Studies of
maternity services

In the beginning

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Contents

Introduction

This collection of essays has a common theme. It consists of accounts of research and studies which have been commissioned within a sector of medical care arrangements, unique in the sense that it is mainly concerned with the healthy at the stage where individual human life can be said to begin, and when a host of linked facts can be recorded at the beginning of a new life.

Yet, for all the common theme, in introducing the essays one must reluctantly eschew the temptation to pull together the various conclusions written from markedly different viewpoints and from different experiences and disciplines, and refrain from making a series of cosmological observations: for the main conclusion to be drawn from the collection is how inadequate is our basic information. It is still not possible well in advance of birth to identify those pregnancies which will require major attention on the part of specialist obstetricians and there is uncertainty at a critical stage of the natural history of the individuals who are the material of the medical care studies which are presumed to provide the basis of national policies. What this particular exercise has reinforced is the belief that there is need for intense scientific cultivation of sectors of medical care from which there tends to be over-frequent crops of confused thinking, because of rooted prejudices and emotive growths.

Thus ten or more years ago when the demand for maternity beds was rising significantly not only as a consequence of the rising birth-rate but also because of the publicity given to the feeling that it was important to have a high percentage of beds available related to births, a great deal of attention was paid to the policy of early discharge. Less attention was paid to the

quality of services necessary to support the kind of 'bed' implied in the high standards presumed in the general theory which demands a high percentage of births taking place in hospital beds. Yet the quality of the supporting services is all, and cannot be determined by the unqualified equations of beds in teaching hospitals with those, say, in cottage hospitals.

Because it appears that the GP is the person who is mainly responsible for giving advice to pregnant women in which environment they should be delivered, he is thus a member of a key group of people in the National Health Service whose actions or inactions may above all affect perinatal and neonatal mortality, as well as the general care of the high-risk group of women. Yet it seems that seldom is the GP concerned with the development of obstetric policy in a particular area. If he is to do the job adequately he must be kept fully informed about the incidence of risk and the outcome of care in the groups at greatest risk.

It may well be, as is suggested by the few examples so far recorded, that better information will direct attention to the quality of the supporting services and at the same time by aiding the discussion of a policy for a particular area, unite the members of the different professions concerned in health services in a common objective.

When the exercise was first reported as under way, three fields of inquiry were specifically mentioned—the *supply of resources*, the *selection for confinement*, and the *general information system*.[1] Because of the falling birth rate it is doubtful if the first of these has call on a high priority for administrative action. A *better selection* for confinement would appear to depend very much on more information about the care of the foetus and more acute identification of high-risk groups. This needs more clinical and social research related to the antenatal period. In addition to biochemical and biological research however, what is evidently needed above all is a *better information* system related to better defined populations. This is so evident that a special exercise by the Trust was initiated, leading to the submission of proposals to the

1. Shegog, R. (1966) in *Problems and Progress in Medical Care*, **2** (ed. Gordon McLachlan) (London: O.U.P. for Nuffield Provincial Hospitals Trust).

Registrar-General for the improvementof the information which is recorded at birth. We are confident that these proposals will in fact soon be officially accepted and a mechanism developed to provide the basic information on which vigorous policies for the improvement of all medical care can be based.

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Progress in the 1960s and problems for the 1970s

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Progress in the 1960s and problems for the 1970s

Mortality in children has generally declined since the earliest historical period for which data are available. The extent of the decline has been less marked and the date of its onset later in historical time, the earlier the age range we consider. It seems reasonable to conclude that our ability to control the adverse circumstances of early life has been relatively late in developing and relatively less effective than our capacity to control the circumstances of later life. The differences in our relative success at different human ages seem likely to stem from three considerations. One, the relatively greater sensitivity to environmental insult at earlier stages in development, two, the inaccessibility of the individual from the point of view of aetiological study during the most crucial period in development, and three, the special problems involved in the provision of medical care during the first ten months or so of human existence. All three considerations have influenced progress in the past decade and are likely to be central to the problems of the immediate future.

An additional consideration which complicates each of the three already enumerated has been that responsibility for dealing with these considerations has not unequivocally been accepted by any branch of the medical profession. Medical involvement in midwifery began at a period in history when the early postnatal environment was so hostile that it was reasonable to regard the foetus as relatively safe so long as he remained in the uterus and to focus attention much more sharply on the mother for whom pregnancy and child-bearing was a hazardous adventure. Thus, obstetrics became coupled with gynaecology and the care of the early human individual has been entrusted to a

branch of the profession which also accepts responsibility for the surgery of the female pelvis and the disordered physiology of the menopause.

It will be useful, therefore, to consider progress in the 1960s and problems for the 1970s under the following four heads: The capacity of the foetus to survive; the perinatal environment; foetal access to medical care; and medical practice and the foetus.

The capacity of the foetus to survive

In the present discussion of recent progress and likely future problems four discussion points are selected. These are (*a*) inherited defects, (*b*) accidents around conception, (*c*) accidents during organogenesis, and (*d*) the capacity to grow.

a. INHERITED DEFECTS, in this discussion, are those arising from factors transmitted directly from the parents. It has become usual to suppose that because of the effects of selection the contribution of parental genes to foetal death must be small. In respect of single gene effects this view is difficult to controvert but there are at least two kinds of genetic mechanism which may provide means by which lethal selection may be avoided. For one of these mechanisms we have direct evidence of its occurrence in man; for the other, its widespread operation in other wild species makes it at least plausible that it also occurs in man.

The first mechanism is chromosomal translocation which is now known be the basis of a small but interesting proportion of cases of Down's syndrome and which, in less gross forms, may be relatively common. The occurrence of normal offspring with balanced translocations will do much to counter any lethal selective effect of the unbalanced condition. At present chromosomal techniques are inadequate for the demonstration of any but gross translocation defects but it seems possible that the next decade may produce advances in technique comparable with those of the last decade. There would be some advantage in being able to detect chromosomal anomalies of this kind since any morbidity associated with them is in principle preventible.

A more intractable mechanism involves effects which may be due to combinations of genes. Selection operates less stringently against these since potential variability may be realized by recombination in the offspring of survivors of a stringently lethal selection. Such recombination will depend on the spatial distribution of the relative genes on their chromosomes. The evidence for such systems in other species is strong and the likelihood of their existence in man is great. However, the difficulties which have prevented us from actual demonstration of such mechanisms in man are also likely to frustrate preventive medical applications even if there should be a substantial increase in our knowledge.

Selection operates against individual lethal traits and therefore against the responsible single genes. Although this means that defects attributable to single genes are likely to be rare there is nothing to prevent the collective effect of a number of such single genes from being substantial. Since there are probably fewer distinguishable effects than there are genetic causes it is possible that more foetal mortality and morbidity has a genetic origin than is commonly supposed. Increased understanding of the operation of adverse genetic factors can confidently be expected in the next decade. The extent to which such understanding will lead to preventive or therapeutic action is much more difficult to predict.

At present, early antenatal diagnosis is possible in relation to only a few conditions and is not wholly free from hazard. Cytological examination of amniotic fluid is, however, a promising line of inquiry which may have useful results in the next decade.

b. ACCIDENTS AROUND CONCEPTION include errors in the transmission of genetic information from the parents, errors in the fertilization process, and errors in the initial stages of division immediately after fertilization. The term 'accident' is here used to imply that we lack any systematic understanding of the causation of these events.

An important phenomenon is what Edwards (5) has called 'uterine selection'. There seems little doubt that the prevalence

of anomaly shortly after conception is very much greater than it is at birth. This can be inferred from the high proportion of aborted foetuses which exhibit gross anomalies and from the discrepancy between expected ratios of affected to unaffected and the ratios actually encountered. This raises the possibility that eventually we may be able to harness and control the selective powers of the uterus to preventive ends.

c. ACCIDENTS DURING ORGANOGENESIS may have their origin at an earlier stage but the use of the term 'accident' implies our lack of knowledge of the causal processes involved. The complexity of the process which, in the space of a few weeks, generates a recognizable human being from a unicellular zygote clearly affords a large number of opportunities for derangements to occur. Present knowledge offers us little reason for expecting that we shall come to understand these disorders within the next decade. Perhaps the most important preventive possibility in relation to disorders arising at this stage lies in the avoidance of unnecessary medication of women. Approximately 1 in every 30 women of child-bearing age is at any time harbouring a foetus undergoing organogenesis.

d. THE FOETAL CAPACITY TO GROW is fundamentally important to its capacity to survive. Although immaturity is substantially determined by environmental causes and will be discussed in this context in the next section there is evidence that foetal growth capacity may be impaired in some morbid conditions; for example, it seems likely that part of the low birth-weight in Down's syndrome is of foetal rather than maternal origin (8). An impaired capacity to grow is probably not an important determinant of immaturity in otherwise normal foetuses. It remains possible that it contributes substantially to gross immaturity which is so important a correlate of perinatal mortality. The demonstration that the distribution of birth-weight departs from normality and apparently contains a separate distribution of low birth-weight (2) raises the possibility that severe immaturity may have discrete causes differing from those causes which

determine the general distribution of birth-weight. To any extent that these are foetal rather than maternal they are likely to prove difficult to elucidate.

Perinatal environment

The term 'perinatal' is most commonly used to imply that a morbid process was present when a child was born, or arose shortly after birth. The causes of perinatal morbidity in this sense may therefore be either antenatal, intranatal, or postnatal, in their timing. Since this distinction is convenient in relation to the aetiological influences involved the present discussion will be continued under these three heads.

a. ANTENATAL ENVIRONMENTAL INFLUENCES affecting health and normal development comprise what is probably the largest single category of insults to which the human individual is subjected. Evidence of the importance of antenatal environment in man is overwhelming. Many individual diagnostic categories of perinatal morbidity exhibit marked associations with such indices of environmental influence as maternal age, order of birth, social class of the parents, season of birth, maternal nutrition, maternal infection, and maternal medication. It will be convenient to consider them in three groups: transmaternal influences, intramaternal influences, and influences affecting maturity at birth.

Transmaternal influences are those which reach the foetus from outside its mother. Although only a relatively small number of such influences are known at the present time it seems likely that they are representative of a larger range of influences which will eventually be discovered. Infection may reach and damage the foetus *in utero*; rubella virus is a well-established example, while there is good evidence that listeriosis and toxoplasmosis are important. Influenza virus has come under legitimate suspicion but the evidence that it produces specific effects upon the foetus is still equivocal. A good example of a drug capable of influencing the foetus is, of course, thalidomide. But others are either under suspicion or are so obviously capable of foetal

damage that their use during pregnancy is rare. The influence of X-irradiation on the growing foetus is now well established although it seems likely that untoward consequences of such irradiation are mostly delayed beyond the immediately post-natal period. Cigarette smoking has now been demonstrated as capable of retarding foetal growth. The search for other agents capable of damaging the foetus is currently very active.

Intramaternal causes of foetal morbidity are more difficult to specify in detail. Although maternal conditions are often considered important in determining foetal morbidity, relatively few such conditions have been adequately distinguished as inimical in any specific way. Toxaemia of pregnancy, placenta praevia, and diabetes are among the more important, but since progress in relation to morbidity arising from these conditions has been substantial, steady rather than spectacular progress may be expected in the next decade. What seems more important is the possibility that there exist conditions whose significance is presently unknown but which may prove to be significant and preventible causes of morbidity to the foetus. If progress is to be made in this area it seems likely that new research techniques will become necessary. At present much of our ignorance in this field derives from the great difficulty of studying the interaction between the foetus and its environment with any precision.

The influence of the antenatal environment on foetal growth has been the subject of extensive research and more is known of the factors determining birth-weight than of those concerned with almost any other attribute of the new-born. Unfortunately, although the influences determining the distribution of birth-weight are quite well known we remain remarkably ignorant of possible influences determining exceptionally low weight.

It is obvious that birth-weight must be determined by the rate of foetal growth and the duration of gestation. It is also now well recognized that immaturity at birth may be due to impaired growth, early delivery, or both. The low birth-weight associated with some forms of congenital malformation seems to be predominantly attributable to impaired foetal growth

while the low birth-weight associated with placenta praevia, for example, is due to an early onset of labour. It is not altogether surprising that we lack any detailed understanding of all the processes involved but we have good evidence of the importance of maternal size, parity, and placental size, in determining the observed distribution of birth-weight.

The possibilities that we shall be able to prevent exceptionally low birth-weight do not seem promising and although the early survival of seriously immature infants has been substantially improved by new techniques of post-natal care it is still the case that immaturity is associated with poor prospects of survival as well as physical and intellectual impairment for survivors.

Despite the steady accumulation of knowledge of the significance of the antenatal environment it is still unfortunately the case that the medical and health care of the foetus is a rudimentary branch of the practice of medicine. The function of antenatal care remains no more than educational and selective. In a majority of cases antenatal care consists of little more than a routine screening for the early detection of pre-eclamptic toxaemia, multiple pregnancy, and gross malformation, following an initial appraisal of the likelihood of hazards associated with delivery. If the antenatal care of the human individual is to become as effective as post-natal care we shall need very considerable extensions of our existing knowledge.

b. THE INTRANATAL ENVIRONMENT has proved much more tractable. Not only do we know much more of the hazards likely to be encountered but also we are far better able to intervene so as to avert their effect. So far as concerns delivery itself, the practice of obstetrics has made a reasonably successful transition from a preoccupation with maternal hazards, to a concern for the safety of the child. It is becoming rarer to encounter midwives who pride themselves on being able to avoid an episiotomy or a tear regardless of the foetal damage which may be the price of such an achievement. An important reason for the satisfactory progress has been the general tendency for delivery in hospital to become the normal rule.

However, accidents still occur during the process of delivery, often because of an inadequate opportunity for medical examination of the parturient mother during the early stages of labour. If the obstetrician has been able to make an adequate examination he now generally has techniques at his disposal adequate to ensure a safe delivery, if not by the vaginal route, by hysterotomy. Advances in the safety of anaesthesia and of operative procedures have made an important contribution to progress during the past several decades. Improvements in techniques for assisted extraction have also reduced the mortality and morbidity associated with emergency deliveries of this kind.

Nevertheless, difficult labour, placental and cord conditions, and birth injuries account for more than one-quarter of perinatal deaths and more than one-tenth of infant deaths. There is clearly room for improvement even if the means of its accomplishment are far from easy to suggest.

c. THE POST-NATAL ENVIRONMENT is, in this context, taken to include only the first few hours following birth, and the more important part of that period is probably the first few minutes. Asphyxia and atelectasis account for nearly 15 per cent of perinatal deaths and whatever their origins their outcome is determined in the very early post-natal period. Considerable advances have been achieved in the treatment of these conditions and provided that treatment is instituted sufficiently promptly it seems able to exert an important effect. Nevertheless, there is room for improvement in the treatment. An interesting advance in this respect has been the use of hyperbaric oxygen which produces results comparable with intra-tracheal intubation despite the insecure physiological foundations upon which the new treatment rests.

Many of the underlying conditions which may have been already determined at the start of the post-natal period are amenable to modification of the severity of their effect by suitable post-natal procedures. This is particularly true of immaturity although few advances have been made in the treatment of this condition since the great strides were taken in the

1940s and 1950s. It seems possible that some of the antenatal damage associated with prematurity is irreversible. Whatever improvements there are likely to be during the next decade it is unfortunately likely that there will remain a residue of intractable problems of the post-natal period.

Foetal access to medical care

Although it is clear that for a large part of the period of human life with which we are concerned, the possibilities of medical care are limited by lack of medical knowledge it is also an important problem that foetal access to such medical care as is available is often unsatisfactory. Any adult patient's access to medical care is affected by his or her attitude to such medical care or to illness. In the case of the foetus, access to medical care is affected by another person's attitudes.

The traditional belief that babies are safe while they remain in the uterus and that obstetric care is directed principally to mothers, is inappropriate now that mothers are at relatively little risk while babies are at substantially greater risk before than after birth. The survival of this tradition may result in pregnant women taking the need for medical care insufficiently seriously. This is certainly a problem in multiparae whose previous experience may make them disregard the possible hazards to their child. It seems possible that some of the social class differences, in seeking obstetric care, are due to the continued tradition which reassures a reasonably healthy woman that all will be well for her.

Most studies of foetal access to obstetric care have used the simple criterion of delivery in hospital as an index of the quality of the care received. Since, as we have seen, substantial opportunities to influence foetal health are largely confined to the intranatal and early post-natal periods it is certainly clear that hospital delivery is a very important element in successful obstetric care. Britain is unusual, although not unique among western nations, in not regarding the hospital as the only acceptable place in which to be born. Although the proportion delivered in hospital is fast approaching 100 per cent in Scotland

the proportion lags somewhat behind this in England and Wales. Policy concerning delivery in hospital is generally based on the criteria of the Cranbrook and Montgomery Reports which imply selection for hospital delivery of pregnancies where the foetus is considered to be at greater than average risk. Access of the foetus to hospital care is, therefore, governed by attributes of the mother or her pregnancy, and the extent to which the relevance of these attributes is accepted, interpreted, and implemented.

There is no doubt that in practice, confinement in hospital is not completely related to assessable risk. A study in Glasgow (7) showed that in that city more than 90 per cent of the births were associated with generally acceptable indications for hospital delivery. Selection for hospital delivery was inefficient. In Glasgow, social conditions contribute little to the chances of hospital delivery, and even an adverse obstetric history has little effect; for example, more than 40 per cent of mothers having their fourth or later child were not delivered in hospital, and a history of previous abortion is associated with a hospital confinement rate below that for all births. The proportions delivered in hospital vary among the social classes; the highest proportion being in social class I mothers, and the lowest in social class V. This association is independent of the effect of parity differences among the classes.

Social class differences in perinatal mortality are, of course, large. In fact, the social class of the mother accounts for a larger part of the variance in perinatal mortality than any other identifiable attribute of the pregnancy or delivery. The difference is so great that if all classes enjoyed the perinatal mortality rates now enjoyed by social class I we should save twice as many lives as are lost in road traffic accidents at all ages. This grossly unequal distribution of a major component of all mortality (more deaths occur in the week of birth than in the next thirty-five years of life) together with the unequal access of foetuses to obstetric care has prompted a number of investigations into the whole question of effective utilization of available maternity services.

There seems some evidence (see pp. 73–8 of the present work) that the attitude of expectant mothers to hospital confinement is conditioned by their understanding of its availability. It is improbable that they will see it as available unless those responsible for determining the place of confinement make it clear that hospital delivery is not only desirable but also easily possible. The experience of Aberdeen where a planned policy has not only transformed the proportion of deliveries in hospital but also the perinatal mortality rate demonstrates that mothers can be persuaded to use a service which is seen to be freely available. There is considerable evidence that the availability of a hospital bed for confinement is not pressed upon expectant mothers in many regions of the country. Elsewhere in this work (pp. 69–73) evidence is provided of the role of the medical profession in determining a woman's decision concerning where she wishes to be delivered of her child. It seems clear that a concerted effort on the part of the medical profession, as a whole, could achieve a very much higher proportion of hospital confinements.

The actual number of beds available is not in itself a limitation on the possible proportion of hospital confinements. However, there is a limit to the shortening of the average duration of stay that is possible unless adequate provision can be made for domiciliary puerperal care. There have been many approaches to a solution of this problem and all must necessarily involve the provision of domiciliary nursing care for the puerperium. If we continue to insist that such nursing care must be provided by qualified midwives we shall always face the problem that such midwives must be found opportunities for the professionally more rewarding tasks of actual assistance at delivery. An integrated obstetric service could very well provide such opportunities and there is considerable evidence that this is possible even within the present administrative framework of the National Health Service.

It may always remain a problem that precisely the mothers who are most in need of intensive obstetric care and hospital delivery (especially multiparae) will prefer delivery elsewhere

than in hospital. One approach involves a clear identification of the determinants of such maternal attitudes and a health education programme designed to convince mothers that it is in the interests of their child, rather than of themselves, that they should be delivered in hospital. Research into the formation of maternal attitudes in this respect is currently proceeding in a number of centres (see pp. 73–6) and there is hope that suitable educational programmes will become possible during the next decade.

Meanwhile, the problem of reluctance to enter hospital for delivery will remain. It is determined not only by maternal attitudes but also by the practical exigencies of family life in relation to schoolchildren and working husbands. The experimental unit in Salford (described on pp. 165–77) offers a possible means by which the essential features of hospital delivery can be provided while retaining many of the advantages to mothers and their attendants of home delivery. The success of such schemes will depend quite crucially on the efficiency with which mothers can be selected for delivery in either a full specialist hospital or a unit having immediate access to hospital facilities in case of emergency. The Salford experience suggests that efficient selection is possible and that transferral of patients to the specialist unit is less inhibited than when delivery takes place in the patient's home.

It has sometimes been suggested—possibly because of the experience of the Netherlands—that confinement in hospital is not important in itself but only because, in this country, it represents an index of the quality of total pregnancy care. Those who have made this point have suggested that it is probably the quality of antenatal care that is really important and that there is a tendency to postpone the seeking of antenatal care until relatively late in pregnancy. Butler and Bonham (3) showed that the perinatal mortality rate was substantially increased among infants whose mothers had received no antenatal care and increased to a lesser extent where relatively few antenatal visits were recorded. In Glasgow (7) a less consistent picture emerged, although categories with exceptionally high perinatal

mortality rates were those who had had no antenatal care, those in whom the week in which antenatal care was started was unknown, and those whose antenatal care was provided by their own doctor only but were delivered in hospital. The latter group is heavily selected so as to include emergencies of late pregnancy or delivery. The perinatal mortality rate among those with no antenatal care was appreciably higher where they were delivered in hospital rather than at home. This is also presumably due to late transfer to hospital in consequence of emergencies. Analysis of the relationship between perinatal mortality and the quantity and timing of antenatal care is, unfortunately, complicated by the likelihood that antenatal care is sought earlier and visits are made more often by mothers in respect of whom some known obstetric risk complicates their pregnancy and consequent care. Such a group would be expected to have a high perinatal mortality.

There, nevertheless, seems little doubt that there are advantages to the foetus who has early access to antenatal care. Later in this work (pp. 87–94), the special group of 'late bookers' are examined and it is concluded that 30 per cent of late booking is attributable to illegitimate pregnancy, and high parity is also involved in a substantial proportion of the cases. In general, what Vaughan (9) has called 'a poor attitude to antenatal care' is a principal reason for delayed and infrequent attendance. Robertson and Carr (p. 99) found that 40 per cent of late bookers would have booked earlier had a grant of £10 been made conditional on early booking. This conclusion must, however, be viewed with caution since it is based on retrospective opinion rather than actual behaviour. The general findings of both Vaughan, and Robertson and Carr, suggest that unsatisfactory antenatal attendance is part of a generally unsatisfactory attitude to health-related behaviour.

It is probable that the whole question of the health and medical care of the foetus before, during, and after birth, is best tackled by considering the various phases as part of a total programme of foetal health care. The issues of antenatal care and hospital confinement are complexly interrelated.

On the basis of experience in Aberdeen, Baird (1) has recently proposed a maternity service based on health centres with GP obstetricians having hospital appointments and specialist obstetricians playing an over-all supervisory role for an area obstetric service. Baird stresses the necessity to combine excellence of clinical practice with an 'imaginative approach to the patient and her personal problems'. Such an organization might make the maternity services a model for co-operation in the health service as a whole instead of, as at present, a good example of the administrative muddle which characterizes our National Health Service.

Medical practice and the foetus

It was suggested earlier that the entry of the medical profession into the practice of midwifery occurred at a time when foetuses were relatively safer than infants and it was the mother who was more at risk from pregnancy and delivery. Thus, the specialty of obstetrics became combined with that of gynaecology while the specialty of paediatrics tended to be excluded from the care of the child at the most crucial stage in its development. The function of obstetric services is surely to seek to maximize the proportion of all conceptions that result in a live, healthy, and wanted child. A measure of our present lack of success in this endeavour is provided, even at a crude level, by the observation that in the world as a whole between one-quarter and one-half of all human individuals die before the end of their first year of post-natal life, while in this country the proportion is not much lower than one-fifth. Although most societies tend to adopt an attitude of resignation towards what they take to be unavoidable, our present complacency about reproductive wastage will almost certainly be seen by future generations as barely credible.

If this enormous wastage of human life is to be reduced we shall need more than the new knowledge suggested by the earlier sections of this essay. There is good reason to believe that we could make a quite substantial improvement in the situation by a better-organized maternity service and a different attitude to

the health and medical care of the foetus. A specialized branch of the practice of medicine seems to be justified to deal with the period from shortly before conception to the end of early childhood. In some areas, collaboration between paediatricians, obstetricians, and family planning advisers, points the way to how such a branch of medicine might be developed.

The first important requirement is that the medical profession should concern itself much more with the problem of conception control. At present, advice on contraception is far too frequently held not to be a medical concern except in the context of maternal ill-health or unfavourable personal social circumstances (4). It is clear that the medical profession still regards contraception as a convenience for parents rather than part of a programme devoted to the health of children. Now that a choice of reasonably effective contraceptive methods is available the medical profession should regard unwanted pregnancies as failures in the health and medical care of the next generation. It is extremely doubtful whether the small amount of morbidity associated with oral contraceptives is at all comparable with the morbidity likely to arise in a next generation, a substantial proportion of which were not welcomed by their parents.

The reluctance of many doctors to promote the practice of contraception may stem from their own ignorance. There seems to be little teaching of this subject in medical schools and many doctors owe what knowledge they have of the subject to personal experience. It is not surprising that they are reluctant to advise patients who may very well be more knowledgeable than themselves. There would seem to be many advantages in teaching contraception as a part of the course in child health. Similarly, in medical practice there would be an advantage in associating family planning with child health rather than with personal sexual convenience.

The problem of termination of pregnancy is a difficult one. Few people can regard it as anything but an unsatisfactory alternative to prevention. However, whether a pregnancy is unwanted because the foetus can be identified as in some way impaired or for any other reason, it has now generally been

agreed that termination of pregnancy is acceptable. Hostile attitudes to termination derive from a feeling that the convenience of the mother is being put before the life of the child. It may be more useful to regard termination as a means of avoiding the child morbidity which is so frequently attendent on being unwanted. Arguments against termination of pregnancy based on the fear that gynaecological resources will be overloaded, overlook the fact that delivery at full-term is the only alternative to termination and its consumption of resources is even greater. A practical approach to the problem of providing for termination of pregnancy would be to include such procedures as part of the work of a child health service.

There would be much to be said for a general inculcation of the attitude that a pregnant woman is the temporary biological custodian of a future citizen whose capacity for a rewarding and productive post-natal existence is crucially dependent on his early care. A concentration of obstetric practice on the foetus might be promoted if it became usual for paediatricians to take a part in antenatal care, or perhaps for obstetricians to forsake their association with gynaecology and accept responsibility for the first weeks or months of their charges' post-natal life. The latter course might well have advantages but, in any case, experimental developments of these and other kinds would be worth fostering, especially if careful evaluation could be undertaken.

As in so many aspects of our professional practice in medicine today, we are slow to adjust to radically changed situations. The respective responsibilities of obstetricians, paediatricians, GPs and midwives, tend to follow lines dictated by tradition rather than by the changing needs of their foetal patients.

Conclusions

The main feature of the last decade in relation to maternity services has been the general recognition of the importance of perinatal morbidity and mortality, and of the influence of maternity care on their prevalent levels. In addition to recognizing the importance of the problems, we have begun to assess their complexity and the range of researches that will be relevant to any

programme of improvement. We have begun to assemble a central body of knowledge deriving from genetics, physiology, embryology, pharmacology, psychology, and sociology, which will be necessary if a rationally based programme is to be devised.

The next decade will require further extensions of our knowledge, not only of the techniques that it will be necessary to apply, but also of the circumstances which have conspired to limit the application of existing knowledge. The considerable variation in perinatal mortality within Britain must be mainly due to variations in the quality of medical care available to foetuses. Just as we have a responsibility to a post-natal child even where parental attitudes are not co-operative, so we must increasingly assume similar responsibilities in respect of the foetus. The toll of mortality and of disability associated with inadequate foetal care represents a major part of the total human toll. We have now recognized this and have demonstrated in favoured areas how it can be reduced. The problem for the 1970s is how to co-ordinate the resources of scientific investigation and clinical practice so as to reduce the disease toll of the first year of human existence to dimensions more commensurate with the second and subsequent years.

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The analysis of regional variations in infant and perinatal mortality rates

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During recent decades numerous attempts have been made to evaluate factors influencing variations in perinatal and infant mortality in England and Wales. Researchers have largely confined themselves to examining variations within and between such factors as parity, age, birth-weight, gestation period, social class, confinement, etc. There have been few attempts to ascertain the role such factors play in explaining regional variations, and in these the validity of the techniques used has been open to question. It is the object of this paper to review some of the techniques available for a regional study and to point out the problems of applying the methods, interpreting the results, and obtaining suitable data.

The paper is divided into three sections: an examination of the post-war trend of perinatal and infant mortality, a review of multiple regression analysis, and the application of a binary multiple regression to regional data.

