	8.3 *12.2*	−5.6 *5.5*	11.2 *13.6*	33.7 *22.6*	22.5 *18.6*
		No anæsthetic	4	20.7 *4.0*	22.0 *22.9*	−4.0 *3.0*	8.2 *7.0*	20.2 *5.7*	12.0 *1.9*
		Expectant	7	14.6 *3.6*	3.6 *4.4*	−1.8 *1.4*	1.8 *1.4*	18.4 *6.3*	16.7 7.0

Symptomatic abortion	3
Admitted twice ...	5
Died	2
	300