Post-war trend

The object of the trend analysis was to examine the annual decline in infant and perinatal mortality and to attempt to explain any significant deviations. Unfortunately attempts to explain the trend in terms of the social and biological factors known to affect infant and perinatal mortality were prevented by lack of data over a sufficient period. The period chosen over which to study the regional trends was from 1946 to 1964—regional mortality rates are not available for an earlier period. The analysis involved determining mathematically the curve which would best fit the data. A cursory examination of the raw

Table 2.1. *London and South-eastern Region. Tests for best degree polynomial curve*

Source	*DF*	*Sum of squares*	*Mean square*	*Variance ratio*
TOTAL	18	328·99		
X	1	229·65	229·65	
Error	17	99·34	5·84	
X, X^2	2	229·67	114·83	
Error	16	99·32	6·21	
Increment of X^2	1	0·02	0·02	
X, X^2, X^3	3	253·85	84·62	
Error	15	75·14	5·01	
Increment of X^3	1	24·18	24·18	4·83[1]
X, X^2, X^3, X^4	4	254·59	63·65	
Error	14	74·40	5·31	
Increment of X^4	1	0·74	0·74	0·14

1. Significant at $p = 0{\cdot}05$.

data suggested that either a logarithmic or polynomial curve would best fit the infant mortality series. Tests indicated that the logarithmic curve explained a greater percentage of the variation. The perinatal series did not respond to a logarithmic or any other transformation, and consequently polynomial curves were fitted. The tests for the best degree of polynomial are given in Table 2.1. The addition of X^4 into the equation does not increase the fit of the curve significantly (cf. X^3). The curve which offers the best fit is the cubic polynomial:

$$Y = a + b_1X + b_2X^2 + b_3X^3.$$

Figures 2.1, 2.2, and 2.3 show the raw data for perinatal and infant mortality from 1949 to 1964, the fitted curves, and their confidence limits. The regions shown in the graphs of Figures 2.1, 2.2, and 2.3 were chosen as they represent the regions with the lowest and greatest ranges. It is interesting to note how the differences between their trends has decreased over time. Social and clinical improvements appear to be reducing the differentials. The confidence limits represent the 95 per cent zones of significance. If any deviation from the fitted curve falls outside these limits, it is 95 per cent certain that it is significant. No such deviations occur for infant mortality, but for perinatal mortality the years 1948, 1949, 1950, 1951, 1957, and 1960 were significant in London and the South-east, and 1950 and 1961 in the South.

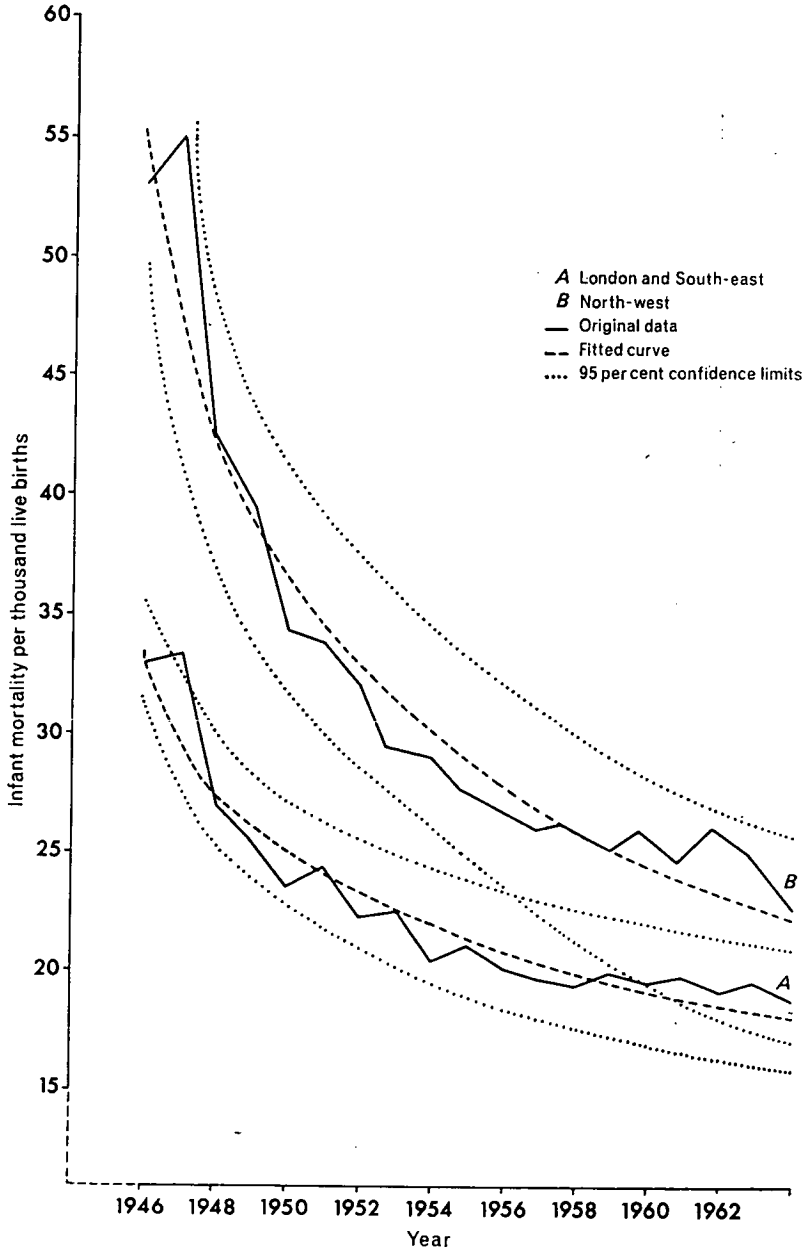

Figure 2.1. Infant mortality 1946–64

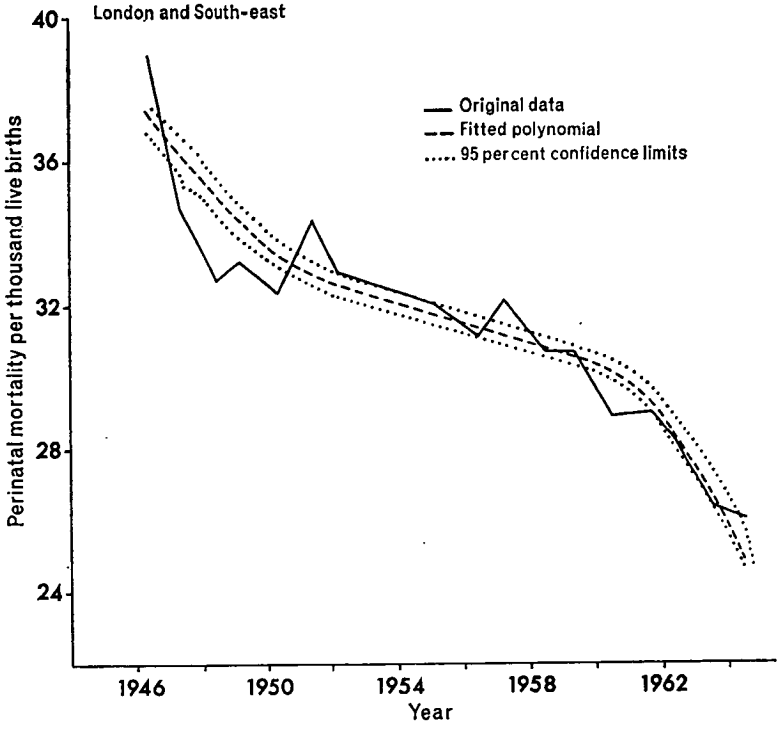

Figure 2.2. Perinatal mortality 1946–64

Unfortunately a time-series analysis using various socio-economic variables to explain these deviations is not possible since adequate data are not available.

A prediction of infant mortality using the logarithmic curve would give a rate which becomes progressively lower, but which is asymptotic to the axis of the graph. Prediction of perinatal mortality with the aid of a polynomial curve raises two questions. First, is the polynomial fit merely a mathematical abstraction; second, can the perinatal rate be reasonably expected to behave in the future as it has in the past? The answer to these questions ought to lie in an explanation of the marked 'bump' in the curve between 1950 and 1957. If the 'bump' can be attributed to a specific cause of death, it would be possible to assess the probability of it occurring in the

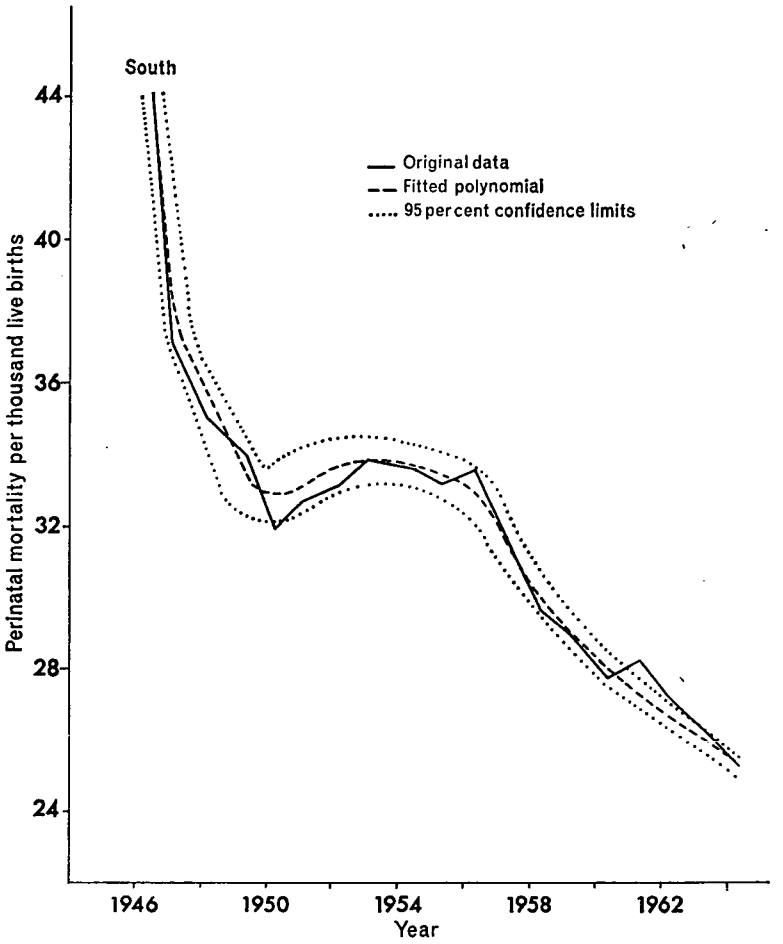

Figure 2.3. Perinatal mortality 1946–64

future and consequently to establish the viability of a polynomial fit as a method of prediction. An examination of the still-birth and early neonatal time-series showed that the 'bump' can be entirely attributed to still-births. Attempts to relate this 'bump' to specific causes of still-births were prevented by the absence of the relevant data.

A different approach was adopted in an attempt to relate variations in mortality rates with those of the mortality from

Table 2.2. *Percentage of total infant and neonatal deaths*

	Infant	*Neonatal*
Pneumonia	14·32	6·02
Bronchitis	2·26	0·30
Congenital malformations	21·10	19·61
Birth injury	10·23	14·71
Immaturity	16·42	23·27
Haemolytic disease of new-born	1·94	2·74
Post-natal asphyxia, atelectasis	14·69	20·93
Gastro-enteritis	2·47	0·43
	83·43%	88·00%

various causes. This involved comparing the standard deviations and coefficients of variation of the mortality rates with those of the rates for some causes of death. The causes of death and the percentage of the total infant and neonatal deaths they account for are shown in Table 2.2. The causes of death were chosen as they account for a large percentage of total deaths. In Figures 2.4, 2.5, and 2.6 the standard deviation of the regions from their mean is shown to decrease with time. This characteristic is common to most of the mortality trends which fall over time. It indicates that as the rates become lower they are less sensitive to extraneous influences and that factors which used to explain variations in the level of mortality are becoming progressively less important. The coefficient of variation, however, has remained fairly steady over the period, and this indicates that, though the differences between the regions are lower than in the past, the *relative* disparity between the best and the

Table 2.3. *Correlations of the coefficients of variation*

	Early neonatal	*Late neonatal*	*Infant*	*Post-natal*
Pneumonia	0·4614	−0·5177	—	—
Congenital malformations	0·3840	0·3688	−0·0054	−0·3386
Birth injury	0·3297	−0·0118	0·1318	—
Immaturity	0·6080	−0·3271	0·0296	—
Haemolytic disease	0·1663	−0·2842	−0·248	—
Post-natal asphyxia	0·3198	−0·0227	−0·5618[1]	—
Bronchitis / Pneumonia	—	—	0·4397	0·8165[1]
Gastro-enteritis	—	—	0·1656	0·3554

1. $p = 0{\cdot}05$.

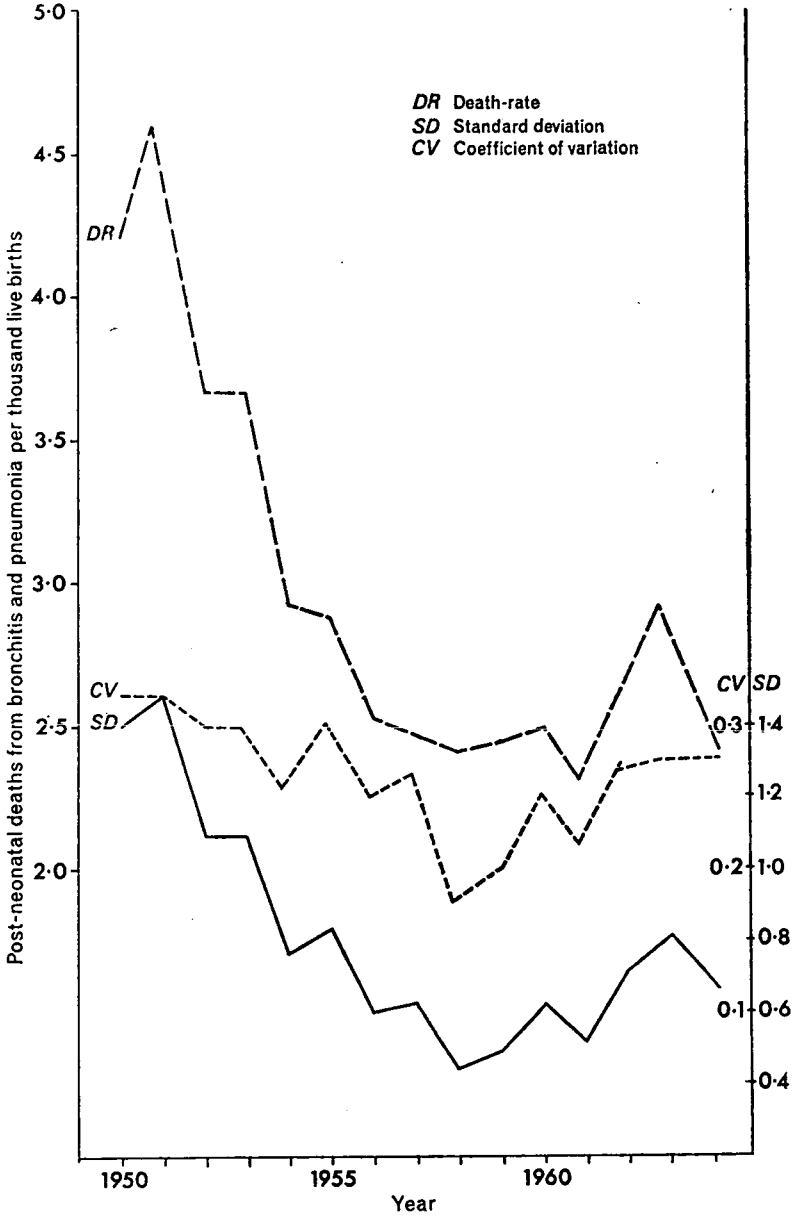

Figure 2.4. Post-neonatal deaths from bronchitis and pneumonia, England and Wales

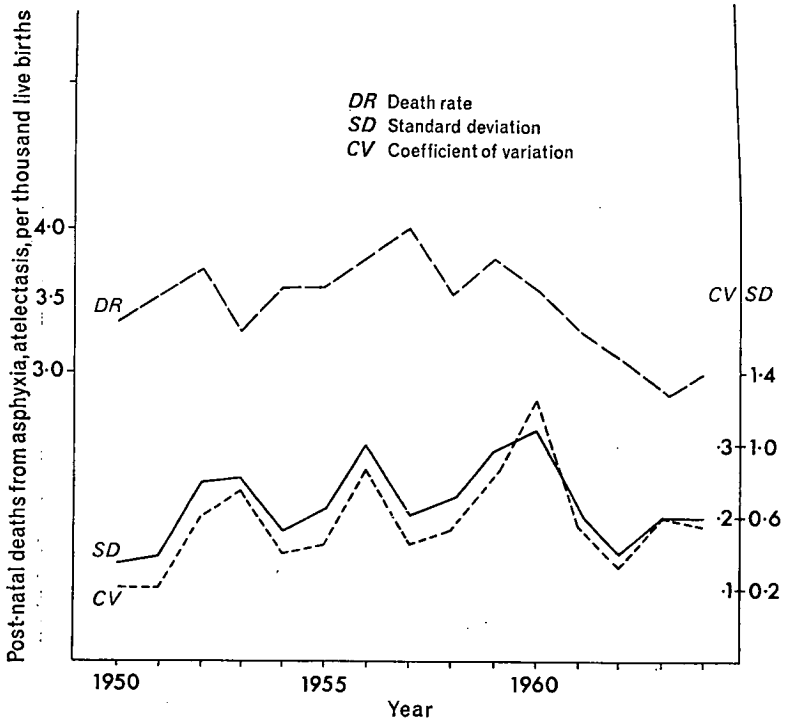

Figure 2.5. Infant deaths from post-natal asphyxia, atelectasis, England and Wales

worst remains unchanged. Whilst the 'extraneous influences' are less important in absolute terms, they still serve to maintain the relative disparities between regional infant and perinatal mortality rates.

The correlations between the coefficients of variation of various mortality rates and some causal mortalities are shown in Table 2.3. They serve to indicate which causes appear consistently to give rise to deviations from the mean mortality rates. Deaths from immaturity (Figure 2.6) play an important role in explaining the pattern of variation of early neonatal deaths. There is evidence that immaturity is a function of social conditions, and consequently these variations may be explained in terms of unemployment, female employment, etc. As expected, respiratory diseases (bronchitis and pneumonia) only begin to play an important role in the late and post-neonatal periods

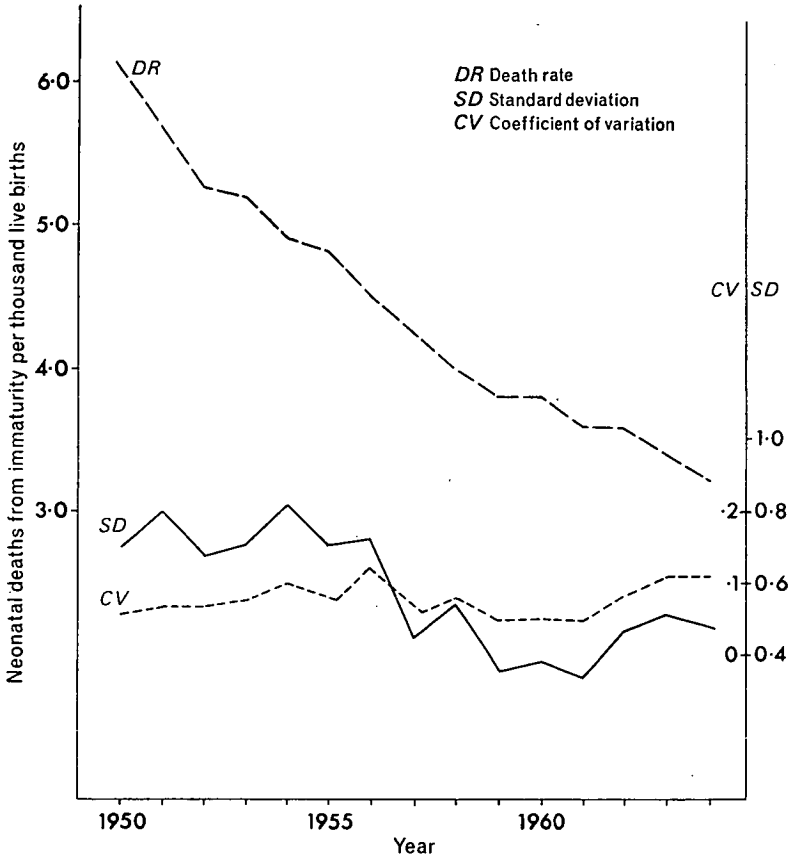

Figure 2.6. Neonatal deaths from immaturity, England and Wales

(Figure 2.4); in earlier periods they are dwarfed to insignificance by such causes of death as congenital malformation, immaturity, etc. The one anomaly is deaths from post-natal asphyxia and atelectasis (imperfect expansion of the lung at birth). Only this appears to be significantly correlated with the infant mortality rate, whereas it would be expected to bear a close relationship with early neonatal mortality. One interpretation is that it exists from birth, but causes death at regular intervals in the areas with a poor social environment. Evidence for this hypothesis is that post-natal asphyxia, atelectasis, in 1964 accounted for 17·2 per cent of infant deaths in the North-west Region and only 13·4

and 14·6 per cent in the East and South Regions respectively. The deterioration of the social environment towards the north of England is a reasonable interpretation of these phenomena.

Multiple regression

The method of multiple regression is concerned with an investigation of the dependence of one variable on a linear combination of one or more independent variables. For instance, if infant mortality (Y) is the dependent variable and live birth rates for social class V (X_1) and parity 4+ (X_2) are independent variables, then the regression equation takes the form:

$$Y=a+b_1X_1+b_2X_2+\mu.$$

This relationship is only valid if the points of X_1 and X_2 respectively plotted against Y take a linear form. The coefficients a, b_1, b_2 are constants which must be determined from the data, and μ is an unknown random variable (residual deviation) which is a measure of the departure of Y from exact linear dependence on X_1 and X_2.

The object of this analysis was twofold. First, it was hoped to ascertain the structural relationships between explanatory variables and the mortality rates and, second, it was intended to construct an efficient prediction model.

Any attempt to explain the differences between regional mortalities must ultimately depend upon the availability of explanatory variables. However, while it would be illuminating to measure the effects of the degree of antenatal and post-natal services, the obstetric history of the mother, etc., it has not been possible, for the data are either not available or are related to hospital regions and not standard regions. An additional problem arises in so far as the effect of any one variable may depend upon its interaction with another, and consequently where only one of the variables is available, results are non-significant or nebulous. The midwifery service is the paradigm of these problems. Statistics are only available by hospital regions, and any attempt to aggregate subdivisions of these into standard regions is complicated by the fact that hospital catch-

ment areas ignore local authority and county boundaries. Furthermore, it is difficult to isolate hospital staffing because hospital services, beds, turnover, etc., are also factors which interact with staffing. Again priority of admission is related to medical policies which vary between hospitals irrespective of the supply of staff. Ideally a statistical analysis ought to take account of all these variables and more besides.

EXPLANATORY VARIABLES

Previous research has indicated that the most important variations in infant and perinatal mortality (8) fall into the following groups—biological, social, and obstetrical. Variations within these areas have been well documented, but the part they play in explaining regional differences has, so far, been relatively ignored. It was intended to assess the relative importance of the three groups by examining the relationships of representative variables with both infant and perinatal mortality. The variables are discussed briefly below:

Biological (4, 9, 10, 11).

1. *Parity.* Three parity groups were used—parity 0, 1–3, and 4+.

2. *Age.* Four age-groups were obtained—age 15–25, 25–30, 30–5, and 35–45.

Social (1, 2, 3, 4, 10, 11).

1. *Socio-economic groups.* An obvious index of social conditions is the Registrar-General's five-point social classification. Unfortunately it was not possible to use this as the number of live births by social class was not available by standard regions. Instead, the seventeen socio-economic groups were reclassified into two classes: groups 1–7 and 8 and 10 were aggregated to form a higher and a lower socio-economic group respectively. The proportion of economically active males was obtained from the 1961 Census.

2. *Female employment.* The percentage of female employees aged between 15 and 65 was obtained from the *Abstract of Regional Statistics.*

3. *Unemployment.* The percentage of registered unemployed was extracted from the *Abstract of Regional Statistics.*

Obstetrics

1. *Place of confinement.* These data were obtained from the Registrar-General's Office and grouped into home and hospital confinements. It was hoped that variations in the number of hospital-booked deliveries would explain a part of the mortality variation.

Attempts were made to obtain other variables but without success. The *Birthday Trust Report* (17) indicated that hospital staffing was important in regulating perinatal mortality. Unfortunately, efforts to obtain midwifery data and data on the quality of hospital staffing failed for the reasons mentioned above. Attempts to obtain data on birth-weight (7), length of gestation, and height and weight of the mother (6) met similar difficulties. It seemed likely that regional variations of mortalities from pneumonia, for instance, are climatically conditioned. Data on relative humidity and temperature was obtained from the *Annual Summary of the Monthly Weather Report.* Regional averages of temperature and relative humidity were calculated from the individual meteorological stations and these were correlated with infant and perinatal mortality for the years 1950 and 1960. Results were non-significant, probably because it is virtually impossible to obtain accurate regional averages from arbitrarily distributed and few meteorological stations. Most counties have only one or two stations and the location of these can critically bias regional averages.

The maximum length of time over which these variables were simultaneously available was 1957–61, the study was restricted to this period.

The analysis of the standard regions has an initial considerable problem. With the possibility of fifteen variables in the regression and only eleven regions on which to base the analysis, any results would be completely untenable. To build a reliable model it is necessary to increase the number of observations. One possibility is to pool the five-yearly observations. This is

not a permissible procedure since it violates the assumption that the observations for each year are independent—i.e. it assumes that the difference between, for instance, the Northern Region and the Southern Region in 1957 is the same as that between the Northern Region in 1957 and 1958. The solution to this problem lies in the use of five dummy variables—one for each year (13). The observations were pooled and given a value of 1 if they fell in 1957 and 0 otherwise; this gave the first dummy variable. The same procedure was applied to the remaining four-yearly dummy variables. This means that the number of observations is effectively increased to fifty—sufficient to obtain efficient regression estimates.

Since a straightforward regression analysis assumes that the relationships between the mortality rates and the variables are linear, the variables were plotted against the mortality rates in order to establish the form of the relationship. All the relationships appeared to be approximately linear, and in cases of doubt the offending variables were transformed into logarithms and correlated. The correlation coefficients were no greater than those obtained from the untransformed data.

The matrix of simple correlation coefficients is shown in Table 2.4. As can be seen a number of variables are significantly correlated with the mortality rates. At a first glance, some interesting structural relationships seem to emerge from a regression analysis. Unfortunately the analysis is not quite so simple, since the independent variables themselves are also highly intercorrelated, especially those which are significantly correlated with the mortality rate. Expressing the situation in the formal sense, the position is characterized by the presence of excessive multi-collinearity (see the Appendix).

The remedy lies in the acquisition of new data which could break this multi-collinearity deadlock. Unfortunately a paucity of data prohibits this. However, whilst this situation prohibits the analysis of structural relationships, it does not impede the derivation of a relatively efficient prediction model, provided that the multi-collinearity may reasonably be assumed to continue in the future (13).

Table 2.4. *Correlation coefficients*

	X_1	X_2	X_3	X_4	X_5	a_1	a_2	a_3	a_4	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20}	X_{21}	X_{22}	X_{23}	X_{24}
X_1	1	—	—	—	—	0·19	0·08	—0·02	—0·08	—0·28	—0·24	0·77	—0·09	—0·59	0·23	0·78	0·09	—0·17	—0·53	0·73	0·64	0·09	—0·08	0·61
X_2		1	—	—	—	0·19	0·07	—0·01	—0·08	—0·36	—0·19	0·82	—0·05	—0·57	0·16	0·73	0·01	—0·07	—0·61	0·80	0·68	0·17	—0·11	0·59
X_3			1	—	—	0·31	0·15	0·03	—0·18	—0·32	—0·21	0·75	—0·25	—0·44	0·31	0·79	—0·13	0·04	—0·65	0·69	0·76	0·01	—0·23	0·62
X_4				1	—	0·28	0·12	0·01	—0·15	—0·31	—0·23	0·78	—0·20	—0·51	0·29	0·81	—0·05	—0·03	—0·62	0·72	0·74	0·04	—0·18	0·64
X_5					1	0·16	0·14	0·03	—0·10	—0·43	—0·10	0·76	—0·10	—0·53	0·21	0·72	—0·01	—0·07	—0·62	0·67	0·59	0·12	—0·35	0·73
a_1						1	—	—	—	0·29	—0·39	—0·02	—0·57	0·31	0·47	0·30	—0·04	0·02	—	—	0·12	—0·32	—0·04	—0·20
a_2							1	—	—	0·10	—0·15	—0·04	—0·28	0·17	0·14	0·13	—0·08	0·06	—	—	0·06	—0·17	—0·05	0·23
a_3								1	—	0·03	—0·05	—0·02	0·07	0·01	—0·12	0·00	—0·04	0·03	—	—	—0·08	—0·13	—0·05	0·26
a_4									1	—0·24	0·26	0·01	0·21	—0·15	—0·07	—0·13	0·04	0·00	—	—	—0·10	0·19	0·03	—0·11
X_{10}										1	—0·70	—0·68	—0·36	0·38	0·30	—0·02	0·44	—0·39	0·75	—0·40	—0·43	—0·67	0·60	—0·52
X_{11}											1	—0·15	0·40	—0·10	—0·38	—0·38	—0·39	0·37	—0·32	—0·09	0·02	0·57	—0·51	0·19
X_{12}												1	0·15	—0·63	—0·01	0·59	—0·26	0·20	—0·85	0·82	0·71	0·51	—0·19	0·53
X_{13}													1	—0·55	—0·88	—0·47	0·17	—0·15	—0·19	0·12	—0·13	0·33	—0·06	0·00
X_{14}														1	0·23	—0·43	—0·32	0·35	0·43	—0·49	—0·37	—0·22	0·04	—0·43
X_{15}															1	0·59	—0·05	0·03	0·15	—0·03	0·22	—0·23	0·14	0·04
X_{16}																1	0·13	—0·17	—0·32	0·48	0·54	—0·13	0·05	0·49
X_{17}																	1	—0·98	0·60	—0·30	—0·41	—0·51	0·31	0·08
X_{18}																		1	—0·54	0·26	0·34	0·52	—0·23	—0·18
X_{19}																			1	—0·73	—0·71	—0·50	0·47	—0·42
X_{20}																				1	0·70	—0·48	0·10	0·27
X_{21}																					1	0·26	—0·10	0·35
X_{22}																						1	—0·07	0·02
X_{23}																							1	0·55
X_{24}																								1

X_1 Earlytneonatal mortality per thousand live births.
X_2 Infant mortality per thousand live births.
X_3 Still-birth rate per thousand live births.
X_4 Perinatal mortality per thousand live births.
X_5 Late neonatal mortality per thousand live births.
a_1 Dummy 1957.
a_2 Dummy 1958.
a_3 Dummy 1959.
a_4 Dummy 1960.
X_{10} Parity 0 per thousand live births.
X_{11} Parity 1–3 per thousand live births.
X_{12} Parity 4+ per thousand live births
X_{13} Age 15–25 per thousand live births.
X_{14} Age 25–30 per thousand live births.
X_{15} Age 30–5 per thousand live births
X_{16} Age 35–45 per thousand live births.
X_{17} Hospital confinement per thousand live births.
X_{18} Home confinement per thousand live births.
X_{19} SEG (A) proportion of economically active males.
X_{20} SEG (B) proportion of economically active males.
X_{21} Prematurity.
X_{22} Live-birth rate.
X_{23} Percentage of female employees.
X_{24} Percentage of registered unemployed.

The problem remains which of the variables to use in the regression. As a result of the above it is not possible to include all those which are significantly correlated with the mortality rates. The solution would appear to lie in a step-wise regression. The variable which accounts for the largest proportion of the variation of the dependent variable is entered into the regression first. Subsequent variables are those which account for the largest proportion of the remaining variation. The introduction of new variables is complete when the addition of another does not increase the level of explanation by a significant amount. Table 2.5 shows how this process operates for a regression of early neonatal deaths on selected variables. The premature live-birth rate is not included in the regression since it does not increase the level of explanation significantly (the ratio of the increment due to prematurity to the error mean square is not significant at $F=2{\cdot}27$). This step-wise procedure was applied to the regressions of early and late neonatal deaths, and perinatal mortality and infant mortality. The regression equations resulting from the analysis are shown in Table 2.6.

Early neonatal deaths

The simple correlation matrix of Table 1.5 would suggest the inclusion of variables, parity 4+, age 25–30, age 35–45, SEG (A) and (B), prematurity, and unemployment in the regression. The high degree of intercorrelation between these has prohibited their inclusion, and this is why the choice of variables may appear strange. The fact that the model explains 89·1 per cent of the regional variation in early neonatal mortality indicates that it is a very good fit. The problem is how to interpret the variables. The number of live births born to mothers aged 35–45 offers an extremely high proportion of the explanation (56 per cent). Some workers have made the mistake of stating that this indicates that half of early neonatal mortality is caused by physiological factors associated with older mothers. In fact, it is impossible to be so positive since the variable is significantly correlated with SEG (A) and (B), unemployment, parity 4+, etc. Undoubtedly the risk for older mothers is higher, but the

Table 2.5. *Step-wise regression for early neonatal mortality*

Source	*DF*	*SS*	*MS*	*a Increment of* X_i	*Ratio of 'a' to error MS*
TOTAL	49	104·24			
X_{16}	1	63·54	63·55		
Error	48	40·69	0·85		
X_{16}, X_{20}	2	80·11	40·05	16·56	32·2[1]
Error	47	24·13	0·51		
X_{16}, X_{20}, X_{24}	3	86·41	28·80	6·30	16·3[1]
Error	46	17·83	0·39		
X_{16}, X_{20}, X_{24}, X_{18}	4	89·77	22·44	3·36	10·4[1]
Error	45	14·47	0·32		
X_{16}, X_{20}, X_{24}, X_{18}, X_6	5	92·43	18·49	2·67	9·9[1]
Error	44	11·81	0·27		
X_{16}, X_{20}, X_{24}, X_{18}, X_6, X_{21}	6	93·02	15·50	0·59	2·3
Error	43	11·22	0·26		

F: 0·05; *DF* 1 and 43 = approx. 4·0.

1. It is worth noting that a variable may be correlated extremely significantly with mortality yet contribute nothing to its explanation.

degree of risk is still speculative since other significant variables are not suitable for inclusion in the regression.

The inclusion of domiciliary live births is at first surprising since it has a non-significant correlation coefficient with early neonatal mortality of −0·17. It is included in the regression

Table 2.6. *Regression equations*

EARLY NEONATAL. Explanation 89·1 per cent

$Y = 2{\cdot}48 + 0{\cdot}735\, a_1 + 0{\cdot}115\, a_2 - 0{\cdot}129\, a_3 + 0{\cdot}143\, a_4 + 0{\cdot}496 X_{16} - 0{\cdot}068\, X_{18} + 0{\cdot}326\, X_{20} + 0{\cdot}684\, X_{24}$

LATE NEONATAL. Explanation 89·6 per cent

$Y = 4{\cdot}61 + 0{\cdot}545\, a_1 + 0{\cdot}119\, a_3 + 0{\cdot}131\, a_4 - 0{\cdot}0007\, X_{12} - 0{\cdot}14\, X_{14} + 0{\cdot}073\, X_{20} + 0{\cdot}342\, X_{24}$

INFANT MORTALITY. Explanation 92·7 per cent

$Y = -7{\cdot}89 + 2{\cdot}508\, a_1 + 1{\cdot}23\, a_2 + 0{\cdot}648\, a_3 + 0{\cdot}033\, X_{11} + 0{\cdot}067\, X_{12} + 0{\cdot}147\, X_{17} + 0{\cdot}620\, X_{20} + 1{\cdot}053\, X_{24}$

PERINATAL MORTALITY. Explanation 94·9 per cent

$Y = 25{\cdot}65 + 3{\cdot}855\, a_1 + 2{\cdot}896\, a_2 + 2{\cdot}337\, a_3 + 1{\cdot}178\, a_4 - 0{\cdot}699\, X_{14} + 1{\cdot}219\, X_{15} - 0{\cdot}195\, X_{18} + 0{\cdot}0009\, X_{19} + 0{\cdot}615\, X_{20} + 0{\cdot}203\, X_{21} - 0{\cdot}121\, X_{23}$

See Table 2.4 for key to X_1 to X_{24} and a_1 to a_4.

because of the significance of its partial correlation coefficient. For instance, the correlation between domiciliary confinement and early neonatal mortality, independent of the effects of SEG (B), is −0·54. The negative sign of the regression coefficient indicates that, as the number of home births increases, early neonatal mortality falls. The implication that it is safer to have births at home is false, since it is likely that only low-risk cases are allowed to stay at home—the correlation matrix shows that home confinement is more highly correlated with low-risk groups, such as parity 0, 1–3, and age 25–30.

The inclusion of SEG (B) is self-explanatory, as the clear social gradient in infant mortality rates is common knowledge. Unemployment, on the other hand, would be expected as covariant with SEG (B) to be left out of the regression. Its inclusion indicates that it must represent an effect which stands apart from the SEG. The probable reason is that in one area skilled workers may connote workers in heavy industry, living in old and unhealthy urban conditions (e.g. North-west Region), whereas in other areas there may be predominantly workers in light industries living in a healthier physical setting. Unemployment, on the other hand, could be a measure of the type and age of industry. The structurally old and declining industries of the north have higher unemployment rates than the fast-growing, light industries of the south. The significant correlation between unemployment and parity 4+ indicates that as families are larger in the northern areas and often live in older and more cramped housing, the chance of infectious diseases increases, and the health of the mother is lowered.

Late neonatal deaths

It is well documented that as the infant grows older, different influences affect mortality. The direct effects of the physical characteristics of the mother are less important in the late neonatal than in the early neonatal periods. The evidence of the regression seems to contradict this, as both live births to mothers in the parity 4+ and the 25–30 age-group together explain 67·4 per cent of the late neonatal mortality variations; parity

4+ alone explains 60·8 per cent. It can only be inferred that parity 4+ stands for something more than physiological characteristics. For instance, larger families are associated with poorer housing and generally poor social environment, not to mention a greater exposure to infection. Thus parity 4+ may indicate both the physiological characteristics of the mother, and aspects of the social environment. A strange feature of the parity 4+ regression coefficient is its negative sign. This can be explained by noting the high level of intercorrelation between parity 4+ and unemployment. In a regression excluding unemployment the coefficient for parity 4+ is *0·017*; in the final regression including unemployment, the coefficient is *−0·0007*. The sign has changed and the coefficient has been reduced; its *t*-value is 0·15 (*t*:0·05, $DF\,42 = 2{\cdot}02$) and is non-significant. Just how far the coefficient is a reliable estimate and its *t*-value accurate, is doubtful for the reasons mentioned earlier. The high degree of intercorrelation also explains the inclusion of the 25–30 age-group, as opposed to the 35–45 age-group, and the low degree of explanation of SEG (B). Once again unemployment plays a separate role and the implications behind it are the same as those discussed earlier.

Infant mortality

The infant mortality rate would be expected to depend upon a combination of these variables which explained its subdivisions. Once again parity 4+ and SEG (B) are important and explain 79·5 per cent of a total explanation of 92·7 per cent. The very fact that they are both included in the regression and have significant regression coefficients is important, especially in view of the high correlation (0·82) between them. It indicates that the social environment plays a vital role in determining regional variations. Unfortunately it is impossible to be more specific in view of the nature of the problem.

Variations in the number of hospital births account for 4·6 per cent of the infant mortality variation. This is because, despite its weak correlation of 0·01 with infant mortality, its partial coefficient (independent of SEG (B) and parity 4+) is

0·51. The interpretation of this phenomenon is extremely difficult since it seems reasonable to assume that the high-risk cases would be given priority of admission to hospitals. It has already been shown that women falling in the categories of SEG (B) and parity 4+ are such cases, and yet the correlation independent of these is 0·51. A reasonable interpretation would seem to be that as most hospital confinements are indeed high-risk cases, removal of the effects of SEG (B) and parity 4+ would leave a coefficient which represents the relationship between infant mortality and the high-risk cases of the upper section of the social scale.

Perinatal mortality

The correlation matrix of Table 2.4 suggests the inclusion of several variables. The variables which entered the regression are a result of the effects of multi-collinearity on the step-wise regression. The first variable in the regression was the 35–45 age-group and this was followed by SEG (A). The third variable, the domiciliary live-birth rate, has a negative coefficient, merely indicating that low-risk cases are confined at home. The fact that two age-groups and both socio-economic groups entered into the regression stresses the importance of the increasing risk with age and the vital role of socio-economic status, particularly in perinatal mortality. The percentage of female employment was the last variable to enter into the regression, and, as a result, it is difficult to attach any meaning to it, since it only becomes significant when the effects of all the other variables have been removed. If it had played a part in its own right, it could have been interpreted either as an indication of the ill-effects of working during pregnancy or as the beneficial effects of a supplementary wage-packet. Since the simple correlation coefficient is non-significant which of these, if either, is applicable cannot be stated.

General

Because of the extensiveness of intercorrelation and the absence of trustworthy strategic data when they were required, the

Table 2.7. *Mortality rates per thousand live births*

	Best		*Worst*	
	Hypothetical	*Observed*	*Hypothetical*	*Observed*
Early neonatal	10·2	11·0 (East)	17·4	16·4 (Wales)
Late neonatal	1·2	1·6 (South-west)	3·4	3·6 (Wales)
Infant mortality	15·3	18·1 (East)	28·8	28·4 (Wales)
Perinatal mortality	19·9	27·8 (South)	42·6	42·2 (Wales)

structural value of the model is minimal. The extremely high degrees of explanation show it to be a very efficient predictor. An interesting test of this predictability is to select the most favourable and the most unfavourable values obtained in all regions. By this is meant that during the years under examination the highest and the lowest values of the variables which contribute significantly to the regression were selected. These were then substituted in the equations in Table 2.6. The mortalities which they predict are the hypothetically best and worst values which might be expected at least during the years studied. Theoretically, the hypothetically derived best values might be expected to be lower than the observed best ones, indicating that there is still some way to go. Hypothetically worst values might be expected to be greater than the observed worst ones, indicating that things might be worse.

The relevant values and the regional identities are given in Table 2.7. It is quite obvious from this table that within the range of existing data the worst possible situations correspond very closely to Wales whilst the best possible correspond with the Eastern, Southern, and South-western Regions. For infant and perinatal mortality this only holds for the worst possible areas. Even in the best areas there is obviously room for considerable improvement, since the lowest recorded values for infant and perinatal mortality over the five-year period were 18·1 and 27·8 respectively.

Binary multiple regression

The regression analysis has demonstrated how difficult it is to evaluate the effect of any one factor. The last section in this paper briefly discusses and demonstrates a method which combines the best properties of the available methods, having in mind the paucity of data.

The regression method indicated that it was not the number of factors affecting infant mortality which were the problem, but the fact that they do not occur independently of each other. The serious limitation of high intercorrelations has already been noted. The type of question that needs to be answered is whether the high risk, for instance, of mothers in the Northern Region is a reflection of high age and parity and low social class, and if so what is the contribution of each factor? An attempt could be made by merely examining data on the combinations of these factors, but it would be virtually impossible to assimilate so much data, and small numbers would mean estimated rates which would be subject to large sampling errors. These problems are overcome by the use of a binary variable multiple regression (14).

The use of binary variables does not necessitate any assumptions about the form of the relationships between the factors and the mortality under consideration. It also allows qualitative factors (e.g. regions) to be considered. Although the binary character of the independent variable violates the least squares assumption of homoscedasticity (the variance of the error term associated with an observation is proportional to the individual's risk) the sample size of 642,411 live births obviates the need for a two-stage determination of the regression coefficients (13). Apart from the great advantage of its analytical power this technique has two other attractive qualities. First, because of the binary nature of the data, the normal equations can be written directly from the number of deaths in each sub-class, and the data in a series of two-way tables classifying live births by, for instance, parity and age, age and social class, etc. Second, the number of factors which may be studied can be considerably increased and the effect of any one factor can be

studied separately, as well as compared as to its importance relative to the other factors.

In the following example the data relate to the number of live births and perinatal deaths in 1950 (15). Whilst the relationships and their effects may have diminished since then, the data will serve to demonstrate the method. The data were split into six age and six parity groupings and five social classes. The regions are grouped into three: (1) North (Northern, North-west, East and West Ridings, and Welsh Regions); (2) Midland (North Midland, Midland, and South-west Regions); (3) South (East, London and South-eastern, and South Regions). Attempts were made to obtain more recent data (16) but unfortunately age, parity, and social class were only split into three divisions, and it was felt that this was insufficient to obtain a good estimate of their effects; too much detail would be lost in the grouping.

The results of the analysis are shown in Table 2.8 and Figure 2.7. The unadjusted percentage deviations from the mean perinatal mortality rate of 37·2 per thousand live births illustrates the familiar increase in mortality towards the north. The remarkable feature of the unadjusted deviation is the extremely favourable position of the southern part of England with a percentage deviation of −15·66.

Some authors, on the basis of standardized mortality rates, have ruled out parity, age, and social class as significant factors in regional variations. This analysis serves to prove them wrong to a considerable extent. The age-adjusted percentage deviations show that age plays a negligible role in regional variation and that, contrary to popular belief, it has a slightly beneficial effect on mortality in the north. The over-all adjustment for age, parity, and social class reveals that these factors do tend to increase the disparity between regions. The most remarkable result is the reduction of a positive deviation above the mean of 5·08 in the north to −0·7. It indicates that virtually all the high perinatal mortality in the north can be attributed to the greater proportion of the population in the lower social classes and higher parity groups. Examination of their separate effects

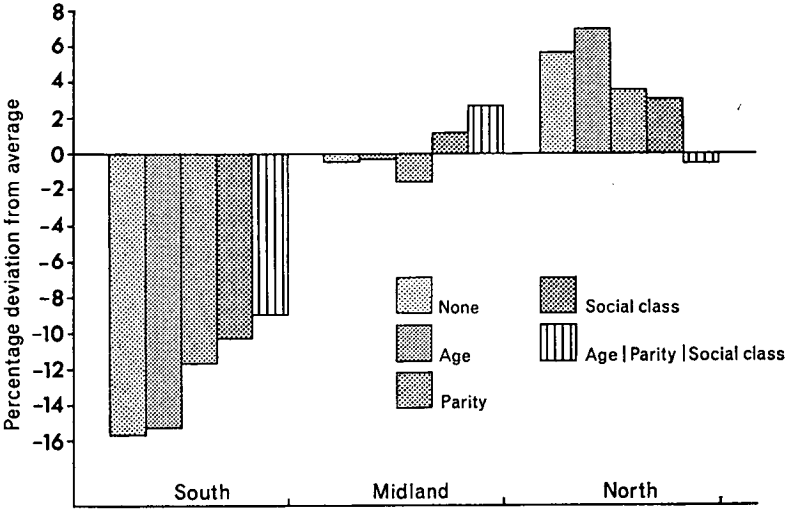

Figure 2.7. Effects of parity, age, and social class on regional perinatal mortality adjustment

shows that social class is more important than parity. The situation is mirrored in the south where adjustment brings the rate up to 9·06 per cent below average. Once again social class and parity are the important factors, with social class most important.

The most important results of this analysis is that social class and parity not only exert different forces in any one region but also that their combined effects are different between regions. Whilst these two factors account for almost 100 per cent of the deviation above the mean in the north, in the south they only account for 29 per cent of the deviation below the mean. Obviously there remains another 71 per cent of deviation which must be attributable to other factors. Unfortunately a shortage

Table 2.8. *Adjusted percentage deviations in perinatal mortality by regions*

	Adjusted percentage deviations				
	None	*a Age*	*b Parity*	*c Social class*	*a, b, and c*
South	−15·66	−15·39	−11·68	−10·32	−9·06
Midland	−0·24	−0·19	−1·49	+0·84	+2·21
North	+5·08	+6·4	+3·08	+2·47	−0·70

of data on the classification of perinatal mortality by variables in the maternity services, height and weight of the mother, etc., prevents any attempt to explain the large deviation below the mean perinatal rate in the south of England.

Discussion

1. In the trend analysis our intention was to determine best statistical fits to the data and to examine significant deviations from fitted trend lines. We were much less interested in prediction into the immediate future than in being able to reach conclusions in terms of the deviations from the lines of best fit. Thus a statistically significant deviation from a fitted line in a given year should be relateable to extreme variation(s) in other data during that year. These other data could then be embodied as inputs to a prediction model of the regression type.

Significant departures from the polynomial trend fitted to perinatal mortality data were easily attributed to variations in still-births. We went on to examine large numbers of possible causes of atypical still-birth variation without particular success.

A more profitable line of inquiry was found by relating the mortality rates to the data describing death from various causes. This procedure has shown those causes of death which remain intractable as the producers of significant departures from trend. It was shown that deaths from immaturity play an important part in explaining the pattern of variation of early neonatal deaths. Respiratory diseases play a predominant role in the later categories. A surprising result was that the two causes, post-natal asphyxia and atelectasis, were potent explainers of the variation in infant mortality rates. Irrespective of the gross causes of mortality under the various classifications, the results above nominate those causes which are least under control. In a situation where trends are encouraging for the future, atypical variations present a challenge to correlate the periodicity and scale of these variations with their causes. We were not able to determine these causes from the official statistics; but it may be that suitable hypotheses can be put up by those with the relevant qualifications.

As shown in the text, the relative order of mortality between the geographical regions was maintained during the period studied. Inevitably, of course, the differences between the regions are lower than in the past.

It is always tempting to use fitted trend lines for projection into the future. There is some justification for the prediction of infant mortality since a good fit to a logarithm expression has been found. However, the prediction of perinatal deaths from a polynomial is not feasible. When a longer run of *validly comparable* data is available from the Registrar-General it may well be that a logarithmic curve will fit these data also. If so, prediction into the future will also be feasible for the perinatal series.

2. The results of the multiple regression models were disappointing. While it has been possible to produce four regression equations which explain 90 per cent of regional variation, little was added to an understanding of the structural aspects.

It was hoped that the regressions for successive periods up to the first year would indicate the change in the pattern of forces operating upon the mortality rates. For instance, so-called 'biological' factors are presumed to be more important at earlier stages of infancy, and environmental factors at later stages. This hypothesis could not be tested for two reasons. First, because of multi-collinearity, limitations on the choice of regressors prohibited a structural interpretation of the results. Second, the meaning underlying any one variable is doubtful. The possible ways of interpreting parity 4+ and female employment have already been noted. Moreover, the importance of such variables as socio-economic groups, unemployment, and female employment is likely to be under-valued as the data refer to the proportion of the total population in these groups. In areas, for instance, where 50 per cent of the population is in SEG (B) this will include a large proportion of females who are not pregnant. This means that a non-significant simple correlation does not rule out the possibility that female employment is an important factor in explaining variations in infant mortality

rates. These variables could only be regarded as accurate if, for instance, the proportion of pregnancies remained constant between the regions. This is obviously not a viable assumption. Consequently, if a meaningful analysis is to be undertaken, it is vital that more relevant variables and more accurate data are collected. Only in this way can the multi-collinearity deadlock and the problem of interpretation be solved.

3. The binary regression analysis was much more rewarding, although the data which provided most scope were rather out of date and the regional groupings were coarse. It was possible to show the gain from this kind of model. We have been able to prove that as far as these data are concerned, age plays a negligible role in explaining regional variation. The two potent factors determining regional differences are social class and parity, and of the two social class is the more influential.

Conclusions

For the present any attempt to explain the trend of regional variations in infant mortality rates is seriously limited because data are scanty and inadequate. The only conclusion that could be reached from the multiple regression analysis was that social or environmental factors explained the regional variations in rates. The extremely high level of intercorrelations prohibited a more meaningful analysis. This problem is insoluble unless new variables can be introduced. Whilst other variables do exist, their use was restricted, since they were either classified by hospital regions, and Ministry of Labour regions, or they were not available for certain years. Furthermore, an assessment of the effect of some of the variables was seriously hampered because such variables as female employment and SEG (B) applied to the whole population and not to the sub-population of maternities. It is, moreover, extremely unfortunate that the most recent source of data on the classification of the various mortality rates by social class, age, parity, and region was in 1950. More recent sources of data have been of little statistical value, since important detail is lost by grouping the

data into a limited number of classes. The binary multiple regression technique has been proved to be extremely effective and practical under these restrictions. It indicated that whilst parity and social class explain the deviations from mean perinatal mortality in the north, they do not completely do so for the south. Attempts to explain this are hampered once again by lack of data in the correct form and for possible variables. This type of binary regression analysis has far-reaching possibilities only if more data on the cross-classification of such variables as birth-weight, gestation period, height and weight of the mother, place of confinement, qualifications of midwife or other personnel, region, cause of death, etc., are collected. With modern computer facilities there seems to be little excuse for the severe paucity of specialized data.

The necessity for multivariate approaches to the study of the aetiology of disease is apparent from the extreme degree of multi-collinearity. No slur is intended on the natural or controlled experiment which considers a few variables in a cross-sectional manner. Such studies are essential, for they locate the variables to be examined. Nevertheless, as will be seen from the matrix of simple correlation coefficients, covariance between measures is very widespread. As a result, simple study 1 will claim to have located the most potent explainer but so will researches 2, 3, 4, etc.; all possibly championing different explanatory variables. Yet the extent of covariance in the system might be so great that an unmeasured variable might well be accounting for a substantial portion of all of these. Certainly, techniques have existed for many years for the study of causation (e.g. path analysis), but such exercises profit little if the range of available strategic statistics is so small.

In this study the effect of social class is seen to be important and all pervasive. Yet the term itself is an ill-defined repository for an aggregate of properties and practices. A more precise examination of this heterogeneous and variable term would be of considerable service.

The difficulties encountered in this research stresses the necessity for an immediate re-examination of the number and

	X_1	X_2	X_3	X_4
X_1	1	0·77	0·73	0·61
X_2	0·77	1	0·82	0·53
X_3	0·73	0·82	1	0·27
X_4	0·61	0·53	0·27	1

X_1 Early neonatal mortality.
X_2 Parity 4+—live-birth rates.
X_3 SEG (B)—proportion of economically active males.
X_4 Unemployment—percentage registered unemployed.

Correlation matrix

character of official statistics in the socio-medical field. They also stress the need to maintain through the years the original definitions and classifications. If later discoveries or turns of events suggest some innovation in definition, the innovation should be introduced only if recording also continues using the original terms of reference.

Appendix

Multi-collinearity between variables

A simple example will serve to explain the problems multi-collinearity raises. If the correlation matrix of early neonatal deaths and live births for parity 4+, socio-economic group (B) (SEG (B)), and unemployment is taken and the coefficient of SEG (B) with parity 4+ is incremented from 0·2 to 0·95 some interesting results emerge. These are shown in the Figure 2.8A, the partial correlations are shown plotted against r_{23} (the correlation between parity 4+ and SEG (B)) and as such they are dependent upon the value of r_{23} (i.e. $f(r_{23})$). This is also the case in the Figure 2.8B for the partial regression coefficients and their standard error (*SB*). The partial correlation, for instance $r_{14\cdot23}$ represents the correlation between variables X_1 and X_4, with the effects of variables X_2 and X_3 held constant. In this way the true relationship between X_1 and X_4 can be ascertained. This is also the case for the other partial correlation and regression coefficients. In Figure 2.8 the coefficient of multiple correlation (R^2) is shown to fall as r_{23} is increased; this means a fall in the level of explanation. This is because the partial correlation coefficients, $r_{13\cdot24}$ and $r_{12\cdot34}$, decrease rapidly and

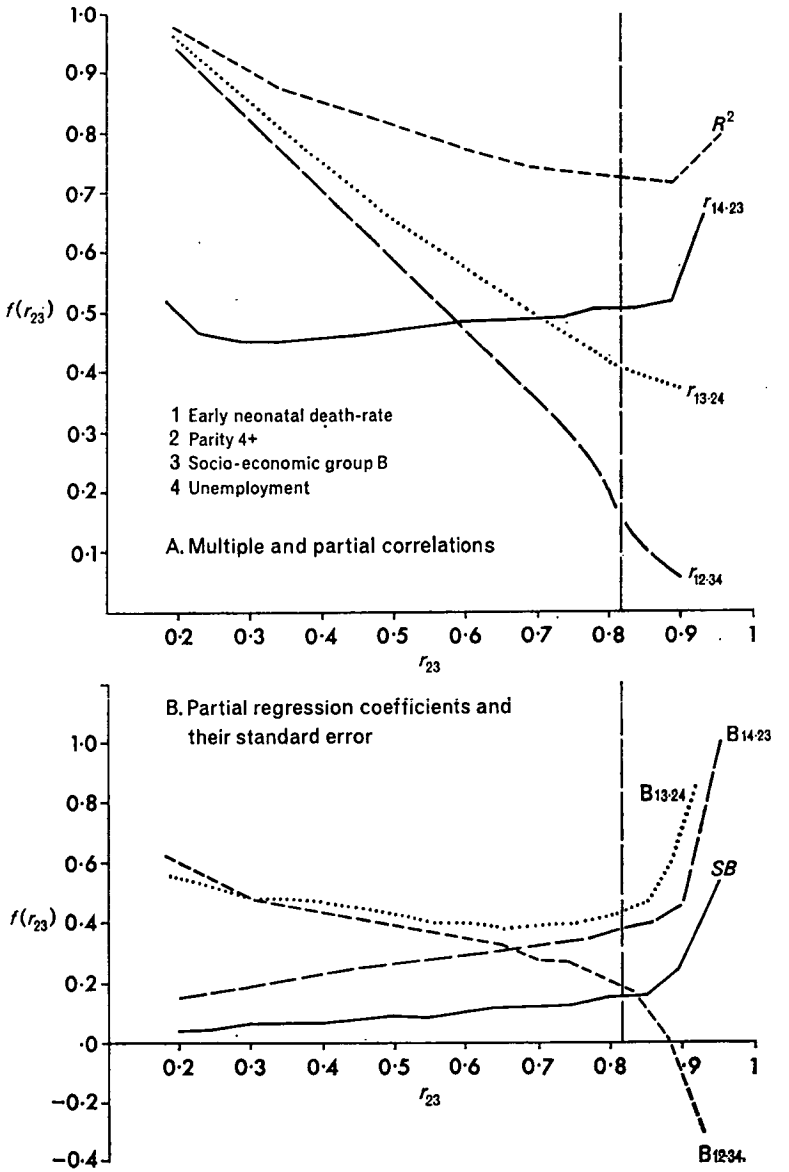

Figure 2.9. Effects of intercorrelation

consequently parity 4+ and SEG (B) contribute very little to the level of explanation in the regression analysis. The graph of the partial regression coefficients and their standard error indicates that the latter increases with r_{23} since the partial correlations are falling faster than the multiple correlation coefficient (R^2). This has very little effect on the t-values of B 14·23 and B 13·24 as these increase proportionately with the standard error. However, this is obviously not the case with B 12·34 which eventually becomes less than its standard error and, therefore, a non-significant regression coefficient. At the true correlation for r_{23} of 0·82 the partial regression for parity 4+ has a non-significant t-value of approximately 1·2. The fact that a variable such as parity 4+ can be highly correlated with early neonatal mortality ($r = 0{\cdot}77$) and yet fail to explain a significant amount of variation indicates that any attempt to evaluate the contribution which each variable makes towards explaining regional variations in infant mortality is presently very difficult.

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3

Selection procedure for hospital and domiciliary confinements

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Selection procedure for hospital and domiciliary confinements

Introduction

Although the maternity services in this country are generally of a high standard there are still avoidable maternal and infant deaths (1). One cause for concern is that some confinements where the mother or baby (or both) was known in advance to be at more than average risk, none the less took place at home. The Chief Medical Officer of the Ministry of Health has suggested that greater attention to the selection of women for hospital confinement could reduce maternal mortality considerably. Support for this suggestion comes from studies in Bradford, Poole, and Lancashire (2) which showed that considerable numbers of high-risk maternity cases were being booked for home delivery. The Poole study further shows that even where these women are in fact delivered in hospital under the emergency admission procedure, the perinatal mortality rate is three times higher than in booked hospital confinements.

An examination of the process of selection of place of confinement seemed likely to throw some light on the reasons for booking a substantial number of high-risk maternity cases for home delivery, and the present modest study was intended to test the feasibility of such research on a larger scale. The area of investigation was limited to a south-coast city with a population of a quarter of a million.

As mother-to-be, family doctor, district midwife, and hospital maternity department all play a part in selecting the place of confinement, the attitudes of each of these groups were examined.

Local selection procedures

The maternity services of the area have 88 beds in the hospital maternity unit, plus 17 beds held in another hospital for women admitted for hospital confinement because of social conditions. The domiciliary service has 27 district midwives and one supervisor of midwives. Some 4,000 confinements occur each year in the city: about 60 per cent are in hospital, 8 per cent in private nursing-homes (a third of these are in a home for unmarried mothers run by a charitable organization), and the remainder are domiciliary confinements.

HOSPITAL BOOKINGS

The hospital booking clinics always offer a hospital confinement if requested to women in the following categories:

(*a*) Any woman aged 25 or over expecting a first baby;
(*b*) Any woman having a fifth or subsequent baby;
(*c*) Any woman having an illegitimate baby;
(*d*) Any woman having adverse medical or social conditions.

A woman attending a hospital booking clinic for the first time must bring a letter from her doctor recommending her for hospital confinement. She is then given an appointment to see the consultant named in her doctor's letter, and after examination the consultant will decide whether she is to have a hospital confinement booked. Very few of these women are refused a bed. (In 1965 only ten were refused.) Selection of patients for place of confinement, therefore, does not take place to any great extent at the hospital booking clinics.

MIDWIVES' BOOKINGS

For the domiciliary midwifery services, the city is divided into ten areas of roughly equal size served by twenty-seven district midwives with a supervisor of midwives, who does not attend confinements except in an emergency. The city maintains two fully equipped mobile theatre teams (obstetric and paediatric) which a district midwife may summon by telephone to any home confinement should complications arise during childbirth.

The supervisor said that the categories of expectant mothers for whom hospital confinement was desirable were well known to all her midwives, and this indeed appeared to be so. However, records of bookings, and some of the booking sessions observed during our study, showed that quite a number of women in the specified categories were accepted for home confinement. As the supervisor pointed out, a district midwife must accept a woman for home confinement if requested, whatever the midwife's own feeling, but the midwife is recommended to approach the woman's doctor to enlist his support in urging her to accept hospital confinement. Should a doctor prove unco-operative, the supervisor may make a report to the Medical Officer of Health, asking him to point out to the doctor the seriousness of the risks. If the doctor still prefers to keep his patient for domiciliary confinement, the responsibility is then his alone. If he attempts to persuade his patient and fails, then the woman is made clearly aware that she is taking a great risk with the life of her coming baby, and even her own, and that full responsibility rests with her if she acts against the advice of doctor and midwife.

Sometimes, the supervisor said, a district midwife accepts a domiciliary booking from a high-risk patient simply to gain the opportunity for regular contact which may enable her to persuade the patient to accept hospital confinement.

Most patients come to clinic after their own doctor has confirmed pregnancy. Where a woman comes direct to the clinic, the midwife may accept booking for a home confinement and refer the woman to her doctor, or refuse to make any firm arrangements until the patient has consulted her doctor. Bookings for domiciliary confinements are usually made much later than bookings for hospital confinement.

There was no record of a woman seeking a home confinement being refused a booking. In the sessions we observed, none was even recommended to seek a hospital confinement, although one patient was a woman of 39 in her ninth pregnancy.

Since the beginning of 1966, the Medical Officer of Health has required district midwives to visit the home of every expectant mother for whom there is a record of a confinement

booking, to determine whether her social and accommodation standards are adequate for home confinement or for early discharge after a hospital delivery. From discussion with the midwives about these forms, it appears that the visit to the home is carried out somewhat perfunctorily. Indeed, one midwife whose area was comprised mainly of council housing, said she knew from the address of a patient what the accommodation would be, so did not need to visit at all. One midwife said she sometimes used the visit to women applying for hospital confinement to suggest that they might change their minds and have a home confinement. Many others said that the visit was usually made to women booking home confinements round about the seventh month of pregnancy, and was the occasion to check how the confinement could be managed in the prevailing conditions, rather than whether it could be managed at all. This is borne out to some extent by the finding that during the previous twelve months twenty-one midwives had delivered at home one or more women having no bathroom, or no inside toilet, or no running hot water, or a combination of these deficiencies.

SUMMARY

Ninety-two per cent of maternity cases are selected for either hospital confinement or domiciliary confinement with a local authority midwife attending. The selection procedure, however, does not appear to operate to any great extent at the time of booking, since the vast majority of women are booked at the clinic (hospital or domiciliary) to which they first apply. None the less as Table 3.1 shows, a process of selection does operate, but generally at a stage before that of booking the confinement. Each midwife, including the supervisor, was visited by an interviewer who completed a questionnaire. Despite the willingness of the midwives to co-operate, they could not answer some of the questions either because they had no record or the record had passed out of their possession and could be looked up only with difficulty.

As one of the aims of this study was to assess the feasibility of wider research, a question was included about the 'co-opera-

Table 3.1. *Hospital confinements*

Category	*City births in 1964*[1] *Percentage of category having hospital confinement*
HIGH-RISK CASES	
Primiparae	80
Grand multiparae 5th births	68
Illegitimate births	81
2nd, 3rd, 4th births	49

1. The last year for which such a breakdown of maternity cases is available.

tion card' with which every patient booked for a domiciliary confinement should be issued according to a Ministry of Health directive. This card is intended to be taken by the pregnant woman to every antenatal visit, whether to her doctor or to the midwife, so that a complete record of all treatment and routine checks during pregnancy should be available. There is room on the card for notes on the confinement and on the post-natal examination of the mother. After that, the card is supposed to be kept by the patient's doctor. These cards could be a reliable source of information on stages at which confinements are booked, transfers of bookings, emergency admissions to hospital, but there is apparently no uniformity in issuing, collecting, or storing them.

To assess to what extent the district midwife played a part in selecting cases for hospital or domiciliary confinement, questions were asked about the number of high-risk maternity patients each midwife had on her list from 1 July 1965 to 30 June 1966. Ten midwives had not delivered a single primipara over the age of 25 during the period, and a further 12 had each had only 1 case. The remaining 5 midwives had delivered 24 such primiparae between them.

When it came to the grand multiparae, only 4 of the midwives had made no such deliveries over the period, and 73 of these high-risk cases had been delivered in the district out of 1,690 domiciliary deliveries. In 1964 the records show that 41 grand multiparae were delivered at home out of 1,475 domiciliary births. Possibly more women are having large families

but there is no evidence of an increase sufficient to explain this difference, and the figures suggest that a greater proportion of grand multiparae are now being delivered at home.

The midwives were also asked about the domiciliary confinements of women who might be regarded as priorities for hospital beds because of adverse social conditions. The midwives had no exact record of such cases, and indeed there would seem to be no record of them anywhere. Since January 1966 the city Medical Officer of Health has required a form to be completed for each woman booking either a hospital or home confinement, stating whether there is a bathroom in her home and whether in the midwife's opinion home confinement is practicable, but no question is asked about a hot-water system or an inside toilet. The midwives could not estimate the numbers of confinements they had attended where the facilities were inadequate, so that it is not possible to suggest to what extent social priority groups are being confined at home, but nearly every midwife has some such cases booked for domiciliary confinement.

All the 27 midwives had delivered either primiparae over the age of 25 or grand multiparae. As this might have been done at the request of the patients and reluctantly on the part of the midwives, a question was asked about the number of bookings each midwife had queried with her supervisor or the patient's GP over the period. Once again there were no accurate records, since any query was usually put verbally or over the telephone and not recorded, but 9 midwives could not recall having queried a single booking throughout the twelve-month period. The 18 other midwives estimated that they had made 36 queries between them. According to the supervisor's record only 10 such queries had been raised over the period. The discrepancy may be explained by the fact that some midwives took the matter up directly with the doctor rather than going through the supervisor. On the other hand, the records of maternity cases booked for home confinements but admitted as emergencies for hospital delivery was 355 and the midwives' estimate was 140 which suggests that the accuracy of their recall was

Table 3.2. *Home versus hospital confinement*

	No. of midwives[1]
ADVANTAGES	
Less family disruption	25
Mother not left alone during labour	7
Opportunity for continuous care	16
Mother more relaxed—easier labour	10
DISADVANTAGES	
Difficulties in obtaining help in the home during confinement period	16
Inferior facilities, e.g. poor light, small room	4
Risks of complications	4
Too many visitors	3

1. Each midwife could specify more than one factor

not reliable. But accepting the midwives' estimate of 36 queries, since the actual number of primiparae over 25 and grand multiparae delivered at home during the period was 109, clearly many bookings for domiciliary confinement in these two high-risk categories are accepted by the district midwives without any demur.

From the supervisor's records, there were 1,690 home deliveries during the period, and 355 deliveries in hospital of women admitted as emergencies during labour (17 per cent of the 2,045 bookings for home confinements due in the period). It is not known how many of these 355 emergency admissions were women in high-risk categories.

Booking clinics for domiciliary confinements apparently play only a negative part in the selection of maternity cases for place of confinement, since midwives neither reject, nor, for the most part, attempt to dissuade a woman in a high-risk category from booking a home confinement because they have positive conviction that home confinement has distinct advantages over hospital confinement. The opinions of the midwives (including the supervisor) on the advantages and disadvantages of domiciliary confinements are summarized in Table 3.2.

Seven of the midwives were mothers, but personal experience of childbirth did not seem to have any bearing on a midwife's attitude to domiciliary confinement. The supervisor suggested

that length of service was relevant to a district midwife's awareness of the risks of childbirth. A newly qualified midwife was likely to have a much livelier awareness of possible difficulties and complications because she would have been dealing with them lately in hospital. On the other hand, a district midwife of many years' standing would have attended so many deliveries, the vast majority of which would have been straightforward, that she was likely to think of childbirth as a normal domestic event, and lose sight of the risks. Certainly the 4 midwives who mentioned the risks of childbirth as a disadvantage of home confinement, had an average length of service of six years, whereas the average for the 24 who did not mention the risks was over twelve years. Only 10 had had any experience as a hospital midwife since qualifying and 3 of the 4 who mentioned the risks of childbirth had spent one or more years, since qualifying, as a hospital midwife.

It was thought that the midwives' acceptance of bookings might be influenced by their views on whether the hospital maternity unit had enough beds to meet all demands, but in fact only nine midwives thought there were not sufficient beds and even these thought there were enough beds to accommodate all the priority groups.

The midwives had received between them during the past year about 360 women discharged from hospital forty-eight hours after delivery. Although each midwife's work was affected only slightly by this practice, nearly all were very critical of it. Twenty-one thought that the principal function of the GP unit to be opened in the near future should be to reduce, or eliminate, forty-eight-hour discharges.

SUMMARY

District midwives are clearly convinced that home confinement is superior to hospital confinement in important ways and has minimal disadvantages. This conviction seems to explain their readiness to accept bookings from expectant mothers in high-risk categories.

The district midwives do not seem concerned about the numbers of high-risk cases being confined at home, nor about

the percentage (17 per cent) of emergency hospital admissions. Their chief worry seems to be the increasing number of forty-eight-hour discharges, and most of them considered that any expansion in maternity services should be concentrated on reducing or ending this practice. Few felt there was unmet demand for hospital beds; in their opinion most mothers sensibly wanted to have their babies at home, and, as district midwives, they were happy to encourage this attitude, offering friendly, dedicated, and highly skilled services, with the support of the city's well-equipped flying squads.

Attitudes of general practitioners

We interviewed 88 family doctors, of which 48 were in group practices, 20 in partnerships, and 20 in single practice.

The main basis for the GP's record of maternity work was his book noting payments received or due under the National Health Service for maternity medical services fees. These records did not necessarily (or even usually) include the sort of information that we were seeking, though many doctors went to considerable trouble to look up the individual record cards. We tried to obtain, for example, an idea of the number of bookings for domiciliary confinement accepted by each doctor over approximately the same twelve-month period as we used in the study of district midwives. Five doctors were not on the obstetric list, and accepted no maternity work. Of the remainder, those in single practice estimated the numbers of maternity cases from their payment books, but some of the doctors (but not all) in partnerships and group practices, appear to have given the number of cases booked with the group or partnership as a whole. The doctors' estimate of the numbers of primiparae over the age of 25 confined at home is far in excess of the annual rate given in the Medical Officer of Health's recent reports. On the other hand, the doctors' estimates of grand multiparae confined at home during the period is identical (73) with the midwives' figure. Nor could the Ministry of Health maternity co-operation card be relied on as a source of information. Although the majority of doctors claimed to issue such a card to all their

Table 3.3. *Advantages and disadvantages of home confinements*

	No. GPs	%	*No. midwives*	%
ADVANTAGES				
Less family disruption	55	(69)	23	(82)
Mother not left alone during labour	15	(19)	7	(26)
Opportunity for continuous care	26	(33)	16	(57)
Mother more relaxed—easier labour	43	(54)	10	(36)
Less cross-infection (not mentioned by midwives)	26	(33)	—	—
DISADVANTAGES				
Difficulties in obtaining help in the home during confinement	18	(22)	16	(57)
Inferior facilities	14	(17·5)	4	(14)
Risks of complications	55	(69)	4	(14)
Too many visitors—not enough rest for mother	11	(14)	3	(10·5)

Table 3.4. *Function of the GP unit*

Function	*No. GPs*	%	*No. midwives*	%
Reducing numbers of nursing-home confinements	5	(6)	1	(3·5)
Reducing numbers of 48-hour discharges	24	(30·5)	21	(75)
Reducing numbers of home confinements	32	(40·5)	3	(10·5)
To take social cases at present going to hospital	12	(15)	1	(3·5)
Reducing numbers of hospital confinements	9	(11·5)	0	
No views/no conceivable function	3		2	

Table 3.5. *Place of birth (figures as a percentage)*

	All births			*2nd, 3rd, and 4th births*		
	Hospital	*Home*	*Nursing home*	*Hospital*	*Home*	*Nursing home*
GP's children (aged 10 or under)	57	31	11	57·3	32·5	10
City births	53	37	8	37	53	5·5

maternity patients, only eight collected the cards after confinement, and over half the cards that were collected were retained for less than a year.

While, therefore, it is not possible to analyse the types of domiciliary maternity bookings accepted by GPs on the basis of age of the doctor, or years of experience, it is possible from the figures for domiciliary births kept by the Medical Officer of Health and from the responses of the GPs to draw the broad general conclusion that high-risk maternity cases are being accepted by GPs for domiciliary confinement, though to an extent unknown apparently even to themselves.

Nearly all the doctors thought there were enough hospital maternity beds to meet the demand from priority groups, and almost half thought there were enough beds to meet all demand, irrespective of any assessment of priority needs. Some doctors, however, volunteered the information that if a patient came to them expecting a second, third, or fourth child, with no record of obstetric or medical difficulties, any request for a hospital confinement was strongly discouraged as 'utterly unrealistic'.

The views of the 79 doctors on the obstetric list on the advantages and disadvantages of home confinements and on the primary function of a GP unit (set out in Tables 3.3 and 3.4) show that they are not as overwhelmingly convinced as the midwives of the superiority of home over hospital delivery.

The doctors agree with the midwives that the main advantage of home confinements is the minimum disruption of the family, but they strongly disagree over the main disadvantage, which the doctors overwhelmingly regard as the risks of complications in childbirth. This opinion is perhaps echoed in the doctors' suggestion that the main function of any GP unit should be the reduction of home confinements. Less than a third of the doctors wanted such a unit to concentrate on reducing the numbers of early discharge of hospital maternity patients, whereas three-quarters of the midwives had urged this as the primary aim of such a unit.

Though the doctors accept some patients within the high-risk categories for domiciliary confinement, they give only

qualified approval to childbirth at home. The doctors preferred, and managed to obtain, hospital deliveries for their wives at a higher rate than applied in the city generally (Table 3.5).

SUMMARY

Record-keeping in general practice does not permit the gathering of accurate information on maternity patients. This is particularly unfortunate as a woman sees her doctor as the first step in arranging either a hospital or home confinement and the GP is thus in a position to play a key role in the selection of place of confinement. The records of births kept by the Medical Officer of Health show that high-risk maternity patients are having domiciliary confinements. Each of these women has presumably seen her doctor as the first step in booking her confinement, and has not been dissuaded from having her baby at home. All the same, the doctors seem well aware of the risks of home confinements, and look forward to a GP unit opening in the area and reducing the numbers of home confinements. The doctors do not seem to condemn early discharge of hospital maternity cases to the same extent as the midwives, but nearly a third thought that the incidence of forty-eight-hour discharges should be reduced.

GPs seem to be accepting high-risk maternity patients for domiciliary confinement not because they are convinced of the superiority of childbirth at home (as seems true of the district midwives), but because they fail to persuade these women to accept a hospital confinement. An indication that the system of payments might play some part in the GP's attitude was given by one doctor who said that he never referred a pregnant patient, even in the high-risk categories, to the hospital booking clinic until her 36th week of pregnancy. Till then he gave her complete antenatal care and he was therefore entitled to claim the fee for this from the National Health Service. The system of payments under the National Health Service may, therefore, have some influence in a number of cases, since the GP receives no recognition for the giving of antenatal or post-natal care once his patient is booked for a hospital confinement. There is

Table 3.6. *Reasons for failing to secure hospital bed*

Reason	*Number of women*
Rejected by hospital booking clinic	5
Discouraged by GP	18
Discouraged by midwife	2
Thought it useless to apply	10

as yet, however, insufficient evidence to justify any firm conclusion as to the number of cases where such influence is felt.

Attitude of mothers

We contacted 200 expectant mothers (to be reinterviewed after confinement) and 200 women who had recently given birth to a child.[1] Of the 400 women (a 10 per cent random sample of births in one year in the city) there was no response from 19—8 refused and 11 could not be traced at the addresses given. We failed to contact a further 14 for a second interview.

Of the 382 interviewed, 99 per cent had their pregnancy confirmed by their GP in the first instance, and this was before the 16th week for 311 women. Firm bookings for the confinement were made at this stage in pregnancy by 44 per cent of the women, and by the 24th week almost 85 per cent had booked. For 169 a domiciliary confinement was booked, but 35 said they had wanted a hospital confinement. Their reasons for failing to secure a hospital bed were given as shown in Table 3.6. There was information about the actual place of confinement for only 160 of the 169 women booked for home confinement, of these 33 were in fact delivered in hospital—7 as emergency admissions and the remainder after a re-booking during pregnancy on medical advice.

Of the 169 women booked for a home confinement, 6 were primiparae over 25 years (3 of them over 30) and 13 were grand multiparae. Excluding the emergency admissions, 18 women in

1. Two sources of samples are possible. The birth notifications on the Medical Officer of Health's register and the confinement bookings in the city. Half of our sample was collected by each method. Both have advantages and disadvantages but on the whole we think the notification method is preferable.

Table 3.7. *Preference for place of confinement*

Registrar-General's class[1]	*Number in class*[2]	*Preferring hospital*[2] *No.*	%	*Preferring home No.*	%
I and II	53	27	(51)	20	(37·7)
III, IV and V	305	146	(47·8)	138	(45)
TOTAL	358	173	(48·3)	158	(44)

1. Information about husband's occupation, on which social class position in the Registrar-General's scale is based, was available for only 358 of the 382 respondents.

2. The sum of responses in these two columns does not amount to 358 since some women had no strong preference, or preferred a nursing-home confinement.

the two high-risk categories had domiciliary confinements, or 14 per cent of the 127 known domiciliary births in the sample.

One hundred and fifty-four of the 382 mothers claimed they were not asked by their GP where they wanted to have the baby. Only 6 women said their plans for the confinement were changed as a result of the midwife's visit to assess housing and social circumstances.

Women in classes I and II of the Registrar-General's social scale (3) were over-represented in hospital confinements, while women of classes III, IV, and V were over-represented in domiciliary confinements. There was, however, no significant difference at the 5 per cent level in the preferences expressed by women of different social groups for place of confinement (Table 3.7).

The initial preferences for place of confinement do not explain the greater propensity of mothers of social classes I and II to have hospital deliveries. Only half the women wanted a hospital confinement although 60 per cent of the births in fact took place in hospital. Possibly women in social classes I and II can more easily be redirected to hospital confinements because their higher educational standards enable them to grasp the GP's explanation of statistical risks.

When the preference of mothers is analysed in relation to parity and confinement experience, the increasing predilection for home confinement is apparent (Table 3.8). Eighty per cent gladly accepted the opportunity to have a first baby in hospital. The explanations given by the 382 mothers for their preferences

Table 3.8. *Preferences of mothers analysed (as a percentage)*

	No.	*Preferring home*	*Preferring hospital*	*No preference/ other*
All mothers	382	44	49	7
Mothers expecting 2nd or subsequent baby	252	58	37	5
Mothers with experience of both home and hospital confinement	101	86	10	4

are set out in Table 3.9. Clearly mothers prefer a hospital confinement for reasons of safety. If adverse social conditions are regarded as a health hazard, as distinct from an inconvenience, then 89 per cent of the women who chose a hospital confinement did so because they believed it offered greater medical safety.

Nearly two-thirds (60·5 per cent) of the women preferring a home confinement chose it because it did not mean separation from the family, particularly from other children. The reasons given by the remaining 40 per cent of women choosing domiciliary confinement all imply criticism of hospitals—total and unspecific in the 12·5 per cent who simply disliked the whole atmosphere of hospital, but relating to specific aspects of care in 13 per cent. The opportunity offered by domiciliary confinement for continuous care from the same medical personnel was stressed by 57 per cent of midwives and 33 per cent of GPs. In fact in the domiciliary births of the sample only half the mothers were attended by the same midwife who gave antenatal care; 65 per cent had no GP present at the birth, and less than a quarter were delivered by the same GP who gave attention during pregnancy. Continuity of medical care in domiciliary confinements may be overestimated by doctors and midwives, but not by mothers themselves, for only 2 per cent said this influenced their choice of place of confinement.

Reluctance to be left alone during labour was expressed by 11 per cent of those preferring a home confinement, but it was not possible to link this with experience in previous confinements, for women found it difficult to remember how far they had been left alone in labour. Very few were completely unattended, but not many were never left alone at all. Only 13 per

Table 3.9. *Explanations for preference given (as a percentage)*

PREFERENCE FOR HOSPITAL (186)[1]	
Medical safety	67·5
Social reasons (e.g. poor housing)	21·5
Other reasons (e.g. cheaper, more rest)	11
	100
PREFERENCE FOR HOME (167)[1]	
No need to leave family	60·5
Dislike of hospitals	12·5
Not left alone in labour	11
Continuous care	2
Other reasons (e.g. less regimentation, more visitors)	14
	100

1. These numbers do not total 382 since some women had no preference, or preferred a nursing-home confinement.

cent of the responses indicated that the possibility of the husband's presence during labour had any bearing on the choice of place of confinement.

Fifty-seven per cent of the midwives and 22 per cent of the GPs considered the difficulties of obtaining domestic help an important disadvantage of domiciliary confinement. The mothers themselves did not mention this point. Of the 260 women for whom this was a second or subsequent pregnancy, none had been forced to let her other children go into care while she was confined, and none had made use of the local authority home-help service. The husband looked after home and family during confinement in 65 per cent of cases, with the wife's mother and other relatives and friends giving help where he could not, or did not, cope.

SUMMARY

In the sample, 44 per cent of the 382 mothers expressed a wish for home confinement. The chief issues emerged as safety in childbirth, which was practically the only consideration of women preferring hospital confinement; the desire not to leave the family, which was paramount with over 60 per cent of those women choosing a home confinement; and dislike of the whole atmosphere of hospitals, the regimented routine, and rules.

Although the proportion of confinements booked for home (44 per cent) is roughly equal to the proportion of women expressing a preference for home confinement, the women booked for domiciliary confinement were not always the same women who wanted to have their babies at home. Of the sample of 382 women, 169 were booked for domiciliary confinements and over a fifth of these said they had wanted a hospital confinement. Conversely, some women who would have liked to have their babies at home, were persuaded to accept hospital confinements. Notwithstanding this selection process, 18 domiciliary births in the sample were to women in the two high-risk categories.

It seems clear from this investigation that few women who ask for a hospital confinement are denied one. In general women in this city appear to want hospital confinement to roughly the extent that women actually have hospital confinements. In Aberdeen it has been observed that as maternity beds increased, so more women were prepared to accept hospital confinement. It seems likely, then, that women's preferences are conditioned to some degree by knowledge of the availability of hospital beds. If this is so, the present proportion of women in the city preferring home confinement is not a fixed quantity, but reflects the current understanding of the availability of hospital maternity beds. To some extent the reasons given for preferring home confinement may be rationalizing a situation seen as inevitable, but undoubtedly some genuine conviction exists that a domiciliary confinement has important advantages over hospital confinement, especially less disruption of the family. The women seemed well aware of the greater medical safety of hospital confinement and probably most would accept a hospital bed, despite having to leave the family, if persuaded of its necessity.

Women who asked for a home confinement even if they were in one of the high-risk categories seemed to be given little persuasion to change their minds. If high-risk cases were routinely reported by district midwives, the supervisor and the GPs would have an opportunity to attempt to influence these

mothers to accept hospital confinement. One inducement might be to offer a hospital delivery with early discharge, for minimal absence from home might be acceptable to many. The replies of the midwives, and to a lesser extent the GPs, showed disapproval of any increase in the practice of early discharge. Midwives might be less condemnatory of the procedure if they were encouraged to see it as a means of improving the maternity care of high-risk groups and not merely as a convenient device to increase the use of hospital beds at minimal cost.

This study indicates that doctors and midwives could do more to persuade expectant mothers who present any sort of maternity risk to accept hospital confinement and, since the main reason why women choose a home confinement is fear of disruption of family life, the extension of schemes for early discharge would be a means of reducing the numbers of high-risk cases confined at home.

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Late bookers for antenatal care

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Late bookers for antenatal care

Introduction

Since the war numerous investigations have demonstrated the wide range of medical and social factors which are related to perinatal mortality. Studies within local populations (1–5) and studies based on national statistics from the General Register Office (6–16) have thrown light on relationships between mortality and a variety of maternal characteristics such as parity, age, stature, social class, health during gestation, past obstetric history, smoking habits, place of residence, social circumstances, place of confinement, and adequacy of antenatal care. Two large-scale surveys of all births occurring in the country during one week in 1946 (17) and one week in 1958 (18) have added greatly to our knowledge of the degree of risk associated with the many influences studied. Multivariate statistical analyses (19) show that relationships between perinatal mortality and age, parity and social class each persist when allowance is made for the others, and Spicer and Lipworth (20) have shown that regional variations in mortality are not eliminated when allowance is made for the effects of these factors. The relationship between local booking patterns and mortality has not been adequately explored hitherto.

Butler and Bonham (18) found that the perinatal mortality rate in babies whose mothers had received no antenatal care at all was five times the average, the rate among babies born to women who had received only one antenatal examination was four times, and among women who had three or four antenatal attendances three times that for all babies born during the week.

Although part of this excess mortality is attributable to the age, parity, social class, and social circumstances of the group of women who book too late to obtain the benefits of antenatal care, the strength of the association is great enough to support the view that antenatal care does prevent some perinatal deaths.

During the course of a local study one of us (21) had found grossly inadequate antenatal care to be confined to those instances where the woman had failed to inform the doctor or midwife of her pregnancy until late in gestation. Clearly, if this were also true of other areas, substantial improvements in antenatal care could only be achieved by inducing such women to 'book' earlier. Knowledge of the social characteristics of the women who 'book' late and of their reasons for delay in booking would clearly facilitate efforts to influence them.

Butler and Bonham found that delay in commencing antenatal care was related to parity. Women of parity 3 failed to obtain care before the 32nd week of gestation twice as frequently, and women of parity 4+ three times as often, as did those of parity 0 and parity 1. It seemed likely that these women might, as a result of experience of normal confinement, have lost the fear-incentive to early attendance, and be deterred by the inconvenience, expense, and social difficulties due to their families of young children from seeking antenatal care.

During a visit to France one of us learned that in Paris an overwhelming majority of expectant mothers attended clinics at the 12th week of gestation in order to obtain the certificates of continuing pregnancy needed to claim a social-security payment. This contrasts with the position in England where Butler and Bonham found that less than half the women had sought care by the 16th week. Clearly the probable effects of a financial incentive to early antenatal attendance upon these English women who tend to 'book' late would be worth assessing.

Objectives

This survey was therefore designed with a view to ascertaining the social characteristics of those women who booked for obstetric care so late in gestation as to deprive themselves of

adequate antenatal care, to inquiring into their reasons for delay in booking, and to discovering whether variation in incidence of delayed booking and in local custom regarding time of seeking medical care might account for differences in perinatal mortality between various areas in England and Wales.

Method

Advice on the design of a standard interview was obtained from a number of authorities, and instructions for interviewers were drawn up. The questions were printed as an interview book, so that by reading out each question and recording the answer in the prescribed manner numbers of different interviewers could provide comparable data.

As social characteristics and motives might vary between women in different parts of the country, it was desirable to sample widely, including urban and rural populations from different geographical regions. Only by restricting the survey to areas with relatively small populations could a sufficiently large number of authorities be included. We therefore identified the local health authorities with populations of less than 500,000, calculated quinquennial perinatal mortality rates for them, and ranked them in this order. We then selected groups of two county boroughs and one county from the top, from the middle, and from the bottom of the resulting table, paying regard to the need to include as wide a variety of cultures and geographical regions as possible. When experience had shown the incidence of late booking to be lower than we expected from Butler and Bonham's figures, two further areas were included in the survey for a shorter period, but the original group was asked to supply information about all obstetric bookings during a period of six months. Each medical officer of health was asked to arrange for a health visitor or a midwife to visit and interview as soon as possible every woman who was more than thirty-two weeks pregnant at the time of booking and had not been receiving a regular monthly antenatal examination before this stage of pregnancy.

To detect these late bookers we asked every hospital providing obstetric services in the areas to submit each week a return

showing the name, address, age, parity, week of gestation when antenatal care commenced, and week of gestation at time of booking. Local health authority midwives were asked to complete similar returns.

Our initial proposal to seek information from GPs was abandoned. Women booking for domiciliary care normally book both with a doctor and with a midwife, and it was ascertained that less than 1 per cent failed to do this. The administrative difficulty and expense of obtaining returns from GPs and of overcoming the problem of duplicate bookings rendered this impracticable.

Because we wished to ascertain each woman's views at the time of booking it was requested that interviews should take place before confinement whenever possible. An additional inquiry had therefore to be made to ascertain the outcome of each pregnancy. It was consequently arranged for each health department to keep a register of cases, make out a post-natal inquiry form for each woman interviewed, and send this to the obstetric attendant notifying the relevant birth. During the final week of the survey midwives and hospitals were requested to ask every woman who booked in that week to complete a simple questionary providing a few additional items of information for comparison with our interview data.

Results

Eleven local health authorities and one borough with delegated functions took part in the survey. One hospital serving part of the county of Lindsey and one serving part of Anglesey declined, and Oxfordshire excluded part of its area (Table 4.1).

Details of 10,250 obstetric bookings were obtained. Fourteen of these related to a mother and baby home in Carlisle which accepts unmarried girls from other areas, and these were excluded. Of the 10,236 remaining bookings, 7,485 were for institutional and 2,543 for domiciliary confinement. A further 208 women had booked at combined booking clinics but the decision as to place of confinement had been deferred. Women with other children were inclined to seek home care, but the

Table 4.1. *Participating areas: their populations, perinatal mortality rates, and apparent completeness of sampling*

Area[1]	*Population 1966*[2]	*Perinatal mortality rates 1961–5*	*1967*	*Total number of births in 1967*	*Number of obstetric bookings shown on weekly returns*	*Percentage of expected number of bookings in period*
Merthyr Tydfil	57,750	41	28	951	386	93
Carlisle	70,610	37	34	1,226	614	100
Sunderland	186,820	35	33·5	4,101	1,403	102
Anglesey County	56,470	34	24	1,012	79	31[4]
Blackburn	100,920	34	25	1,892	1,039	109
Lindsey County[3]	350,330	34	25	6,530	2,668	82[4]
Cumberland County	223,180	32	29	3,671	1,173	64
York	101,550	30	29	1,750	800	94
Great Yarmouth	52,370	28	27	1,221	392	64
Oxford	108,780	24	16	1,705	722	85
Oxford County	230,970	22	21	4,794	960	40[4]

1. Ranked according to the perinatal mortality rates for the quinquennium 1961–5.
2. Taken from the *Ten Per Cent Sample Census* of 1966.
3. Including Scunthorpe Borough which has delegated health functions.
4. Areas from which some parts or institutions have been omitted in our survey.

Table 4.2. *Perinatal mortality and commencement of antenatal care*

Local Health Authority	*Perinatal mortality rate for quinquennium 1962–6*	*Percentage of all women for whom dates of starting are known*	*Percentage of women with known dates who started Before 12th week*	*Before 16th week*	*After 31st week*
Merthyr Tydfil	39	99·6	4·7	19·2	18·2
Sunderland	35	98·6	34·1	56·2	3·1
Carlisle	34	29·4	1	1	1
Blackburn	33·5	67·7	16·2	42·2	4·0
Anglesey County	32	100	6·3	17·7	17·7
Cumberland County	31	65·3	13·9	42·7	6·9
Lindsey County	30	74·7	18·5	52·7	2·3
York	29	66·7	19·1	48·5	1·7
Great Yarmouth	29	97·1	35·8	79·1	1·8
Oxford	22	98·7	46·7	74·9	2·8
Oxford County	22	98·9	40·6	71·5	2·0

1. Percentage omitted because of incomplete information.

efforts of doctors and midwives to persuade the high-risk grand multiparae to accept hospital bookings reversed the trend for parity 4+; even so almost a quarter of parity 4+ bookings were for domiciliary care.

Place of booking and the start of antenatal supervision were closely related. Over 80 per cent of the 308 women who began antenatal care during the first eight weeks of pregnancy were booked for hospital confinement. The proportion booking for domiciliary care rose with week of starting antenatal care from a minimum of 19·1 per cent of the very early bookers to a maximum of 43·3 per cent among the 353 who started antenatal care between weeks 28 and 31, declining to about 35 per cent of the very late bookers.

The proportion of women seeking antenatal care very early in pregnancy was related to perinatal mortality (Table 4.2) if allowance is made for the effect on the latter of the high incidence of grand multiparity in Blackburn and Sunderland (Table 4.3). Both time of booking and mortality were related to social class, parity, and maternal age, but the strength of the association suggests that lack of adequate antenatal care is likely to be among the causes of excess perinatal mortality, particularly among the Welsh communities of Anglesey and Merthyr Tydfil.

Table 4.3. *Parity of women in each area*

Area	*Perinatal mortality rate for quinquennium 1962–6*	*0*	*1*	*2*	*3*	*4+*	*Not stated*	*Total %*
Merthyr Tydfil	39	27·2	30·3	20·7	10·4	10·6	0·8	100·0
Sunderland	35	31·5	23·9	19·2	10·3	15·0	0·1	100·0
Carlisle	34	40·5	30·3	16·0	6·0	7·2	—	100·0
Blackburn	33·5	23·0	32·1	22·5	9·9	12·5	—	100·0
Anglesey	32	21·5	26·6	20·3	22·8	8·9	—	100·1
Cumberland	31	37·4	29·4	16·3	8·9	8·0	—	100·0
Lindsey	30	36·1	26·6	16·8	9·3	9·3	1·9	100·0
York	29	32·1	31·9	19·6	8·6	6·6	1·1	99·9
Great Yarmouth	29	38·0	29·3	17·1	5·9	9·7	—	100·0
Oxford	22	41·8	27·7	17·5	7·1	5·7	0·1	99·9
Oxford County	22	33·9	34·6	17·9	6·8	6·7	0·1	100·0

Cases interviewed

Of the cases shown on the weekly returns as having had no antenatal care before the end of the 32nd week of gestation, 12 could not be traced and 6 refused to be interviewed. In 3 instances interviewers declined to interrogate patients because this would have caused distress. Many interviews were started, but later abandoned when it was discovered that the woman had received early and adequate antenatal care unknown to the person accepting the booking. In 68 such cases the interviews were completed and yielded data about a group which had been selected as a result of defective communication between the branches of the health service. These 68 interviews along with 11 interviewed cases from Coledale Hall mother and baby home, whose inclusion would have caused bias, were excluded from our analyses. Thus of 243 women interviewed only 164 complied with our criteria. Of these 66 (40 per cent) had seen their doctors before the 31st week of gestation, 6 (3·6 per cent) of them before the 12th week. In these cases too the failure to begin antenatal care earlier may have been partly due to lack of liaison between the branches of the obstetric services and not wholly the result of error on the part of the patient.

The two outstanding groups in our sample were women living in irregular marital situations and the grand multiparae

Table 4.4. *Parity of late bookers*

Marital situation		*0*	*1*	*2*	*3*	*4+*	*Not stated*	*Total*
Normal	No.	4	23	23	10	36	1	97
	%	4·1	23·7	23·7	10·3	37·2	1·0	100·0
Irregular	No.	36	14	3	6	8	—	67
	%	53·7	20·9	4·5	9·0	12·0	—	100·1

Table 4.5. *Age of late bookers*

Marital situation		*Age at last birthday*					
		Up to 19 years	*20–4 years*	*25–9 years*	*30–4 years*	*35+ years*	*Total*
Normal	No.	5	36	28	13	15	97
	%	5·2	37·1	28·8	13·4	15·5	100·0
Irregular	No.	20	22	11	6	8	67
	%	29·9	32·8	16·4	9·0	11·9	100·0

(Table 4.4) and there were some important differences in their social backgrounds and attitudes.

THE SIXTY-SEVEN WOMEN IN IRREGULAR MARITAL SITUATIONS

Sixty-seven of the late bookers were in irregular marital situations. Four of those were widowed or divorced, 11 were married but pregnant to men other than their husbands, 9 had conceived before marriage, 6 were single but cohabiting, 35 were single but not cohabiting. As might be expected, the unmarried girls tended to be young and nulliparous (see Tables 4.4 and 4.5). Few of these women were pleased about their pregnancy (Table 4.6) and concealment of pregnancy was by far their most important reason for booking late (Table 4.7).

Compared with the 97 normally married, rather more of these women lived in rural areas, had been in their present area of residence for more than five years, shared accommodation with adult relatives, and more were members of smaller less-crowded households.

Over a third either had very unstable finances or, if young, had not yet assumed housekeeping responsibilities. Almost a third were living in households with non-earning female heads

Table 4.6. *A First reactions to pregnancy in various survey populations*

A. FIRST REACTIONS TO PREGNANCY

Survey population	*Marital situation*		*Pleased*	*Surprised*	*Worried or frightened*	*Ashamed*	*Other or no answer*	*Total*
Women completing terminal questionaries	'Mrs.'	No.	143	35	23	2	1	204
		%	70·0	17·2	11·3	1·0	0·5	100·0
	'Miss'	No.	1	2	—	10	—	13
		%	7·6	15·4	—	77·0	—	100·0
Late bookers	Normal	No.	29	28	33	5	2	97
		%	29·9	28·8	34·0	5·2	2·1	100·0
	Irregular	No.	4	11	26	24	2	67
		%	6·0	16·4	38·8	35·8	3·0	100·0

B. PLANNING OF PRESENT PREGNANCY

			Pregnancy planned	*Pregnancy accidental: contraceptive failure*	*Religious objections to contraception*	*No contraceptive measures taken*	*No answer*	*Total*
Late bookers	Normal	No.	13	15	5	58	6	97
		%	13·4	15·5	5·2	59·7	6·2	100·0

1. Ten women completing terminal questionaries did not give information on their marital status.

Table 4.7. *Main (assessed) reason for booking late*

Marital situation		*Persistent late booker*	*Removal*	*Care of family*	*Pregnancy unsuspected*	*Cost or difficulty of getting antenatal care*	*Problem family*	*Conceal-ment*	*Other*	*Total*
Normal	No.	29	21	12	7	6	5	4	13	97
	%	29·9	21·6	12·4	7·2	6·2	5·2	4·1	13·4	100·0
Irregular	No.	3	2	1	6	3	4	43	5	67
	%	4·5	3·0	1·5	9·0	4·5	6·0	64·1	7·5	100·1

Table 4.8. *Late bookers' paid work in pregnancy*

A. WHETHER WORKING

Marital situation		*Working*	*Not working*	*Not stated whether working*	*Total*
Normal	No.	18	79	—	97
	%	18·5	81·5	—	100·0
Irregular	No.	45	19	3	67
	%	67·1	28·4	4·5	100·0

B. DURATION OF PAID WORK (EMPLOYED WOMEN ONLY)

		Had left work by the end of				
		5th month	*6th month*	*7th month*	*8th month*	*Total*
Normal	No.	4	6	12	13	18
	%[1]	22·2	33·3	66·7	72·4	100·0
Irregular	No.	3	4	12	24	45
	%[1]	6·7	8·9	26·7	53·3	100·0

1. These figures are cumulative.

(i.e. their own mothers or themselves). Nearly a quarter of their households had no earners at all, and another 15 per cent relied on women's earnings only. Most of them had been in paid work during pregnancy (Table 4.8) and 21 women were still in employment at the end of the eighth month.

Thirty-six girls were experiencing their first pregnancy. Among the multiparae there was a similar pattern of previous obstetric abnormality as for the normally married. While both groups suspected pregnancy at similarly early stages of gestation, many more of those in irregular marital situations delayed their approach to the maternity services by five months or more, and 18 (27 per cent) had no antenatal care at all. Probably because of their parity status or their failure to seek care, an exceptionally high proportion (82 per cent) were admitted for confinement to specialist hospitals, some of them as emergencies or transfers. Post-natal information was available for 61. All but 3 of these babies lived, and the group had fewer premature births than the normally married. The mothers' youth and low parities could account for this.

Although for these irregular pregnancies the women had delayed or refused to obtain antenatal care, their attitudes to

antenatal supervision were rather more positive than those of the normally married. They preferred to get care from their GP, they more often saw the value of early attention, and the great majority of them assured the interviewers that they would approach the services earlier the next time (though some qualified this by promising to do so only if their marital situation was regularized).

THE NINETY-SEVEN NORMALLY MARRIED

Thirty-six of these women already had four or more children. Almost all were born in the British Isles (including Eire); 3 came from industrially advanced parts of the world and 4 from Pakistan. Thirty were Roman Catholics or had Catholic husbands. Three had had no formal schooling at all, and 9 had stayed at school beyond the statutory minimum age. About three-quarters had attended a secondary modern school or its equivalent. The occupations of the husbands of 7 were professional or managerial, 4 white-collar, 41 skilled manual, and 35 unskilled.

A few families had no male breadwinners, more had male heads who were not earning. For about two-thirds the net weekly household income per head after deducting rent and other regular commitments was under £3. 5*s*. Only a few supplemented their housekeeping money by going out to work.

Despite the relatively unfavourable background the interviewers (often midwives, sometimes health visitors) considered that the multiparae maintained average standards of child care. In making a general assessment of the household the interviewers rated one-third as good and one-third as 'average for the district'. The remainder had severe or very severe problems, frequently requiring skilled social casework.

CONTRACEPTIVES

Only 8 women attended a family planning clinic, and 29 had received contraceptive advice from their doctors. Seventeen had just achieved and 36 had already exceeded their desired family size. Of the present pregnancies 13 had been planned and 15

were due to an accidental contraceptive failure. Sixty-three of the women took no contraceptive measures, 5 because of religious objections (Table 4.6B).

OBSTETRIC DATA

Of the 93 multiparae, 8 women had experienced complications at previous confinements and 11 had had still-births or abortions.

Some late bookers had come to realize the dangers inherent in their behaviour. When asked (admittedly by a midwife or health visitor whom they knew to be anxious for their reform) at what stage they would book in any subsequent pregnancy, the majority declared their intention of approaching the maternity services earlier. Even so, almost a third would unrepentantly return at the same or even later stages. Almost a third thought that early medical attention had little value, and in the majority of cases this was not because they feared or disliked internal medical examinations. Seventy of these women had attended antenatal clinics regularly during at least one of their previous pregnancies. A further 19 had attended occasionally, and 7 had never attended a clinic.

As a possible incentive to earlier booking for care, women were asked whether they favoured the idea of an extra maternity grant, conditional upon seeking care before the fourth month of pregnancy. Eight women could not give a definite answer, but of those who did about a third favoured the idea in principle. Far fewer stated they were prepared to modify their booking behaviour if it were introduced. There was clearly some uncertainty on this point, however, because when asked subsequently how they would have behaved if grants of various values had been offered conditional upon early antenatal attendance, 40 per cent of the 77 women who were able to answer this question admitted that they would have booked earlier had a grant of £10 been offered.

Three-quarters of the women had realized they were pregnant by the 16th week. Others made the discovery later, and one woman went into labour unsuspecting. Forty-nine women delayed approaching the maternity services for at least five

Table 4.9. *Interval between suspecting pregnancy and approaching the maternity services for various survey populations*

Survey population	*Marital situation*		*Within 1 month*	*1 or 2 months later*	*3 or 4 months later*	*5 or more months later*	*Not stated*	*Total*
Women completing terminal questionaries	All situations	No.	95	111	19	2	—	227
		%	41·9	48·9	8·4	0·9	—	100·1
Late bookers	Normal	No.	12	17	18	49	1	97
		%	12·4	17 5	18·6	50·5	1·0	100·0
	Irregular	No.	3	4	13	46	1	67
		%	4·5	6·0	19·4	68·6	1·5	100·0

months (Table 4.9). No one cause for delay predominated. Some factors seemed irrelevant: for example, of the few who were in paid employment during pregnancy a third stayed at work beyond the 28th week, but no one gave this as a reason for delay. Many of the women were influenced by several factors. In each case we endeavoured to assess the crucial one, and concluded that 12 delayed because of having to care for their other children; 21 because of moving house during pregnancy. Failure to understand the need for care was the most frequent cause, being the principal factor in 29 cases. Other reasons were unsuspected pregnancy, cost or inconvenience of visit to clinic, and concealment of pregnancy (Table 4.7).

The first approach to the services was almost always to the GP. Only 35 women approached him about supervision in pregnancy, the rest merely wanted to make arrangements for confinement or to get treatment, advice, or the maternity benefit.

For many the GP was but an intermediary whose function was to indicate other sources of care (i.e. the midwife or the maternity hospital). Forty-six women were told to book at the hospital and 22 to return to the surgery. Many in fact did as instructed, but 14 did not.

Particulars of the outcome of the confinement were collected in the post-natal letter-forms returned from the hospitals or the domiciliary midwives attending the mothers. These forms were not completed for all the women, and details are available for only 88 (or 91 per cent) of the married women. Among these there were 2 deaths; 1 was reported as avoidable if adequate

Table 4.10. *Parity in survey populations*

Survey population		*Distribution by number of previous births*						
		0	*1*	*2*	*3*	*4+*	*Not stated*	*Total*
Late bookers	No.	40	37	26	16	44	1	164
	%	24·4	22·6	15·8	9·7	26·9	0·6	100·0
Terminal questionary	No.	74	71	37	18	26	1	227
	%	32·6	31·2	16·3	7·9	11·5	0·4	99·9
Weekly returns entries	No.	3,489	2,949	1,857	902	971	68	10,236
	%	34·2	28·8	18·1	8·8	9·5	0·7	100·1

antenatal care had been given. Two babies who survived were reported to be malformed. The senior attendant at confinement was usually a midwife. In 7 cases a doctor was in attendance, but in 3 instances no trained person was present at the birth.

Clearly, for the married as for the unmarried late bookers the present pregnancy was unplanned and unwanted. Their pattern of late realization, of postponement of booking, neglect of antenatal care, and apathy regarding arrangements for confinement may all derive from this.

TERMINAL QUESTIONARIES

Although the information we were able to collect on the attitudes and motives of the women who booked during the last week of our survey was necessarily less detailed than that which we derived from the sample of late bookers, it does provide valuable information about a reasonably representative group of 227 expectant mothers (Table 4.10). Two-thirds of them were pleased when they discovered they were pregnant. One hundred and eighty had consulted their GP during the first trimester, 136 of them doing so before the 12th week of pregnancy. Their reasons for seeing their doctor at this time were to confirm pregnancy (38·2 per cent) or because they felt unwell and wanted treatment (22 per cent). Only 7·2 per cent went to seek antenatal care.

The reasons given by the 59 women who first approached their doctor between the 12th and 15th week were similar, half of them seeking only to confirm pregnancy, 5 to obtain medical treatment, and a mere 6 (10 per cent) for antenatal care.

Among the 31 women who did not approach their doctors until after the 16th week, the proportion who went to secure antenatal care was higher, 5 women (16 per cent) giving this as their reason. A further 6 (19·3 per cent) went at this time for reasons of personal convenience, 4 (13 per cent) to confirm pregnancy, and 2 to seek treatment for symptoms.

Clearly the need for early antenatal care is not yet understood by the general public.

Of the women who had not already approached the services by the end of the 13th week of gestation 34·7 per cent stated that they would have approached sooner had a grant of £10 been payable to women seeking care by this stage of gestation.

DISCUSSION

Our definition, for the purposes of this survey, of failure to make arrangements for confinement and to receive antenatal care until after the 32nd week of gestation was arbitrary. This choice was made in order to keep the number of interviews small enough so that a health visitor's work load would not be so increased as to deter medical officers of health from agreeing to participate. Butler and Bonham (18) had found that 3 per cent of women failed to receive antenatal care before the 32nd week. We therefore designed a survey to sample about 10,000 births from which we expected 300 late bookers would be identified. That in fact only a little over half this number came to light indicates more enlightened attitudes. The increasing tendency to begin antenatal care earlier may well be an important factor contributing to the nation-wide reduction in perinatal mortality during the past ten years.

Selection of so late a period as 32nd week of gestation not only resulted in rather smaller numbers being interviewed than we had wished, but also had the disadvantage of producing a sample comprising the most difficult cases. Only a minority of perinatal deaths can be confidently attributed to factors which could have been detected and corrected in the last two months of pregnancy. There is a considerable amount of evidence to show that the earlier stages of gestation are of greater relevance

than are the last few months. The effects of rubella infection and of thalidomide ingestion in the first trimester are well known, and indicate the importance of this period of pregnancy. Recent work by Evers in Holland (22) has shown a strong relationship between the iron deficiency in early pregnancy as measured by the iron-binding capacity of the serum, and low birth-weight.

Brimblecombe *et al.* (15) have shown a close relationship between the incidence of low birth-weight and perinatal mortality. It is possible that socio-economically determined nutritional factors leading to differences in incidence of iron deficiency, later modified by the proportion of expectant mothers who seek care and have any iron deficiency detected and corrected sufficiently early in pregnancy, may be important in determining both the prematurity and perinatal mortality rates for a district.

If this were indeed the mechanism by which antenatal supervision exerted its greatest effect upon perinatal mortality it would be as important to persuade the women who tend to book at the 20th week to seek care two or three months sooner as to induce the very late bookers to mend their ways.

A small proportion of the women who complied with our definition of late bookers had visited their doctors early in gestation to confirm pregnancy or seek treatment. Clearly the blame for deficiencies in the antenatal care of this group should be shared between the patient and the health services. If there were adequate co-operation and communication between GPs, hospital staff, and the local health authority personnel, it would be possible to take steps to supervise, at home if necessary, any woman who was known to be pregnant and who had failed to attend at the surgery, clinic, or hospital as advised by her doctor at the initial consultation.

Administrative arrangements varied widely between the different participating areas and many areas had no adequate machinery to secure domiciliary visiting of defaulters from clinics. In Oxford city, where the midwives are attached to general practices, their close contact with the doctors enables

them to learn of pregnancies very early. This may be one of the factors responsible for the very high incidence of very early antenatal care in that city.

Most of the women in irregular marital situations were unmarried girls who were not cohabiting with a man and who were expecting their first baby. Of 44 girls in this situation 9 married during the pregnancy and 35 were still unmarried at the time of their confinement. Six other unmarried girls were cohabiting with men. The remaining 17 women in irregular situations were mainly widows or married women pregnant by men other than their husbands. Our terminal questionary sample showed 6 per cent of all bookers to be unmarried, and as 30 per cent of all late bookers were unmarried it would appear that illegitimate pregnancy increases the risk of delay in seeking obstetric care fivefold.

It is easy to understand why an unmarried girl will wish to conceal her pregnancy, and will not wish to be seen attending an antenatal clinic. Most of them need to ascertain whether or not they are pregnant as early as possible however, and the provision of multipurpose clinics which they could attend for diagnosis or care without the reason being apparent to others would help the few who feel unable to approach their GPs. Multiple screening clinics, or combined cytology and family planning clinics might provide suitable 'cover' for girls in this predicament who fear that their GPs might inform their parents, but clearly the GP is the person best placed to ensure adequate care for this group. There is hope that the recent change in the law regarding abortion may well result in many pregnant unmarried girls consulting their doctors early in pregnancy in future, and improved provision of family planning services and advances in contraceptive methods may reduce the size of the problem.

The majority of our sample of late bookers were married women, however, and 96 per cent already had families. Most of them had several children, 37 per cent having at least 4. Our weekly returns showed that 9·5 per cent of all bookings related to women of parity 4+. The over-all incidence of this parity

among late bookers (married and unmarried) was 27 per cent. Thus it appears that excessive delay in seeking obstetric care is increased threefold among women of high parity.

Even among the married women only 13 per cent had planned their pregnancy and only 30 per cent were pleased about it. Unwanted pregnancy was, therefore, an important factor. Our terminal questionary sample showed that 71 per cent of married women booking in the last week of the survey had been pleased that they were pregnant.

No single cause was predominant in determining why married women delayed seeking care. Some who were about to move to live in another area understandably waited to book in their new area of residence. A larger number failed to appreciate that antenatal care was either necessary or desirable. They were predominantly people of poor educational attainment, of low socio-economic status, living in relatively overcrowded circumstances and many of them had required help and supervision by social casework agencies. Care of other children made it difficult for the mother to go to see her doctor or go to an antenatal clinic, and as many of them lived on low incomes the expense of travelling to clinics or surgeries further reduced the incentive. Experience of past normal confinements had removed their fears of labour, and since the baby was so frequently unwanted, propaganda based on the safety of the baby might well operate in the wrong direction. Sixteen per cent of the pregnancies were due to contraceptive failures. Sixty-five per cent had not taken any contraceptive precautions, but in only 5 per cent was this due to religious objection. Clearly, increased knowledge and availability of free or subsidized family planning services could greatly assist this group of women. Greater readiness on the part of GPs to offer contraceptive advice or to refer cases for sterilization would be of even greater value. Only 30 per cent of our interview cases had received any advice on family limitation from their GP, and 57 per cent stated that their doctors did not give such advice.

Our findings indicate that the few pregnant women who are either grand multiparae of low social class, or who are not

married are particularly prone to delay seeking antenatal care. A proportion of them do, however, see their doctor at an early stage for treatment or to confirm pregnancy. In future even more may do so in the hope of obtaining an abortion. It should be possible to make administrative arrangements to check that every woman who is known to be pregnant is receiving antenatal care. Health visitors paying visits to families of young children could inquire about the possibility of pregnancy. On learning that the woman is again pregnant a health visitor could inform the GP and midwife and make any arrangements for child-minding or transport which may be necessary to enable the woman to attend clinic, surgery, or hospital. Reliance upon the patient contacting midwife or hospital herself is clearly not satisfactory. Although most women do as instructed a few fail to do so soon enough. Clearly if GPs would refer obstetric patients to midwives or to hospitals by post, and if hospitals and local health authority clinics would advise GPs of defaulters, earlier care should result. While such measures would improve the position, they can only work after the woman has disclosed the fact that she is pregnant.

It appears from the replies given on interview that four-tenths of our sample of late bookers might have responded to a grant of £10 conditional upon a medical certificate issued in early pregnancy. More than a third of the small minority of our terminal questionary sample who had not already consulted their doctors before the end of the first trimester would have done so in response to such a grant. Currently maternity benefits are of two kinds. The maternity allowance of £4. 10*s*. per week is payable to women who have been in employment and have paid full insurance contributions earlier in the pregnancy. This is consequently only payable to a small minority of expectant mothers.

The maternity grant of £22, payable after the 31st week of gestation and intended to help all mothers with the expenses of having a baby is denied to a small but needy minority of women. The rules require that the woman or her husband shall have paid twenty-six insurance contributions before the baby

is born and twenty-six contributions in a stipulated test year. Consequently it is denied to the unmarried mother who has been prevented by her other young children from taking employment. Such a woman may be cohabiting with a married man separated from the wife to whom he must also pay maintenance. It is also denied to some very young brides. Review of these rules is already desirable in order to reduce hardship for these most needy cases. Elimination of the contribution test would make the benefit available to the vulnerable groups whom we have found so prone to delay seeking care. Making payment of part—say half—of this grant conditional upon production of a medical certificate issued before the 14th week of pregnancy could provide the incentive for early contact with the doctor, even if economic factors precluded provision of additional funds.

The sample of pregnant women who completed our terminal questionary was not fully representative, as it was less complete than we had wished. The results should therefore be viewed with some caution. They suggest, however, that integration and improved administration of the obstetric services might raise to 80 per cent the proportion of women starting antenatal care in the first trimester. They also suggest that reform of maternity benefits to provide a component conditional upon a medical certificate issued before the 14th week of gestation might raise this to 87 per cent. A small proportion of refractory cases, including those who mistake the amenorrhoea of pregnancy for the menopause, must always remain.

We were able to obtain details of the outcome of pregnancy for 149 (91 per cent) of our late bookers. One woman bore twins. Of the resulting 150 babies three were still-born and two died in the neonatal period. That the still-birth rate should be only 20 per thousand and the perinatal mortality rate only 33·3 per thousand among such a notably high-risk population reflects great credit on the obstetric services. It also implies that the contribution to over-all mortality made by this small minority is negligible. An antenatal grant and administrative reform which would permit improved and earlier care of the

majority of mothers would exert a far bigger influence upon the vital statistics of an area.

SUMMARY

Details of obstetric bookings were obtained from eleven local health authority areas representing boroughs and counties with high, intermediate, and low perinatal mortality rates and in different regions of England and Wales. Women who failed to seek antenatal care before the 32nd week of gestation were identified and interviewed. Data regarding their social circumstances and reasons for delay in seeking obstetric care were collected.

Areas which had experienced consistently high perinatal mortality rates yielded higher proportions of late bookers than those with low rates. From the 10,236 obstetric bookings recorded, 232 who appeared to comply with our definition were identified and interviewed. In 68 instances it was found that antenatal care had been instituted earlier, unknown to the person accepting the booking, and only 164 proved not to have received antenatal care. Sixty-two per cent of those were either unmarried or of parity 4+. Although only 6 per cent of a sample of all women who booked in the last week of the survey were unmarried, 30 per cent of the late bookers were unmarried or married during pregnancy. The incidence of high parity (4+) in late bookers was 37 per cent, while among the 10,236 total bookings it was only 9·5 per cent.

Desire to conceal an illegitimate pregnancy was the most important cause of late booking in the unmarried, most of whom were nulliparous. Unwanted pregnancy was also an important feature among the group of late bookers who were married. This group tended to be of low socio-economic status, of high parity, and to live in overcrowded conditions. Many of them had required help or supervision from social caseworkers. Ignorance of the need for antenatal supervision, change of place of domicile, difficulties regarding care of existing children, deterrence by the cost or inconvenience of attending surgery or clinic, and failure to realize that she was pregnant were the most frequent causes of delayed booking among the married.

Only 40 per cent of the women answering the relevant question would have sought care sooner in response to a £10 grant conditional upon antenatal attendance. The group who failed to seek care until after the 32nd week of gestation proved to be strongly motivated towards delay, but as most of them come from a readily identifiable minority it would be possible by administrative reorganization to secure earlier care for a proportion.

Although the effects of a grant, backed by administrative reform, on the minority who complied with our criteria would only make a small difference to an area's mortality rate, the same measures would also influence the behaviour of the much larger number of women who currently seek care during the second trimester. Our evidence suggests that such measures might result in 87 per cent of pregnant women beginning antenatal care during the first trimester, with consequent benefit to perinatal mortality rates.

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5

Use of maternity care in Glasgow

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Use of maternity care in Glasgow

The perinatal mortality rate in Glasgow has remained substantially above the rate for Scotland as a whole and for England and Wales for at least a quarter of a century. Both the quality of the obstetric care provided and the use of services influence the perinatal mortality of a population. In Glasgow, an increase in the hospital confinement rate has been accompanied by a reduction in the perinatal mortality rate (Figure 5.1), but Smith (4) showed that the proportion of births to Glasgow residents in 1961 taking place in hospital was successively lower from social class I to social class V, and he suggested that the association between perinatal mortality and social class may be explained partly by differences in the use of the services. In a study of social factors which might lead mothers from the lower social classes to use the obstetric services less effectively, Smith and Macdonald (5) showed that, while the over-all hospital confinement rate in Glasgow was 71 per cent, over 90 per cent of mothers had a generally acceptable indication for hospital delivery. Selection of cases for hospital delivery was not very efficient. Social conditions contributed little or nothing to the chances of hospital delivery. More than 10 per cent of primiparae and 40 per cent of mothers having a fourth or later child were not being delivered in hospital. Previous still-births did not appreciably raise the chances of hospital delivery and the data suggested that a substantial number of women booked for home delivery later required delivery in hospital and had a very high perinatal death-rate.

Our present study of what determines the use of maternity care consisted of two parts: 1, a statistical analysis of all births

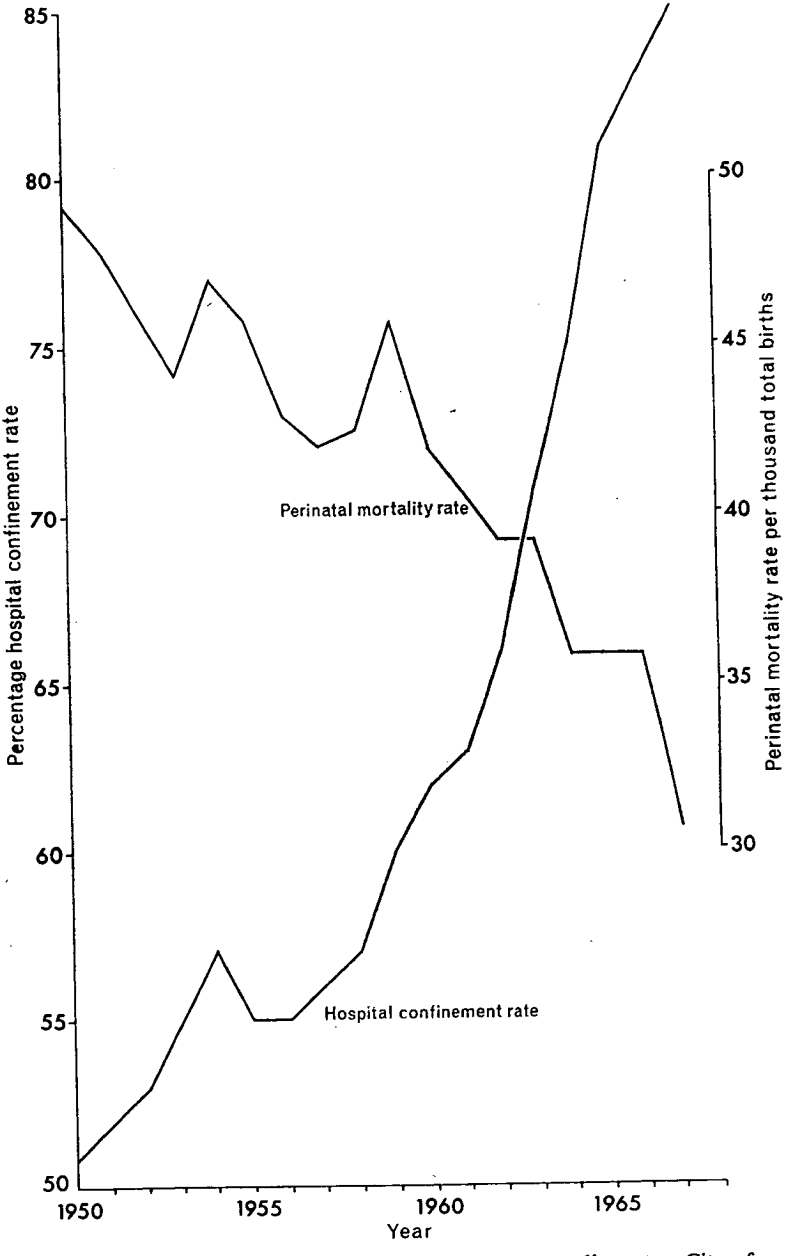

Figure 5.1. Hospital confinement rates and perinatal mortality rates, City of Glasgow, 1950–67

in 1967 to relate the place of confinement and outcome of pregnancy to obstetric and social factors; 2, a domiciliary inquiry into the attitudes of a random sample of recently delivered mothers, supplemented by a search of hospital and domiciliary obstetric records and a questionnaire inquiry into the views of GPs on the maternity services.

Obstetric services

Glasgow has 768 obstetric beds, including 16 in a GP unit. The increase in the hospital confinement rate from 71 per cent in 1963 to 85 per cent in 1967 was achieved by the earlier discharge of patients from hospital. The Domiciliary Midwifery Service attended 1,204 such patients in 1963 and 1,691 in 1967. The opening of a new maternity hospital of 114 beds in 1964 was offset by the closure of two obstetric units with 157 beds. Acceptance is based on the Montgomery recommendations (1) which favour hospital confinement for:

(*a*) Women with medical or obstetric conditions requiring hospital confinement;
(*b*) Primigravidae;
(*c*) Women with fourth or subsequent pregnancies;
(*d*) Women requiring admission on social grounds.

Almost all patients first attend their GP for confirmation of pregnancy and to make arrangements for antenatal care and the confinement. A small number go direct to a local authority clinic. If hospital confinement is considered desirable, the GP writes to the maternity hospital of his choice (usually that nearest to the patient's home) and, if the hospital agrees to a booking, the patient is sent an appointment to attend the antenatal clinic. She may receive her further antenatal care at the hospital clinic, usually with the support of the GP, or at a local authority clinic. If the patient is not accepted for booking, the hospital refers her application to the Western Regional Hospital Board's Hospital Admissions Department. In 1967, 2,029 referrals were made and alternative hospital accommodation was found for all, but sometimes 8–10 miles from the patient's home.

In 1967, 3,333 patients received antenatal care at local authority clinics; 93 were referred from hospital clinics and the remainder were referred by their GPs or went direct to the clinics. Patients attending local authority clinics receive antenatal care from local health authority medical officers and almost all are seen at some stage (usually at the 36th week) by a visiting hospital obstetrician of consultant or senior registrar grade. Each clinic has a quota of hospital beds, and most of the patients attending these clinics are booked for hospital delivery. At the 36th week examination, a report on the pregnancy is prepared. It is 'updated' at each visit and is brought by the patient on admission to hospital. Apart from the letter requesting a booking, this is the only record of the pregnancy and past history available to the hospital.

Most domiciliary confinements are conducted by local authority midwives, and a small number (341 in 1967) by midwives from the Queen's Institute of District Nursing. Booking for domiciliary confinement is made on receipt of a GP's application. If there are clear grounds for hospital confinement and he insists on domiciliary delivery, the GP's word is final. Poor social conditions are not often considered a contra-indication to domiciliary confinement and, when necessary, corporation workers scrub down the home shortly before the confinement is expected.

A small number of patients booked for hospital confinement (18 in 1967) are delivered at home because of a temporary shortage of hospital accommodation, and a few (12 in 1967) as emergencies without having received antenatal care from any agency. Some (9 in 1967) are delivered without any medical or nursing care and others (77 in 1967) in taxis or ambulances.

Analysis of all births in 1967

A computer-based system of linked child health records, set up by the Social Paediatric Research Group (3), enabled analyses to be made of data recorded on three linked documents: (i) an abstract from the birth notification and birth registration; (ii) a registration of infant death; and (iii) the health visitor's record of obstetric and social factors.

PLACE OF CONFINEMENT

The total number of births in Glasgow in 1967 was 19,841 and the over-all hospital confinement rate 84·5 per cent (Table 5.1). Among births to primigravidae, 93·9 per cent were in hospital, but only 75·5 per cent of births to women having a fourth or subsequent baby. Previous still-births did not raise the chances of hospital delivery (84·3 per cent), nor did high maternal age (82·5 per cent). Births to mothers below the age of 20 and births following certain obstetric complications had an above-average rate of hospital delivery but these included complicated deliveries necessitating hospital admission (e.g. Caesarean section).

Out of the total number of births, 44·5 per cent were to women living in only one or two rooms; 11 per cent of births were to women living in houses where no room was used exclusively as a bedroom. Many births (36·4 per cent) were to women who had to share w.c. facilities and/or a supply of running hot water. Hospital delivery rates for these grounds were only slightly above the over-all rate and in no instance above 90 per cent.

The perinatal mortality rate for all births was 31·3 per thousand total births, for births in hospital 32·8, for domiciliary births, 17·8, and for nursing home births, 14·5 (Table 5.1). This suggests that selection of cases for hospital was efficient for multiparae but among primigravidae and young mothers mortality was higher for domiciliary births than hospital births. The rate of 44·8 for primigravidae delivered in nursing homes was higher than either the domiciliary or hospital rates. For other complications (e.g., previous still-birth, multiple pregnancy) mortality rates in both domiciliary and hospital births were high.

For each of the groups with poor accommodation, the perinatal mortality rate was below the mean for all births, and the rate among domiciliary births was lower than among hospital births. In homes without their own w.c. or hot water the rates for domiciliary births were higher than in better-equipped homes and the difference between home and hospital rates is greater when these basic amenities were lacking, which suggests

Table 5.1. *Births and perinatal mortality rates in 1967 according to the place of delivery and indication for hospital confinement*

Category	*Births and place of delivery with perinatal mortality rates in parentheses (per 1,000)*					*Hospital confinement rate %*
	Home	*Hospital*	*Nursing home*	*Other*	*Total*	
OBSTETRIC						
No previous births	266 (33·8)	5,991 (25·5)	67 (44·8)	53 (0·0)	6,377 (25·8)	93·9
Three or more previous births	1,132 (16·8)	3,695 (48·2)	65 (0·0)	4 (0.0)	4,896 (40·4)	75·5
Previous still-birth(s)	105 (47·6)	607 (92·3)	8 (0·0)	0 (0.0)	720 (84·7)	84·3
Age less than 20 years	118 (50·8)	1,922 (26·0)	14 (0·0)	33 (0·0)	2,087 (26·4)	92·1
Age 35 years or over	349 (40·1)	1,884 (57·3)	48 (0·0)	3 (0·0)	2,284 (53·4)	82·5
Primigravidae aged 35 or over	4 (0·0)	170 (35·3)	5 (0·0)	1 (0·0)	180 (33·3)	94·4
Multiple pregnancy	9 (277·8)	209 (118·8)	1 (0·0)	0 (0·0)	219 (124·7)	95·4
Instrumental delivery	33 (30·3)	1,625 (32·0)	15 (0·0)	2 (0·0)	1,675 (31·6)	97·0
Caesarean section	0 (0·0)	1,200 (42·5)	10 (0·0)	0 (0·0)	1,210 (42·1)	99·2
SOCIAL						
Accommodation:						
One room	164 (18·3)	1,471 (31·3)	6 (0·0)	2 (0·0)	1,643 (29·8)	89·5
Two rooms	862 (13·9)	6,241 (28·4)	57 (35·1)	8 (0·0)	7,168 (26·6)	87·1
No room used exclusively as bedroom	258 (11·6)	1,907 (32·5)	10 (0·0)	2 (0·0)	2,177 (29·8)	87·6
Amenities:						
Own running hot water, shared w.c.	137 (14·6)	1,153 (22·5)	5 (0·0)	1 (0·0)	1,296 (21·6)	89·0
Own w.c., shared running hot water	203 (19·7)	1,295 (32·4)	21 (0·0)	2 (0·0)	1,521 (30·2)	85·1
Shared both	563 (12·4)	3,817 (33·3)	16 (62·5)	7 (0·0)	4,403 (30·6)	86·7
ALL BIRTHS	2,719 (17·8)	16,767 (32·8)	278 (14·5)	77 (0·0)	19,841 (31·3)	84·5

Table 5.2. *Births and perinatal mortality rates according to the stage of pregnancy at which antenatal care began and the place of delivery*

Stage of pregnancy at which antenatal care began (weeks)	*Births and place of delivery, with perinatal mortality rates in parentheses (per 1,000)*					*Total as percentage of all births*	*Hospital confinement rate (%)*
	Home	*Hospital*	*Nursing home*	*Other*	*Total*		
<10	692 (13·4)	5,416 (30·1)	84 (38·0)	10 (0·0)	6,202 (28·3)	31·3	87·2
10–19	1,433 (13·0)	8,537 (31·5)	158 (6·7)	15 (0·0)	10,143 (28·4)	51·1	84·1
20–9	539 (19·2)	2,494 (32·3)	34 (0·0)	36 (0·0)	3,103 (29·3)	15·6	80·2
30–9	52 (0·0)	307 (37·7)	2 (0·0)	16 (0·0)	377 (30·5)	1·9	81·2
40+	3 (333·3)	13 (83·3)	0 (0·0)	0 (0·0)	16 (125·0)	0·1	80·0
Total	2,719 (17·8)	16,767 (32·8)	278 (14·5)	77 (0·0)	19,841 (31·3)	100·0	84·5

Table 5.3. *Maternal age and the stage of pregnancy at which antenatal care began (percentage distribution)*

	Stage of pregnancy (weeks)					
Age (years)	*<10*	*10–19*	*20–9*	*30–9*	*40+*	*Total*
<20	27·5	49·5	18·9	3·9	0·0	100·0
20–4	32·9	51·1	14·3	1·6	0·1	100·0
25–9	31·9	52·2	14·4	1·5	0·1	100·0
30–4	30·0	51·9	16·4	1·7	0·1	100·0
35–9	31·0	49·4	17·5	1·9	0·1	100·0
40 and over	27·9	48·0	21·3	2·8	0·0	100·0
Total	31·3	51·1	15·6	1·9	0·1	100·0

Table 5.4. *Parity and the stage of pregnancy at which antenatal care began (percentage distribution)*

	Stage of pregnancy (weeks)					
Previous births	*<10*	*10–19*	*20–9*	*30–9*	*40+*	*Total*
0	39·9	46·7	11·2	2·1	0·1	100·0
1–3	29·0	54·0	15·5	1·5	0·1	100·0
4	21·9	54·0	22·1	1·9	0·1	100·0
5 or more	19·2	48·7	28·6	3·4	0·1	100·0
Total	31·3	51·1	15·6	1·9	0·1	100·0

Table 5.5. *Legitimacy and the stage of pregnancy at which antenatal care began (percentage distribution)*

	Stage of pregnancy (weeks)					
Legitimacy	*<10*	*10–19*	*20–9*	*30–9*	*40+*	*Total*
Illegitimate	12·8	38·7	37·5	10·6	0·5	100·0
Legitimate	32·9	52·3	13·7	1·1	0·0	100·0
Total	31·3	51·1	15·6	1·9	0·1	100·0

that more women living in these houses were being selected for hospital confinement.

ANTENATAL CARE

The sources of antenatal care were: GP, 78·5 per cent; hospital, 61·8 per cent; local authority clinic, 16·1 per cent; and other (e.g., private consultant), 1·8 per cent.

The percentage of mothers who first attended for antenatal care before the 20th week of pregnancy was 82·4, 15·6 per cent attended before the 30th week, and 2 per cent after the 30th week (Table 5.2). There are no data for the frequency of attendance. The hospital confinement rate decreased with delay in the start of antenatal care. For those first attending after the 20th week, the rate was below the mean rate for all births, while for those first attending at or later than the 40th week, the rate was 80 per cent.

The stage at which antenatal care began, seemed to influence only slightly the over-all perinatal mortality rate, except for those first attending at or later than the 40th week. However, there was a clearer trend among hospital births; the mortality rate rose steadily from 30·1 per cent for those first attending in the first ten weeks to 37·7 for those first attending at 30–9 weeks. For those not attending until later, the rate was 83·3 per cent. Young women and women aged 40 years and over tended to begin antenatal care later than women of other ages (Table 5.3). Increasing parity was associated with a decline in the proportion attending first before the 10th week and an increase in the proportion attending first at 20–9 weeks and 30–9 weeks (Table 5.4). Of women with illegitimate pregnancies, 48·6 per cent did not attend until after the 20th week compared with 14·8 per cent of women with legitimate pregnancies (Table 5.5).

Increase in the number of rooms occupied was associated with a tendency to earlier attendance for antenatal care. The absence of a room for use exclusively as a bedroom was associated with a later start, as also was the need for sharing of both a w.c. and a supply of running hot water (Table 5.6).

Table 5.6. *Social conditions and the stage of pregnancy at which antenatal care began (percentage distribution)*

Social conditions	*Stage of pregnancy (weeks)*					
	<10	*10–19*	*20–9*	*30–9*	*40+*	*Total*
One room	21·0	53·3	22·3	3·3	0·1	100·0
Two rooms	30·5	53·6	14·3	1·5	0·1	100·0
Three rooms	33·7	50·6	14·4	1·2	0·1	100·0
Four rooms	33·0	48·6	16·7	1·6	0·1	100·0
Five rooms or more	39·7	46·4	11·7	2·2	0·0	100·0
No room used exclusively as a bedroom	20·3	53·3	23·2	3·1	0·1	100·0
Others	32·7	50·8	14·7	1·7	0·1	100·0
Own running hot water, shared w.c.	28·7	55·0	14·7	1·4	0·2	100·0
Own w.c., shared running hot water	30·0	54·6	14·1	1·3	0·0	100·0
Shared both	22·9	55·0	19·5	2·5	0·1	100·0
Shared neither	35·3	49·3	13·9	1·4	0·1	100·0
All births	31·3	51·1	15·6	1·9	0·1	100·0

Domiciliary inquiry

A sample of recently delivered Glasgow women was taken from Corporation Health and Welfare Department records of 1967 births. The investigation was confined to legitimate births and the mothers were interviewed in their homes by one of us (E.M.D.), usually about three months after delivery. Out of a sample of 500, 393 (78·6 per cent) were traced and interviewed. Except for small differences (e.g., an excess in the sample of mothers over the age of 25 years and of births in social class III) the sample interviewed is believed to be representative of the total birth population in the city.

ANTENATAL CARE

All but two of the mothers interviewed had received some antenatal care. A third did not attend for antenatal care after confirmation of her pregnancy. Of the total 96·4 per cent went

first to their GPs, 2·5 per cent to the local clinics, and 1·0 per cent to private consultants.

Out of the sample 97·7 per cent attended their GPs for antenatal care at some time during the pregnancy and 72·3 per cent received regular antenatal care from him. Only 53·4 per cent attended in the first trimester, but a further 21·6 per cent attended during the second trimester. The frequency of visits suggests that most attended regularly. Two hundred and seventy-nine (71 per cent) received hospital clinic care. Of these, 20 attended only once, but 224 attended on five or more occasions. Seventy-four (18·8 per cent) attended local authority clinics, of whom only 11 attended in the first trimester. The frequency of visits suggests that most attended regularly. Fifty patients (12·7 per cent) received care from domiciliary midwives, 66·2 per cent received care from two agencies, and 4·6 per cent from three or more agencies. The most frequent combination was of GP and hospital care.

Antenatal care was sought by 53·7 per cent during the first trimester; 13 (3·3 per cent) delayed until some time in the last trimester. One was a primipara and 6 were having a fourth or subsequent baby (1 was having her eleventh). All were in social classes III–V, including 3 whose husbands were unemployed at the time of the birth (1 in class III and 2 in class V). All had left school before the age of 16 and none had received any further education or training. Seven had married before the age of 20 (1 at 16). None was engaged in gainful employment during pregnancy. The intelligence of 9 was assessed by the interviewer as average and of 4 as below average; the domestic efficiency of 10 was assessed as average and of 3 as below average. The attitudes and comments of these mothers are illustrated below.

AGE 33. Six previous births, 2 in hospital and 4 at home. Was booked for home confinement because she was very afraid of hospitals. The GP left it to her to decide. She also fears child welfare clinics and said that the health visitor is far from welcome in people's homes.

AGE 27. Five previous births and 2 miscarriages. She wanted a home confinement although the other children had been born in hospital. Said she hates 'all the messing about in hospital and I resent being cared for in labour by single women'. Does not intend going to the child welfare clinic until the baby is three months old as she thinks babies catch cold there.

AGE 23. Two previous births and 4 miscarriages. One child died at four weeks due to spina bifida. She did not attend early for antenatal care because she blames 'injections and treatment' for her 4 miscarriages.

AGE 29. Four previous births (all born in hospital) and 2 miscarriages. Is always anaemic and so cannot have domiciliary confinements. Likes the local authority clinic but is less keen on the GP as she likes having a woman doctor; she finds it embarrassing to speak to a man about any bleeding.

AGE 37. Ten previous births including 2 still-births. She did not attend for antenatal care early because it is a long way (two buses) to the hospital clinic, and she had no one to look after her children.

When asked 'Where do you prefer to go for your antenatal care?' 168 (42·7 per cent) preferred hospital care and 144 (36·6 per cent) GP care. Only 56 (14·3 per cent) preferred the local authority clinic. Eighteen (4·6 per cent) had no particular preference and 7 (1·7 per cent) wanted private consultant care. Among women preferring GP care there was a deficiency of primigravidae and high-parity women, but no striking age or social class patterns. Women preferring hospital care did not show any consistent age, parity, or social-class distribution. Among those preferring local authority clinic care, there was an excess of mothers aged less than 20 years, and a deficiency in the age-group 20–30 years, an excess of high-parity women, and a deficiency of those with 1–4 previous births. Social class did not seem to influence preference for the type of antenatal care.

The following reasons were given for preferring GP care:

'They have more time for you than hospitals.'

'You can talk to him more easily than a complete stranger.'

'At the clinic there is a long wait.'

'They poke you about too much at the clinic and listen with trumpets. My GP doesn't do that.'

'There's less travelling to get to my GP.'

The remarks of those preferring local authority clinic care included:

'I don't think your own doctor bothers about you. The clinic explained what to eat and what exercises to do and there was a woman doctor at the clinic.'

'You can sort of say things to them you would keep back from your own doctor.'

'Your GP hasn't time for blood tests and water tests.'

'You have to wait hours at my GP's. The clinic is much handier.'

Comments of women preferring hospital antenatal care were:

'They give you a careful examination and I like meeting the other patients.'

'The medical staff are willing to discuss your problems and there is privacy to undress.'

'I feel the medical staff are specialized in obstetrics and I like seeing the dietitian and almoner.'

'I like the booklets that are provided and the relaxation classes.'

'I have been to my GP since I was 12 and I feel a bit embarrassed with him for pregnancies.'

'If you go to the local clinic you have to go into any hospital, but if you go to the hospital you know that you are going to be booked there.'

'If any complications arise, the hospital can deal with them straightaway.'

Fifty-one (13 per cent) found that the type of antenatal care chosen was inconvenient—largely because of the distance to be travelled to hospital clinics. Most of these mothers had to take two buses and their journeys lasted three-quarters to one hour each way. Eighteen of these 51 worked during pregnancy, but this did not cause any inconvenience. The care of other children was a problem for some.

All said there were antenatal classes, but only 91 (23·1 per cent) attended. A further 82 (20·9 per cent) did not attend but had done so in previous pregnancies. More than half (56 per cent) had never been to such classes. Reasons for non-attendance included: 'I was working', 'I wan't feeling well during pregnancy', and 'I had a lot to do'. But most women gave no clear reason which suggested that they did not appreciate the importance of this aspect of antenatal care. Of those who had attended classes at some time, 140 (80·9 per cent) thought they were helpful.

PLACE OF CONFINEMENT

The mothers interviewed were asked where they had originally hoped to have the confinement. Ninety-four wanted to be delivered at home, 285 preferred hospital confinement, 10 preferred a nursing-home confinement, and 4 had no preference. Of 230 women who had previously had a hospital delivery, 160 (69·6 per cent) wanted a hospital confinement. But of 23 who had no previous experience of hospital delivery (excluding primigravidae), only 5 (21·7 per cent) wished hospital confinement. Among 140 primigravidae, 120 (85·7 per cent) desired hospital confinement.

Although 94 mothers had hoped for home delivery, only 50 were booked for it and, because of obstetric complications, 8 of these were later booked for hospital delivery. A further 7 were admitted to hospital as emergencies in labour. Four births occurred at home to women booked for hospital confinement and 2 to women who had not received any antenatal care.

Among 344 hospital deliveries, 331 had been booked for hospital, 7 (mentioned above) were admitted as emergencies in

labour having been booked for home delivery, and 6 had not been booked for home or hospital delivery.

Although 94 (23·9 per cent) mothers wished originally for home confinement and 285 (72·5 per cent) for hospital confinement, only 26 husbands (6·6 per cent) wanted the delivery at home and 315 (80·2 per cent) would have preferred it to take place in hospital.

The most common reasons given by the 41 women who had a home confinement were a dislike of hospitals (13), a desire to be with the other children (10), and a preference for the home atmosphere with more attention and more rest (9). Four others were delivered at home (having been booked for hospital) before they could get into hospital, and for 2 no bed was available at the time of booking (1 had moved to Glasgow late in pregnancy and the other would accept a bed in only one hospital). In none was lack of help at home given as a reason for the domiciliary delivery.

But of the 41 women delivered at home, 27 had good grounds for hospital delivery because of their age or parity, their previous obstetric history or complications of the survey pregnancy (Table 5.7). One required a forceps delivery, 2 had postpartum haemorrhages, 3 gave birth to low-weight babies (1 baby requiring admission to hospital), 2 babies had some respiratory distress, and 1 was transferred to hospital because of hyperbilirubinaemia.

Of the 344 women delivered in hospital, 329 had obstetric or medical reasons for hospital confinement and 44 had social reasons (15 having social reasons only).

DOMESTIC HELP

Domestic help during the confinement did not appear to be a problem for most women. Ten lived with their mothers or in-laws, for 296 help was provided by husbands, for 290 by other relatives, and for 35 by friends and neighbours.

Two hundred and forty-four (62 per cent) had children needing to be cared for. Husbands (134) and other relatives (188) usually provided this help, but friends and neighbours (22) also played a part.

Table 5.7. *Ages, parities, and obstetric histories of forty-one women delivered at home.*

Age	*Previous births*	*Obstetric and medical history*	*Survey pregnancy*	*Delivery and puerperium*
SUITABLE FOR HOME CONFINEMENT (14 cases)				
19–33	1–2			One BBA
HAVING GROUNDS FOR HOSPITAL CONFINEMENT (27 cases)				
29	3	PPH first pregnancy		PPH flying squad, admitted to hospital.
31	6			BBA, PPH (admitted to hospital, transfused 4 pints blood, manual removal placenta)
32	3	Two forceps deliveries, including one breech		
34	3	One low-weight baby one neonatal death		Labour at 34 weeks. Birth-weight 5½ lb
26	4			
25	4			
25	2	Long labours	Rh negative (no antibodies).	
31	3	Caesarean section		Birth-weight 5½ lb
21	1		Rh negative with antibodies	Baby jaundiced: Coomb's test and seen by paediatrician
37	3	PPH Craniotomy (mother)	Refused hospital booking	BBA at 36 weeks. Birth-weight 5 lb 13 oz Baby resuscitated and admitted to hospital with hyperbilirubinaemia
33	5	Forceps delivery		
27	1		Five years since previous pregnancy	Baby given oxygen
24	7		No bed available	Labour at 45 weeks
39	2		BBA	
20	3	One still-birth	No antenatal care after confirmation of pregnancy	Labour at 34 weeks Birth-weight 4 lb 10 oz Admitted to hospital
19	0			Baby limp and cyanosed Responded to mucus extraction
23	3			
23	1		Five years since previous pregnancy	
44	1			
41	6		Eleven years since previous pregnancy	
29	1	One low-weight baby	No antenatal care	
27	2	Forceps, low-weight baby, PPH		
34	1	One forceps delivery		
39	3	Forceps delivery	Fifteen years since previous pregnancy Toxaemia	Delay in second stage Forceps delivery
25	4	Delay in labour in previous pregnancy		
35	1	Blood transfusion, forceps delivery		
39	4	Severe toxaemia first pregnancy, thoracoplasty		

Only 15 (3·8 per cent) had a home help during the confinement, and 43 (10·9 per cent) said they could have done with more help at home. One hundred and fifty-eight (40·2 per cent) of the husbands had time off work during the confinement (annual leave, 72; took time off, 66; note from GP, 13; special leave, 6; self-employed, 1). A further 36 (9·2 per cent) were at home because of sickness or unemployment. The reasons given for not using the home help service were that they had not thought of it and no one had suggested it, that the husbands would not agree, that they did not want a stranger in the house or that they believed that it was a service for the underprivileged.

FUTURE CHOICE OF PLACE OF CONFINEMENT

Of the 41 delivered at home, 39 said they were glad, 2 were undecided, but none were sorry. Thirty-four would elect to have a domiciliary confinement again. Seven would want to go into hospital and gave as their reasons lack of rest at home and the greater safety of hospital delivery if complications arose.

Of the 352 women who had been delivered in hospital or nursing home, 7 were sorry and a further 4 were undecided. Fifty would prefer to stay at home on a future occasion. Among these, 3 were dissatisfied with the care they had received in hospital, but most would choose domiciliary confinement to be with their other children. Twenty-four had originally hoped for a home delivery.

Views of general practitioners

A questionnaire was sent to the GP of each patient interviewed. Of the 234 sent out, 172 (74 per cent) were completed and this represents 82 per cent of the practices included. The questionnaire was in four parts, relating to the patients, the practitioner's own service, the maternity services in general, and a fourth section for further comments on the services and their use.

The doctors were asked about their patients' reasons for preferring home or hospital confinement. About a quarter felt

women chose hospital confinement because of housing conditions, the care of children, and the husband's inability to have time off work. On the other hand, more than half (58 per cent) of the doctors felt that the last reason was unimportant, and 77 per cent said that the likelihood of the husband becoming unemployed if he had to take time off weighed with few or none of their patients. Sixty-six per cent of the doctors believed that women chose a home confinement to be near their families and that a previous unfavourable experience in hospital was relatively unimportant.

When asked to specify other social, personal, or medical reasons for the patient's choice, the doctors gave a wide variety of answers, for example, liking for a familiar GP or midwife, previous normal delivery, fear of leaving the husband in charge of the budget, too far and too expensive to travel to hospital, fear of leaving home, less fuss at home, dislike of hospitals' impersonal attitude and discipline, waiting-time at clinics, financial advantage of hospital confinement, fear of home confinement because of years of propaganda, illegitimate pregnancy.

Four per cent of the doctors said that some women refused advice to accept a hospital booking, 56 per cent that few women did so, and 40 per cent that none ever refused.

The commonest indications for hospital booking were held by 15 per cent of doctors to be social, by 9 per cent to be medical or obstetric, and by 75 per cent to be a combination of reasons. The most important social reason was said by 47 per cent to be poor housing and by 15 per cent shared housing. Other reasons given were lack of help at home, the husband's insistence on hospital delivery, and the difficulties of the unmarried mother. Forty-two per cent of doctors considered the commonest clinical indications for hospital booking to be a previous obstetric complication, 36 per cent a first pregnancy, 32 per cent multiparity, 11 per cent a previous Caesarean section, and 8 per cent previous forceps delivery.

Sixty-four per cent of the doctors never had any difficulty in arranging a hospital booking for social indications, 34 per cent

sometimes had difficulty, and 2 per cent often did. Eighty-eight per cent never had any difficulty in arranging a booking for medical or obstetric indications, but 11 per cent sometimes found difficulty. One wrote, 'I require to refer some to the Corporation antenatal clinic to obtain a hospital booking', and another, 'It is usually impossible to secure a booking at the nearest hospital unless the booking is made at six to eight weeks—even when at a later date the matter is urged personally. This often means the patient is hospitalized 10–15 miles from home.'

One hundred and forty doctors commented on their own role in selecting the place of confinement. Forty-one per cent said that the decision was always made by the doctor, 33 per cent that the choice was discussed with the patient, and 14 per cent that the choice was always left to the patient. A further 5 per cent said that all patients were referred to hospital. One wrote: 'This is rather beyond our control now as in the last three years there has been a severe drop in home confinements. There is a change of fashion and the great majority of patients request hospital confinement now. Also there are few good nursing-homes left where previously "better class" women could be confined by their own doctor. The pressure of general medicine and, let's face it, our own ageing, are factors which limit the perpetual night-work of home confinements. Twenty years ago, being out all night on three confinements and starting morning surgeries and visits the next day without rest was just possible. It isn't now.'

Booking arrangements were said to be satisfactory by 54 per cent, fairly satisfactory by 32 per cent, and unsatisfactory by 14 per cent. Comments included:

'Occasionally patients have to travel long distances to hospital.'

'There have been several instances where, from late booking, a patient was refused admission and confined at home before a new booking could be made. This, of course, was the patient's fault.'

'There does not appear to be any lack of beds. One has the impression that any apparent lack could easily be remedied by confinement of suitable obstetrically normal early paras at home.'

'Greatest difficulty is for second and third pregnancies among younger people, many of whom think the only safe place for confinement is hospital.'

'There is an overlap of services, e.g., LA clinics, hospital OP clinics and visits to own GP. This seems very wasteful.'

Seventy-six per cent of doctors were in favour of forty-eight-hour discharges, 14 per cent were against, and 11 per cent were uncertain. Sixty-five per cent would welcome a large increase in this system, 20 per cent would not, and 12 per cent were uncertain. Comments included:

'If there is no indication for hospital confinement, it is unwise to expose mother and baby to hospital organisms for 48-hours.'

'I would welcome this (*a*) as it would mean that practically from the start I would be in charge of the problems of the newborn, feeding, mother's breasts, etc.—how often we have to deal with these problems about the third week! (*b*) it would make more beds available to the maternity units.'

'Occasionally necessary for family reasons, but really these mothers are usually the ones that most require a rest. Breast feeding is almost never established with these patients.'

'This, I feel, is not a good thing as there is a loss of continuity of care. Although the hospital doctors phone about discharges it sometimes takes four to six weeks for a letter to come.'

Discussion

In an analysis of births in 1963 to Glasgow women, Smith and Macdonald (1965) showed that 74 per cent of all births had a past obstetric history or complication of the current pregnancy or delivery which justified hospital confinement. Yet only 75 per cent of these high-risk cases were delivered in hospital and high parity or a history of previous abortion were actually associated with a hospital confinement rate below average.

Between 1963 and 1967 the hospital confinement rate in Glasgow rose from 71 to 85 per cent. But in 1967, 6 per cent of

Table 5.8. *Perinatal mortality rates (per thousand total births) in 1963 and 1967 by place of confinement*

Place of confinement	*1963*	*1967*	*Decreases as percentage of 1963 rate*
Home	20·6	17·9	13·1
Hospital	46·0	32·8	28·7
Nursing home	24·9	14·5	41·8
All births	38·7	31·3	19·1

primigravidae and 24 per cent of mothers having their fourth or subsequent child were not delivered in hospital. Similarly, a history of previous still-birth or high maternal age (35 years and over) did not raise the chances of hospital delivery and adverse social conditions contributed only slightly to the chances of hospital delivery.

A comparison of perinatal mortality rates in 1963 and 1967 (Table 5.8) shows that, while the rates for home, hospital, and nursing home deliveries all fell, the decrease in hospital and nursing home rates greatly exceeded the fall in mortality rates in domiciliary births. This suggests that, despite an overall reduction in domiciliary deliveries, selection for place of confinement showed little improvement.

In the sample of women interviewed in this study, 329 of the 344 delivered in hospital and 27 of the 41 delivered at home had obstetric or medical indications for hospital confinement—a total of 92 per cent. It is clear from studying the histories of the 41 women delivered at home (Table 5.7) that, in this small sample, selection for home confinement was very poor and that a further investigation of domiciliary births with much larger numbers is urgently needed.

The investigation was designed to answer the question, 'What are the administrative, obstetric, medical, social, psychological, and cultural determinants of the place of confinement?' If it is assumed that 92 per cent of Glasgow women delivered have at least one indication for hospital confinement, the present hospital confinement rate of 85 per cent suggests that either the number of hospital obstetric beds is inadequate or that they are not being used to the best advantage. In 1967, a hospital booking

was arranged for every woman for whom an application was made (by the GP or the local authority clinic) but one disturbing complaint by patients and GPs is that the place of delivery was often a long way from the patient's home, sometimes as much as ten miles. This is particularly true of cases booked on social grounds alone and those applying late in pregnancy. When a patient goes into labour, it is not always possible to find a bed for her in the hospital for which she has been booked, or in an alternative hospital, and the patient is then delivered at home by the Domiciliary Midwifery Service.

A high proportion of GPs were in favour of forty-eight-hour discharges. Many would welcome a large increase in these and, if adequate arrangements could be made by the Domiciliary Midwifery Service, this would be one method of increasing the hospital confinement rate. Nevertheless, in the squalid social conditions so prevalent in Glasgow the advantages of an early discharge might be outweighed by the disadvantages of returning to overcrowded conditions without running hot water or inside w.c. (2).

Almost all women delivered in 1967 went first to a GP for antenatal care, and 79 per cent received regular care from him. Although many attended early, 2 per cent delayed their first attendance until after the 30th week. Hospital confinement rates were below average for those who attended from the 20th week onwards, probably because of reluctance to seek hospital confinement rather than difficulty in securing a hospital bed. Late attendance for the start of antenatal care was related to age (below 20 or over 40 years), high parity, illegitimacy, and poor social conditions. Those who did not attend until the last trimester tended to make little use of the maternity and child-welfare services through fear, prejudice, or ignorance. They tended to leave school at a young age, marry young, have husbands who were frequently unemployed, and to be harassed.

The decision on the place of confinement is based on the views of both mother and doctor (almost always the GP). Many GPs said the decision on the place of confinement was always their own, but some said the choice was always left to

the patient. It is difficult to determine the exact role of each in this decision or to obtain a clear picture of the relative importance of reasons for the choice. GPs felt that housing and the care of other children were important determinants. The comments of mothers who were confined at home suggested that a dislike of hospitals and a desire to be with the other children were important. It is of interest that mothers with a previous experience of hospital delivery wanted another hospital confinement significantly more often than mothers with no such experience (excluding primigravidae). The reason may be either an appreciation of the possible benefits of hospital delivery or a continuation of circumstances which made domiciliary delivery undesirable.

Primigravidae and high-parity women tended to prefer antenatal care from sources other than the GPs; high-parity women and mothers aged less than 20 years tended to prefer local authority care. The reasons given for preferring one type of care to another are many; they are contradictory and suggest no clear and consistent pattern in the attitudes of mothers. Although many mothers seemed to have a clear idea of where they wanted to be delivered, and were determined to get what they wanted regardless of difficulties, most seemed willing to accept the GP's opinion and the maternity services being provided. And although there were frequent complaints about such things as hospital visiting-hours and the inadequacy of w.c. and other facilities, the general feeling was one of satisfaction with the care given in hospital. This illustrates a prevalent attitude in Glasgow—that the future will be no brighter than the past and of the futility of demanding higher standards in any sphere. Also, to many mothers, the comparative comfort of a hospital environment is attractive and they are prepared to overlook the deficiencies.

The machinery of booking a hospital bed or securing the services of a domiciliary midwife appear to be efficient except that there is often a delay of several weeks between the application and first attendance for hospital care, that many mothers do not seem to be aware until late in pregnancy that a bed has

been booked for them and that for some the hospital of confinement is a long distance from home.

A large proportion of Glasgow's population lives in conditions of squalor which are among the worst in Europe. Nevertheless, the Domiciliary Midwifery Service is prepared to deliver women in any home if it is the GP's wish. Many of these houses are the notorious 'single-ends', one room which is used for living, sleeping, cooking, and eating—conditions which make home delivery particularly difficult.

The provision of domestic help during the confinement seems to present little difficulty to most families. Husbands, relatives, and friends all play a part, but the Home Help Service is used by very few. To many husbands it was apparently no great problem to take time off during the confinement. Some were able to 'go sick', others were unemployed or were prepared to stay away from work, knowing they would be sacked for doing so.

It is clear from this investigation that the GP is the key figure in selecting the place of confinement and that a high proportion of mothers will accept his decision. It is disturbing, therefore, that less than 40 per cent of the doctors stated that, in their practices, first and high-parity births were among the most common indications for hospital delivery. There would seem to be a great need for a periodic restatement of the high-risk categories. It is disturbing, also, that almost a quarter of the applications for domiciliary confinement are not made until the last trimester, since early application permits a longer period of antenatal supervision by domiciliary midwives and, if the case is considered unsuitable for home delivery, allows more time for arranging hospital care.

Highly unsuitable applications for domiciliary confinements are discussed with the GPs and, if they agree, arrangements are made for hospital delivery. But it is clear that the Domiciliary Midwifery Service is undertaking—and is expected by GPs to undertake—much 'high-risk' maternity work. The Montgomery report (1) recommended that 'it should be the responsibility of the general practitioner to provide or secure the provision of all

the facilities required by the mother during pregnancy, confinement and lying-in'. Patients for home confinement need to be selected with far greater care than at present. Clearly, this is very largely the responsibility of the GP.

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Perinatal mortality, birth-weight, and place of confinement in England and Wales 1956–1965

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Introduction

One of the most important factors in planning maternity care in a community is the balance between domiciliary and institutional confinements. For obvious reasons the more expensive hospital confinements should be directed towards the sections of the population with the greater need. As a result of work by Bonham and Butler (1) and others, the policy in many parts of the United Kingdom is to give priority for hospital confinements to groups where the statistical risk of perinatal mortality is relatively high. Socio-economic status, parity, and maternal age, as well as a history of previous complications in pregnancy, are all regarded as significant. Along with the selection of high-risk mothers, the use of hospital beds has been increased in some areas by early discharge. But we have no real evidence whether the present balance between home and hospital confinements is in any sense optimal. For example, if it is accepted that hospital confinements are desirable at least for some women, it is not clear whether the provision of the highest possible standards of care at a limited number of locations would be preferable to the provision of somewhat lower standards on a more general basis.

To answer these and other similar questions one possible method of approach would be to conduct controlled experiments in different localities in which the factors of interest were deliberately varied. A study of this kind, although desirable from a scientific point of view, would be difficult to arrange on a sufficiently large scale to obtain valid results. A potentially useful and much less expensive alternative is to study existing

data in an attempt to determine whether any association can be found between the pattern of medical care in different areas and at different points in time and the corresponding variations in perinatal mortality and other relevant factors, which are known to be large (2). The present paper is concerned with data on perinatal mortality, birth-weight and place of confinement in the local authority areas of England and Wales during 1956–65, and is part of a systematic programme of research into the biology of low birth-weight, some of which has been published in detail elsewhere (2, 3, 4).

Sources of data

The main source of data was the annual LHS 27/1 return of live- and still-births in each local authority area in England and Wales during 1956–65. This document consists of two sections. Section A gives the total numbers of live- and still-births in the area, subdivided as domiciliary and institutional. Section B deals with so-called premature births, which are defined as all live- and still-births of less than $5\frac{1}{2}$ lb weight at birth. These low-weight births are classified in terms of birth-weight and place of confinement. The returns for 1963–5 are subdivided into births in hospital and births at home or nursing home, the latter category being further broken down to show whether the infant was transferred to hospital on or before the 28th day of life. Before 1962 births at home or in a nursing home were recorded separately. Hospital births in Section B cover National Health Service hospitals only.

It is surprising, and somewhat unfortunate, that the classifications in terms of place of confinement used in Sections A and B are not identical and also that interpretation between different local authorities may vary slightly. The main difference is that births in private nursing homes and mother-and-baby homes are classed as institutional in Section A but as births at home or in a nursing home in Section B. Although this study is essentially a comparison of perinatal mortality 'in hospital' and 'at home', the differences in criteria of classification between the data for all births (Section A) and for low-weight births

(Section B) are believed to affect no more than 1–2 per cent of the total number and are therefore unimportant for most practical purposes. Since standards of care vary widely not only among home confinements, but also amongst hospital confinements, neither group may be regarded as homogeneous in this respect.

To examine differences between groups of local authority areas of the same type, the data have been summarized:

(*a*) For the eleven standard regions of England and Wales used by the Registrar-General before 1965;

(*b*) Within each region in terms of local authority areas which are county boroughs (more urban) or are not county boroughs (more rural);

(*c*) For the local authority areas which are entirely included within one or other of the six standard conurbations in England and Wales as defined by the Registrar-General.

Place of confinement

The over-all proportion of institutional births was effectively constant during 1956–60, with an average level of just under 650 per thousand (Table 6.1A). After 1960 there was a progressive increase to a level of just under 730 per thousand in 1965. In each successive year the proportion of institutional confinements in the county boroughs was consistently higher than in the other local authority areas, the difference being of the order of 20 per thousand for most of the period. The live-births and the still-births each follow a similar trend to the combined data, but the proportions of still-births in institutional confinements were between 100 and 150 per thousand higher than those of live-births.

When the results are subdivided by region the patterns of secular change are to some extent similar to those for the country as a whole. For the more rural local authority areas there are wide geographical variations (Table 6.1B). The highest rates of institutional confinement in 1956–8 were in Wales II (778) and London and South-east (711) and the lowest in the

Table 6.1. *Secular trends in terms of place of confinement. Institutional births per thousand live- and still-births*

A. BY TYPE OF LOCAL AUTHORITY AREA

Population	*Year* 1956	1957	1958	1959	1950	1961	1962	1963	1964	1965
County boroughs	659	657	655	655	661	674	673	697	713	743
Remainder	638	639	635	640	644	651	656	667	696	715
TOTAL	646	646	643	646	650	660	662	684	702	727

B. BY REGION AND TYPE OF LOCAL AUTHORITY AREA

Region	*Not county boroughs* 1956–8	1963–5	*County boroughs* 1956–8	1963–5
1. Northern	603	722	532	667
2. East and West Ridings	606	691	617	678
3. North-western	675	719	663	713
4. North Midland	575	661	584	635
5. Midland	589	626	596	656
6. Eastern	594	625	643	669
7. London and South-eastern	711	725	795	814
8. Southern	664	737	606	652
9. South-western	620	715	659	733
10. Wales I (South-east)	624	718	630	751
11. Wales II (Remainder)	778	858	—	—

C. BY CONURBATION

Conurbation	*Year* 1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
1. No part	609	613	613	618	627	640	646	671	691	711
2. Some part	636	637	630	634	636	640	643	661	678	708
3. Tyneside	573	571	540	552	579	599	626	647	687	719
4. West Yorkshire	678	662	659	653	635	657	664	673	694	703
5. South-east Lancashire	631	606	610	618	621	636	609	652	661	685
6. Merseyside	693	692	675	685	692	711	714	746	756	814
7. West Midlands	622	624	615	618	613	611	613	642	665	695
8. Greater London	795	792	788	782	780	784	778	794	807	809

North Midland (575), Midland (589), and Eastern (594) Regions. In 1963–5 the rate of change in regions varied, but the rate for Wales II (858) was still highest. For 1956–65 the increases in the Midland, Eastern, and London and South-eastern Regions were slight. The results for the county boroughs show equally wide variations. In 1956–8 the proportions of institutional births ranged from 532 per thousand in the Northern Region to 795 per thousand in London and the South-east. In 1963–5 the corresponding figures were 635 per thousand in the North Midland Region and 814 per thousand in London and the South-east. When both types of local authority areas are taken together the results still vary widely. In particular, the Eastern

Region had a low proportion of institutional births at both the beginning and the end of the decade, while London and the South-east had a high proportion which changed little. When the county boroughs and other local authority areas in the same region are compared the pattern is far from uniform. Rates were lower both for 1956–8 and 1963–5 in the Northern, North-western, and Southern Regions, whilst the opposite pattern prevailed in all other regions except the North Midlands and East and West Ridings.

In none of the six conurbations was there any real increase in the proportion of institutional births until 1961 (Table 6.1C). Until then there was a wide difference between Greater London, with a rate of just under 800 per thousand, and the remaining conurbations, with a range of between about 550 per thousand in Tyneside and about 700 per thousand in Merseyside. After 1961 the proportions of institutional births increased at various rates until by 1965 the extreme results were 814 per thousand in Merseyside and 685 per thousand in the adjacent conurbations of south-east Lancashire.

About 60 per cent of the total perinatal mortality occurs in infants of less than 2,501 g birth-weight, who account for only about 7 per cent of the total live- and still-births. Since the special care often required for low-weight infants is available only in some hospitals, the hospital confinement rates for this group are clearly of great importance. Some 840 per thousand of the infants weighing less than 2,501 g were born in hospital (Table 6.2), in comparison with about 700 per thousand of all infants (Table 6.1A). The proportion of hospital births increases with decreasing birth-weight, reaching a maximum of over 900 per thousand for births of less than 1,501 g. On this evidence it is clear that mothers who are likely to give birth to low-weight infants are being selected for hospital confinement with considerable success. Nevertheless, almost 1 in 10 of the lowest-weight births took place outside hospital. The proportion of hospital confinements is slightly higher in the county boroughs than in the other local authorities in all except one of the weight groups. On the other hand, the proportions of infants born at home or

Table 6.2. *Place of confinement of infants weighing less than 2,501 g at birth England and Wales 1963–5. Rates per thousand live- and still-births in weight group*

Place of birth	*Birth-weight (g)*					
	<1,001	*1,001–1,500*	*1,501–2,000*	*2,001–2,250*	*2,251–2,500*	*>2,500*
COUNTY BOROUGHS						
Hospital	920	912	893	860	791	844
Home or nursing home (all)	79·7	88·4	107	140	209	156
Transferred to hospital	30·6	39·6	52·7	44·4	19·8	33·5
	(870)	(638)	(292)	(120)	(61·2)	(223)
REMAINDER						
Hospital	899	908	890	880	782	841
Home or nursing home (all)	101	91·4	110	120	218	159
Transferred to hospital	37·7	42·1	51·1	35·3	18·5	31·4
	(917)	(668)	(312)	(127)	(68·8)	(235)
ALL AUTHORITIES						
Hospital	909	910	891	871	786	842
Home or nursing home (all)	91·1	90·0	109	129	214	158
Transferred to hospital	34·4	41·0	51·8	39·4	19·1	32·3
	(895)	(655)	(303)	(124)	(65·5)	(230)

Note. The figure in parenthesis is the perinatal mortality rate for all births in the weight group.

in a nursing home and later transferred to hospital is lower in the county boroughs for the two lowest birth-weight groups, but higher in the remainder.

The secular trends in place of confinement for the low-weight births (<2,501 g) are summarized in Table 6.3. In both the county boroughs and the other local authority areas the proportion of births taking place in hospital rose year by year, the rate of increase being particularly clear after 1962. The over-all increase of 117 per thousand between 1956 and 1965 is considerably greater than that for all weights (Table 6.1A). Between 1956 and 1962 the proportion of hospital births was slightly higher in the county boroughs than in the other local authority areas, but after that date there is no consistent difference. The rate of transfer to hospital of infants born at home or in a nursing home was consistently higher in the county boroughs and the transfer-rate fell slightly during the decade. In the regions the proportions of hospital low-weight births varied widely, the main contrast being between the high rates in London and the South-east, rural Wales and the South-west

Table 6.3. *Secular trends in terms of place of confinement for low-weight births. Hospital births per thousand live- and still-births less than 2,501 g*

A. BY TYPE OF LOCAL AUTHORITY AREA

Population	*Year* 1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
County boroughs	754	762	770	779	786	802	806	822	841	865
Remainder	737	747	757	764	778	789	803	828	841	858
TOTAL	745	755	762	771	781	794	804	825	841	862

B. BY REGION AND TYPE OF LOCAL AUTHORITY AREA

Region	*Not county boroughs* 1956–8	1963–5	*County boroughs* 1956–8	1963–5
1. Northern	721	815	665	793
2. East and West Riding	738	834	739	827
3. North-western	780	851	770	840
4. North Midland	702	810	713	814
5. Midland	708	804	726	803
6. Eastern	733	809	758	807
7. London and South-eastern	798	877	869	904
8. Southern	747	887	645	766
9. South-western	750	850	789	873
10. Wales I (South-east)	717	861	722	865
11. Wales II (Remainder)	840	913	—	—

C. BY CONURBATION

Conurbation	*Year* 1956–8	1963–5
1. No part	724	835
2. Some part	753	833
3. Tyneside	661	772
4. West Yorkshire	787	851
5. South-east Lancashire	719	795
6. Merseyside	809	894
7. North Midlands	737	805
8. Greater London	864	897

and low rates in the Northern, North Midland, and Midland Regions (Table 6.3B). In the northern part of the country, the proportions of hospital confinements were lower in the county boroughs than in the other local authority areas. In the conurbations (Table 6.3C) the proportion of hospital births in Greater London and Merseyside was high and in Tyneside and south-east Lancashire low. An analysis of births of less than 1,501 g showed essentially the same trends as that for all the births of less than 2,501 g. The over-all proportion of hospital births in this weight-group was higher in the county boroughs than in the other local authority areas but the gap was progressively reduced during the decade.

Perinatal mortality

The analyses of place of confinement indicate considerable variations in the pattern of maternity care. Previous studies of the same basic data (2, 3) have shown equally wide variations in perinatal and neonatal mortality, which may be explained in part by variations in birth-weight distribution. Even when due account is taken of birth-weight there are still differences in mortality, and it may reasonably be asked whether the balance between home and hospital confinements may not be a contributory cause. The choice of place of confinement is by no means random and the criteria applied in different populations vary. A comparison between home and hospital confinements in the same population is not therefore likely to determine which is to be preferred in terms of the risk of mortality. However, the over-all mortality rates in populations with different proportions of hospital confinements, but reasonably similar in other respects, might be a reliable pointer to the type of medical care which is to be preferred.

For low-weight births the county boroughs had slightly higher rates of hospital confinement but consistently lower rates of perinatal mortality (Table 6.2). In both weight groups between 1,001 and 2,000 g the proportions of hospital confinements were almost equal, but the perinatal mortality was appreciably lower in the county boroughs. For the birth-weights above 2,501 g the proportions of institutional confinements were consistently higher in the county boroughs, whereas the perinatal mortality rates were also consistently higher (Table 6.4). Thus, despite some disadvantages in terms of birth-weight distribution (2), perinatal mortality among the low-weight births is lower in county boroughs than in the other local authority areas. The higher perinatal mortality rates for the birth-weights of more than 2,500 g in the county boroughs is consistent with the difference in birth-weight distribution. But it is not possible to say on the basis of the available data how far this mortality difference may be associated with other factors, such as variations in the pattern of maternity care,

Table 6.4. *Trends in place of confinement of births weighing more than 2,500 g. 'Institutional' births per thousand live- and still-births*

Population	*Year*									
	1956	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*
County boroughs	651	647	644	643	649	662	661	685	702	733
	(18·8)	(17·8)	(17·3)	(16·6)	(16·4)	(16·2)	(15·3)	(13·6)	(13·3)	(12·8)
Remainder	630	630	626	631	633	640	644	666	686	704
	(19·6)	(18·2)	(17·4)	(16·8)	(16·0)	(14·5)	(14·9)	(12·7)	(12·5)	(12·3)
TOTAL	638	637	633	635	639	648	651	673	692	717

Note. The figure in parenthesis is the mortality rate (still-births plus deaths within 28 days per thousand live- and still-births) for all births over 2,500 g.

when the influence of the birth-weight distribution is removed.

Besides these variations between the two types of local authority areas there are pronounced regional differences in perinatal mortality and the pattern of maternity care. For all births there is no consistent relation between these two factors although county boroughs in London and the South-east and other local authority areas in Wales are clearly separated from the remainder of the data, and have high rates of institutional confinement and moderate rates of perinatal mortality. However, for births of weight less than 2,501 g in the county boroughs decreased perinatal mortality tends to be associated with increased rate of hospital confinement, although in the North-west Region and South-east Wales the results are somewhat anomalous. The other type of local authority shows no consistent relation for these low-weight births. The corresponding data for infants weighing less than 1,501 g at birth show similar trends, again with anomalous results for the county boroughs in the North-west and in South-east Wales. When perinatal mortality is adjusted for birth-weight the only clear trend is for the county boroughs, where corrected perinatal mortality tends to decrease with increasing proportions of hospital confinement for the low-weight births. Only the North-west region differs substantially from this general trend.

In general, county boroughs in London and the South-east had a high rate of hospital confinement for all birth-weights and a low perinatal mortality rate even after correction for birth-weight. Among local authority areas which are not county boroughs, the corrected perinatal mortality is low in the

Eastern region but the over-all proportion of hospital births is also low. However, for birth-weights of less than 2,000 g the proportion of hospital confinements is well above average. County boroughs in South Wales have an exceptionally high proportion of hospital confinements for birth-weights below 1,501 g and an exceptionally low perinatal mortality. The pattern for place of confinement in county boroughs in the North Midlands is similar to that for South Wales, but the perinatal mortality in the lowest birth-weight groups is 10 per cent higher. In rural Wales both the rates of perinatal mortality and hospital confinement are high for all birth-weight groups above 1,000 g.

Mortality for the low-weight births

In a population, mortality at home or in hospital will depend not only upon the standards of care provided, but also upon the 'mix' of cases.

Hospital confinements are likely to include a large proportion of cases with a higher risk of mortality, though the confinement policy will vary from population to population. Despite this reservation, mortality rates for domiciliary or hospital confinements are a useful basis for comparisons between populations with different rates of institutional deliveries.

For hospital births, all mortality rates are lower in the county boroughs than in the other local authorities for birth-weights of less than 2,001 g. The same is true for birth-weights of 2,001–2,500 g apart from the within-24-hours mortality rate for which the position is reversed. When all births of less than 2,501 g are taken together the within-24-hours mortality rate in county boroughs is somewhat higher, but the within-7-days mortality rate is the same, and the within-28-days rate is lower. For the domiciliary births the county boroughs are at a disadvantage only for within-24-hours deaths in the 2,001–2,500 g birth-weight groups. The county boroughs have an unfavourable weight distribution for hospital births of weight less than 2,501 g but a favourable weight distribution for infants born at home and later transferred to hospital (Table 6.5).

Table 6.5. *Mortality among low-weight live-born infants in terms of place of birth, England and Wales 1963–5. Rate per thousand live-births in weight group*

A. COUNTY BOROUGHS

Place of birth	*Time of death*	*Weight (g)* 1,001	1,001–1,500	1,501–2 000	2,001–2,250	2,251–2,500	>2,500
Hospital	Within 24 hours	630	302	90·9	30·2	15·2	85·1
	Within 7 days	793	449	150	51·9	26·1	126
	Within 28 days	813	473	159	58·4	30·0	133
		(48·4)	(78·8)	(190)	(214)	(470)	—
Home or nursing home (and not transferred to hospital)	Within 24 hours	610	241	66·7	19·0	7·5	23·9
	Within 7 days	660	355	89·4	25·1	10·8	31·4
	Within 28 days	670	373	92·4	25·8	11·6	32·8
		(10·6)	(17·6)	(69·8)	(156)	(746)	—
Home or nursing home (but transferred to hospital)	Within 24 hours	599	269	78·7	44·8	41·0	111
	Within 7 days	778	429	145	87·0	88·5	184
	Within 28 days	790	457	154	106	112	202
		(57·5)	(115)	(298)	(261)	(269)	—

B. OTHER LOCAL AUTHORITY AREAS

Place of birth	*Time of death*	*Weight (g)* 1,001	1,001–1,500	1,501–2,000	2,001–2,250	2,251–2,500	>2,500
Hospital	Within 24 hours	675	318	91·3	29·5	14·1	83·0
	Within 7 days	863	468	156	55·2	26·8	126
	Within 28 days	888	496	165	61·3	31·2	135
		(41·7)	(76·3)	(191)	(220)	(471)	—
Home or nursing home (and not transferred to hospital)	Within 24 hours	688	356	62·4	16·6	6·4	26·9
	Within 7 days	792	479	89·0	33·2	13·5	39·9
	Within 28 days	803	485	97·1	38·1	16·1	43·3
		(14·1)	(15·9)	(70·7)	(133)	(767)	—
Home or nursing home (but transferred to hospital)	Within 24 hours	634	272	71·7	45·1	41·4	123
	Within 7 days	836	454	137	88·8	126	214
	Within 28 days	871	486	153	112	180	245
		(69·5)	(131)	(312)	(219)	(268)	—

Note. The figures in parenthesis show the birth-weight distribution of 1,000 live born infants weighing less than 2,501 g.

In the county boroughs mortality within 24 hours for the hospital births is consistently higher than for the domiciliary births not transferred to hospital. This does not imply that confinement in hospital is a greater risk, since the selection of place of confinement is not random. The mortality rates for infants born at home but later transferred to hospital are mid-way between the hospital and domiciliary births of less than 2,001 g but consistently higher for the 2,001–2,500 g weight-groups. Even in the small groups of home confinements followed by transfer to hospital, there were some forty deaths in the lowest-weight group. The over-all mortality rate for these con-finements is higher for the low-weight births than among either hospital or home confinements. The mortality among transferred babies is only exceptionally high for births over

2,000 g. The pattern of the within-24-hours mortality rates in the other local authorities is less clear. Thus, the mortality among the hospital confinements is lower than among the home confinements (not later transferred to hospital) for birth-weights of under 1,501 g but higher for birth-weights of 1,501–2,500 g. The mortality among babies transferred to hospital is relatively high only for birth-weights between 2,001 and 2,500 g. The within-7-days and within-28-days mortality rates on the whole show a similar pattern to the within-24-hours mortality. In more rural areas mortality of transfers rises for birth-weights over 2,250 g perhaps because babies are transferred later in rural areas than in urban areas. Urban and rural areas within each region conform to the over-all pattern with some notable exceptions. For example, among the hospital births of less than 2,501 g the mortality rate within 28 days in county boroughs in the Eastern Region was 149 per thousand compared with 129 per thousand in the other local authorities in the region. The corresponding figures for the Midland Region of 122 and 156 show the reverse pattern. Other things being equal, it might be argued that the higher the proportion of hospital confinements, the lower should be the home mortality rates, since a greater proportion of the more difficult confinements might be expected to take place in hospital, but no strong association was observed for either type of local authority area between hospitalization rate and mortality at home or indeed between hospitalization rate and hospital mortality.

Hospital confinements showed no reduction in mortality until 1963, but the mortality rate in home confinements (when the baby was not transferred to hospital), with some exceptions, showed a tendency to decline throughout the period. The number of transferred babies is small but the results show a distinct downward trend. All these results are, of course, affected to some extent by the undoubted temporal variations in the 'mix' of cases selected for each type of confinement.

The still-birth rates were consistently lower in the county boroughs but the proportion of still-births delivered in hospital differed little between the two types of local authority areas.

Nor is there evidence in the regions of any strong association for each type of local authority area between the still-birth rate and the over-all proportion of hospital confinements (or indeed the proportion of still-births in hospital confinements) on the other.

Discussion

One of the main aims of this study has been to examine the variations in perinatal mortality and in place of confinement between different parts of England and Wales during 1956–65. As a historical record the assessment of the results is straightforward. There was little change in the over-all proportion of hospital births until 1962, but after that date there was an obvious increase year by year. On the other hand, the proportion of low-weight hospital births increased year by year throughout the whole period, and it seems reasonable to suggest that steady progress has been made in selecting potential high-risk cases for hospital confinement. Throughout the period both the over-all proportions of hospital confinements and temporal trends varied substantially in the two different types of local authority area and in different parts of the country. These variations were matched by equally wide variations in perinatal mortality.

The major interest is, however, in the interpretation of the perinatal mortality data in terms of the pattern of confinements. This involves the comparison of data based on somewhat different populations of births and due account should therefore be taken of variations in other characteristics of the populations which may be more important in determining perinatal mortality than the type of medical care. The effect of birth-weight and of sociological, genetic, and environmental factors upon perinatal mortality is well known. When due account was taken of birth-weight, there was no evidence of any association between perinatal mortality and the prevailing pattern of confinements for the various authorities and regions during 1963–5. Indeed only the low-weight births in the county boroughs showed a tendency for perinatal mortality to decrease with an increasing proportion of hospital births. These observations

are capable of many interpretations, and it is not possible on our evidence to decide which is the most realistic. The position is further complicated by the fact that the hospital confinements cover institutions with a very wide range of medical care. However, despite these uncertainties, an attempt to explain the observations is called for, if only to suggest further analyses and experiments.

Probably in only a minority of confinements are the special skills and equipment in hospital needed to ensure the well-being of the mother and the infant. Perhaps the majority of hospital confinements might have taken place equally well at home, provided that home conditions are adequate. On the other hand, the birth of an infant in hospital increases the risk of cross-infection, which although small is not negligible. In the choice of the place of confinement and in the formulation of a policy for the provision and use of maternity services the safety net of special care offered in hospital must be balanced against the increased chance of infection. If it were possible to be sure that there would be no complications, it might be argued that the confinement should always take place at home provided that conditions there are reasonable and this, of course, would be less expensive.

The absence of any clear relation between rate of hospital confinement and perinatal mortality in the total population of births in the various regions and types of local authority areas is consistent with this view. Only among the low-weight births in the county boroughs does the effect of a higher rate of hospital confinements seem to be beneficial (though even here some assumptions are needed). Support for this view can be found in the experience of other countries. For example, the perinatal mortality rate in the rural parts of Holland is one of the lowest in the world, and the great majority of confinements take place at home. Some Dutch perinatalists hold views similar to ours and their attitude is reinforced by the acknowledged excellence of the Dutch midwifery service (5, 6). On the other hand, experience in Sweden suggests that an equally low perinatal mortality rate can be achieved by almost universal hospital confinement. How far this experience in other countries can be

applied in the United Kingdom is uncertain because of the regional differences. Certainly East Anglia seems to pursue successfully a policy of relatively low general hospitalization with high hospitalization of very low-weight births, if success is judged by low perinatal mortality rates. On the other hand London shows very low mortality rates with a confinement policy more in line with that of Sweden.

When the future of the maternity services in this country is considered, the main object must be to ensure that the best possible use is made of resources and that any new developments should be in areas in which the potential returns are the greatest. On the evidence of recent experience it is by no means certain that the trend towards increasing hospital confinement apparent since 1963 is the best policy. It could be that better general conditions and standards of medical care during pregnancy might do more to reduce mortality. On the other hand, hospital resources might be better used by offering a higher standard of care for the relatively small proportion of high-risk confinements. Such a policy would depend upon the prompt identification of these cases, and while an infallible selection procedure is unlikely ever to be devised, further research might well be fruitful. Careful consideration should be given to travelling times in deciding the numbers and siting of specialized units of this kind. The record for 1956–65 suggests that for low-weight births, centralization has put the rural areas at a disadvantage.

An experiment in two areas in which the populations have similar characteristics might help to resolve these uncertainties. In one such area a more selective policy, with a lower over-all rate of hospital confinements coupled with improved antenatal care, might be applied. At the same time the collection and presentation of vital statistics could also be greatly improved. Certainly the grouping of all hospital births under one heading loses much potentially valuable information. The present failure to collect systematically reliable sociological and environmental data about the population of births may be a major cause of the misuse of resources.

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7

Perinatal mortality in a mining area and its implications for the obstetric service. A preliminary report

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Perinatal mortality in a mining area and its implications for the obstetric service. A preliminary report

Perinatal mortality in South Wales has always been, and still remains, substantially higher than the rate for the United Kingdom, and within the region the mining valleys, particularly those in the north-east, have the blackest record. Perinatal mortality in this area was 44·4 between 1960 and 1964 when the rate in Cardiff was 34. By 1967, the rate in the area had fallen to 35·8, but the rate in Cardiff had fallen to 24, so that the difference remained as great as ever. This situation provides an unusual opportunity for a detailed study of the social and obstetrical causes of death around the time of birth.

It is well known that perinatal mortality is related to unemployment (2, 11, 13), to nutrition in pregnancy (4, 7, 8), to maternal health and physique (1, 2, 5, 9, 10, 12), and, of course, to the standard of local obstetrical services. Baird's work in Aberdeen has shown clearly that induction of labour to avoid post-maturity in older patients and the use of Caesarean section rather than forceps in a difficult delivery can reduce perinatal mortality substantially and these factors must all play some part in maintaining the persistently high mortality rates of the mining valley areas. The purpose of this investigation is to study their relative importance, and to recommend steps which could reduce mortality. The study has been in progress only since June 1968, so that the present report is of necessity preliminary.

Methods

An intensive and confidential inquiry is being made into the social, obstetrical, and pathological causes of each perinatal death in the study area over a two-year period. Detailed information is being obtained about each mother's social circumstances,

physique, health during childhood and early adult life, care during the antenatal period, labour, and the puerperium, the social and obstetrical services available in her home district, and the social and obstetrical services she actually used. The mother, her GP, obstetrician, and midwife are all interviewed. As a control the same information is being collected from every twenty-fifth mother delivered of a live baby in the area.

The cause of death is classified according to the clinicopathological system used in Aberdeen since 1954 and in the British Perinatal Mortality Survey (6). Each death is allocated to a single-cause group which gives maximum information on preventability and takes into account all the clinical aspects of the case as well as the autopsy findings. The aim is to classify each death under the factor which probably initiated the train of events ending in death. For some cases the factor is, of course, uncertain.

The groups are divided into two broad categories. The first—consisting of deaths attributed to toxaemia, mechanical causes, unexplained deaths of mature babies, and Rhesus incompatibility—is dominated by the influence of age and parity. The second—consisting of deaths due to unexplained prematurity, malformations, antepartum haemorrhage, and miscellaneous causes—is less influenced by age and parity and more clearly affected by differences of maternal physique and socio-economic status. Deaths in the first category may be reduced considerably by high standards of obstetrical care, and for this reason have been labelled 'obstetrical causes'. Deaths in the second category, which are less amenable to obstetrical intervention but seem to respond to environmental influences, have been labelled 'environmental causes'.

In view of the confidential nature of this inquiry, the final classification in this survey is made by Professor Turnbull alone.

The area and its obstetrical services

This mining area suffered severely during the depression in the early 1930s, and little new industry has been introduced since. It is mainly composed of valleys along which the roads run.

Communications between the valleys are poor, but recently a road has been built to run along the heads of the valleys and then into the flatter area beyond where a new district general hospital is in course of construction. A general air of depression hangs over the area; houses are often poor and ill-equipped, shops unattractive.

The present specialist obstetric unit of fifty-six beds is in one of the two small towns, and it will not move into the new hospital for five or six years. It is staffed by a consultant obstetrician, two senior house-officers, and a consultant from the main centre twenty miles away has several weekly sessions.

Of the two GP units, one is about five miles from the consultant unit and the other about ten miles (and two valleys) away. Patients can be booked for confinement by GPs and delivered in either unit without discussion with the consultant, but in practice the consultant is closely concerned with one.

Patients may also be delivered in an adjacent area where there are two specialist obstetrical units, three GP units, and a private nursing home. The main hospital of the study area has no specialist paediatric unit and premature or sick babies may be transferred to specialist units in adjacent areas.

Causes of deaths

Between June and December 1968, 52 perinatal deaths and 58 controls have been studied. Six of the deaths were due to premature delivery of twins. Causes of death of the other 46 babies according to the Aberdeen classification are shown in Table 7.1 and compared with the findings of the British Perinatal Mortality Survey in 1958. Since the proportion of potentially preventable 'obstetrical' deaths (21·8 per cent) is only half that of the 1958 survey (44·1 per cent) 'perfect' obstetrical care could only reduce the perinatal mortality by a fifth and in actual clinical practice obstetrical measures can reduce these deaths but never prevent them entirely.

Over three-quarters of the deaths are 'environmental' (78·2 per cent). Though the proportion due to antepartum haemmorrhage and deformity is much the same as in the 1958 survey,

Table 7.1. *Causes of perinatal deaths (single pregnancies) in perinatal mortality survey and present survey*

Cause of death	*Perinatal mortality survey 1958 (%)*	*Present survey 1968 (%)*
OBSTETRICAL		
Toxaemia	12·6	8·7 (4)
Mechanical causes	13·1	2·2 (1)
Uncertain (mature infant)	14·1	8·7 (4)
Rhesus factor	4·3	2·2 (1)
	44·1	21·8
ENVIRONMENTAL		
Uncertain (premature infant)	17·9	32·6 (15)
Malformation	18·8	23·9 (11)
Antepartum haemorrhage	14·2	13·0 (6)
Remainder	5·1	8·7 (4)
	55·9	78·2

nearly a third are in the 'premature, cause uncertain' group. Most of these infants were actually born prematurely, rather than being small at full term.

Some local conditions seem likely to have contributed to these figures.

PREMATURE-BABY CARE

The prematurity rate for Monmouthshire (8 per cent) is higher than average. Six of the 58 controls had premature babies and 15 of the perinatal deaths were of premature infants. As the main hospital has no paediatric unit, babies have to be transferred to units from five to thirty-five miles distance, and GPs tend to 'hang on' to premature babies and care for them in the sub-optimal, but more convenient, conditions of the GP unit or the patient's home. In five of these deaths the baby, or mother in premature labour, were retained in the GP unit for considerable lengths of time when transfer to a specialist unit should have been arranged.

UNSUITABLE BOOKING

Seven patients were booked for delivery at home or in GP units when this was clearly unsuitable. The most striking was an

elderly primigravida with eleven years' involuntary infertility who was booked for a GP unit. Even the finding of a breech presentation and foetal distress when the membranes ruptured did not lead to transfer to the specialist unit, and the infant was still-born after labour had been induced by intramuscular injection of Pitocin and a breech extraction performed. The infant proved to have a gross spina bifida. Other unsuitable bookings included a patient with a history of several late abortions (who should have had a Shirodkar operation, but again lost the baby from prematurity); a gravida 11 with only two living children (but she was unco-operative and would probably have been delivered at home without care if she had not been persuaded to come into a GP unit); a pregnancy prolonged to forty-four weeks; a patient with antepartum haemorrhage (whose management included vaginal examination in a GP unit); a patient with a history of a severe postpartum haemorrhage; and a patient with severe hydramnios (who had previously been delivered of an abnormal baby with oesophageal atresia). Among the controls only three obviously unsuitable bookings were made.

PATIENT APATHY

The average multipara is rather obese, looks old for her age, and tends to be casual and apathetic about herself and the standard of care she received. Six of the perinatal deaths occurred in patients who had had no antenatal care. These patients had failed to attend any doctor or midwife for a variety of reasons—actively concealing the pregnancy; having too many children to look after; or, despite previous still-births, adopting a 'what will be, will be' attitude.

PARITY

Table 7.2 shows the parity distribution of the 52 survey patients, the 58 controls, and all Cardiff births between 1964 and 1966. The survey population so far is not of higher parity than that of Cardiff, which has a much lower perinatal death-rate, but it has a higher proportion of first births and a lower proportion

Table 7.2. *Parity distribution in survey (perinatal deaths and controls) and all Cardiff births (1964–6) (percentage)*

	0	*1 and 2*	*3+*
Perinatal deaths (52)	38	45	17
Controls (58)	40	45	15
All Cardiff births (14,100)	32	47	21

of highly parous women. In the perinatal death and control groups, 11·7 and 8 per cent respectively were having a fifth or subsequent child; the comparable figure in London or Aberdeen is about 7 per cent, so that both the survey area and Cardiff have a relatively large proportion of higher parities.

AGE

The age of patients in both perinatal death and control groups naturally increased with increasing parity, but the primigravidae in the perinatal death group were younger than those in the control group. The comparable percentages were: under 20 years, 40 per cent and 9 per cent; 20–9 years, 65 per cent and 74 per cent; 30 years and over, 5 per cent and 17 per cent.

HEIGHT

Table 7.3 shows the height distribution in the same three groups. The controls have much the same stature as the Cardiff mothers, with 30 per cent of all patients being tall (5 ft 4 in +). The patients with perinatal deaths are relatively stunted, for 31 per cent are short (under 5 ft 1 in) compared with only 22 per cent in the controls or in the Cardiff population.

PRENUPTIAL CONCEPTION

In primigravidae conception was prenuptial in 75 per cent of those with perinatal deaths (15 out of 20), but in only 4 per cent of the controls (1 out of 23).

SMOKING

Sixty-three per cent of those with perinatal deaths and 62 per cent of controls smoked during pregnancy. The incidence

Table 6.3. *Height distribution in survey (perinatal deaths and controls, 1958) and all Cardiff births (1964–5) (percentage)*

	<61 in (short)	*61–3+ in (medium)*	*64+ in (tall)*
Perinatal deaths (52)	31	44	25
Controls (58)	22	47	31
All Cardiff births (14,100)	22	48	30

increased with parity in both groups, and was about 50 per cent in gravida 1, 60–5 per cent in gravida 2 and gravida 3, and 90 per cent in gravida 4 or more. In the 1958 British Perinatal Mortality Survey, only 29 per cent of all patients smoked during pregnancy.

PREVIOUS PERINATAL DEATH

Of the 32 multiparous patients who had a perinatal death in this pregnancy, 8 (25 per cent) had previously lost at least 1 baby (5 had had a previous still-birth; 1 had had a previous neonatal death; 1 had had 3 previous still-births; 1 had had 2 previous still-births and 4 neonatal deaths). Even in the 35 multiparous controls, 6 (14 per cent) had a similar history (4 had had 1 previous still-birth and 2 had had a previous neonatal death).

Discussion

This survey is still at a preliminary stage, but a general pattern of results has emerged which allows tentative conclusions to be drawn and some recommendations to be made.

Perhaps the most important point to make at this stage is that this survey has proved not only practicable, but also of some local interest. Everyone concerned in the care of the patients has been most helpful and co-operative, probably because it was made clear at the outset that the object was not to apportion blame, but to approach the problem of avoidability from an epidemiological point of view. With perinatal mortality, this is better than an attempt to judge individual cases.

Experience of reviewing case-histories in a teaching hospital, with very full information and with the staff responsible present, soon shows that though faults in management can often be

found, it is usually far from easy to be sure that a given death could have been avoided and the purpose of such reviews is, of course, to improve standards of care, not to find fault with individuals (3).

HOSPITAL SERVICE

The proportion of potentially preventable deaths in our survey is only half that of the 1958 survey, but improvements could clearly be made by better obstetrical care. Even during the planning of this survey, it became clear that the obstetrician had too great a clinical task and too little ancillary help. The consultant who visited the hospital had many commitments in his own area, and, although most conscientious in his visits, could hardly be expected to have a vital concern in the over-all problems of the study area. A medical assistant has now been appointed which has greatly lightened the consultant's load. Consideration is being given to the creation of a second consultant post to replace the medical assistant. An additional consultant will certainly be needed when the new unit opens in five or six years, but it may be possible to anticipate this requirement in view of the present load of abnormal cases. With additional senior staff it will be possible to supervise and train more intensively the two senior house-officers, who are usually inexperienced and from abroad. It would also allow a more radical approach to problems of pre-eclampsia and hypertension, induction of labour, difficult labour, foetal distress, and so on.

Much might be achieved if sterilization was more easily available to women with three or four children, for the area has a relatively large proportion of highly multiparous women with consequent risk of recurring perinatal deaths.

When more data have accumulated from the survey, it should be possible to identify vulnerable groups. For example, young, short primigravidae who smoke and have prenuptial conception seem at particularly high risk of perinatal death from prematurity. The relatively high incidence of deaths from prematurity, in comparison with that from antepartum haemorrhage or

deformity, might suggest interference in early pregnancy in an attempt to induce abortion, but in fact the rate is much the same in Aberdeen where criminal abortion is almost unknown.

Since the survey began, a consultant paediatrician has been appointed to the area, but he is to work mainly at the new hospital. With so many premature babies, it would seem advisable to concentrate their care in the hospital with the main specialist obstetric unit. Since so many premature babies, or mothers in premature labour, will still have to be transported throughout the area, the possibility of a special ambulance might be considered.

GENERAL PRACTITIONERS

GPs should be working in conjunction, rather than in competition, with the hospital service, and they should not be booking high-risk cases for delivery. The consultant should attend regular clinics at GP units and discuss the management of cases in which there is doubt or difficulty. The Regional Hospital Board has decided to replace the present GP units by a unit in the hospital where the consultant obstetrician has his department, and this will encourage a closer liaison between the practitioners and the hospital.

VALUE OF SURVEYS

This preliminary report shows how detailed local surveys can be used to assess needs and indicate problems. It also suggests that data collection could, with advantage, become part of the routine service of an area. If appropriate standardized record summaries were available and central facilities for computer analysis provided, results in an area could be assessed quickly, and over a period of time, trends in perinatal mortality could be studied and related to changes and improvements in care. Widespread application of this approach would greatly improve communication between different areas, enable advances to spread more quickly, and generally lead to improved standards of management.

In the area we are studying, it is clear that a great deal can be, and is already being done to improve the obstetrical services, and it has been gratifying that the changes are in the direction the survey seems to indicate. However, it must be stressed that these additions and changes were planned long before the survey began and that the survey findings can at most have expedited their introduction. It will be of great interest to study how these changes influence results in the next year or two.

A really substantial reduction in perinatal deaths in this area must depend on better standards of living and more widespread education about diet and family planning. This is likely to be a gradual process but it would be of interest to see if progress could be accelerated by introducing new industries, providing better housing, and giving intensive health education; however, this would be a major project at a national level.

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8

A general practitioner unit, Hope Hospital, Salford

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A general practitioner unit, Hope Hospital, Salford

Sluglett and Walker (1956) first put forward the idea of a hospital unit with labour rooms only, where patients would be delivered by their GP and domiciliary midwife and sent home from hospital within hours of delivery. They believed that this arrangement would maintain continuity of care more effectively than any early discharge system; all the hospital services would be at hand if the 'normal' case suddenly became abnormal; that it would reduce the domiciliary midwife's feeling of isolation when faced with an emergency; that it would relieve pressure on specialist beds; that the reluctant grand multipara might be persuaded to come to such a unit; that it would bring together the three branches of the obstetric service.

The Salford scheme

At the time that Sluglett's and Walker's paper appeared we were planning a new maternity hospital, and we decided to include a four-bed GP unit along the lines of their suggestion. Because we could not be sure that the idea would prove practicable, we arranged the layout so that it could be used for other purposes if the unit did not prove successful. When we opened our unit in August 1966 a similar unit had been running successfully in Cardiff for about twelve months.

Our GP unit has four bedrooms, each with a comfortable bed to which stirrups can be attached, a cot, a wash-basin, a small wardrobe, and good lighting. The unit has a sluice and sterilizing room, bathroom and w.c., a small kitchen, and an office. Delivery packs are provided by the local authority and suture packs from the main hospital's central sterile supply

department. Experience has shown the need for a sitting-room, and we plan to arrange this. Cleaning and maintenance are done by the hospital staff, but no permanent staff is attached to the unit.

The unit is on the same floor as the antenatal ward of the hospital. The GP and domiciliary midwife can communicate with the main hospital directly by an internal telephone or via the hospital switchboard. In addition, an alarm system, when operated from the unit, sends an audible as well as a visible signal to the antenatal ward so that help can be summoned without anyone leaving the unit.

A committee of GPs, medical officers of health and their maternity supervisors, and the hospital obstetricians laid down the following criteria for admission to the unit:

Healthy primigravidae or multiparae with good home conditions who for their own reasons wanted delivery within hospital precincts;

Patients with no obvious obstetrical complications, whose homes were suitable for early discharge but not for delivery;

Patients who had had minor non-recurrent obstetrical complications in a previous pregnancy but whose homes were good.

The following were to be regarded as indications for admission to the specialist unit and not the GP unit:

Bad home conditions;
Small stature;
High parity;
Primiparae over 35 and multiparae over 40;
Medical conditions likely to complicate the pregnancy;
Previous Caesarean section or difficult vaginal delivery;
Rhesus sensitization.

The criteria have had to be applied somewhat flexibly—for example, if a grand multipara refused to come into the specialist unit, but was willing to come into the GP unit, she was accepted, since this was preferable to domiciliary delivery.

It was agreed that the hospital consultant should have the overriding authority to transfer from the GP unit any patient

who was considered unsuitable, and admit her to the specialist unit. Apart from this, patients are under the sole care of their GP and the domiciliary midwife.

LEGAL DIFFICULTIES

The Hospital Management Committee issued letters of authorization to GPs and agreed to grant honorary contracts to domiciliary midwives. But a difficulty was met when the Regional Hospital Board asked the Local Employing Authority for an indemnity to cover liability to third parties arising out of the attendance of domiciliary midwives at the unit and the performance of duties there. Under the National Health Service Act, 1946 (Section 23) a Local Health Authority is required to provide a service of midwives for attendance on women in their own homes and the attendance of midwives at a GP maternity unit is not strictly within their powers under the Act. This difficulty was temporarily resolved and has now been covered by the Health Services and Public Health Act, 1968 (Section 10 (2)).

METHOD OF BOOKING

For a trial period bookings were restricted to forty in any one month. This number could be doubled without strain on the accommodation, but this would lead to a scarcity of deliveries in the home for some Part II midwifery pupils. A working party on the future development of midwifery training (1967) recommended that not more than half of the domiciliary deliveries necessary for training could be taken in an approved GP obstetric unit, provided that the student is concerned with the patient's antenatal and post-natal care in the home, and the Central Midwives Board allows some Part II pupils doing the whole of their six months training on the district to do 10 cases in the GP unit and 10 in the patient's own home. But Part II pupils who do three months in the specialist unit and only three months on the district must do 6 cases in the patient's home and only 4 in the GP unit.

The GP arranges the booking with the local authority who sends a copy of the details to the hospital consultant. If the information suggests that the case is more suitable for hospital than for the GP unit, the hospital consultant discusses the matter with the GP.

DELIVERY AND RETURN HOME

A patient booked for the unit receives antenatal care from her own doctor and midwife. When she starts in labour she informs the midwife who decides whether labour is established and, if it is, brings the patient into the unit and stays with her until delivery. The hospital staff are willing to watch the patient if progress is slow and the midwife wishes to leave the unit, but such help is seldom requested.

The mother and baby return home by ambulance, accompanied by the domiciliary midwife, within hours of delivery. A patient who is delivered at night is kept until the following morning and supervised by the specialist hospital night staff. She returns home the following morning by ambulance, accompanied by the domiciliary midwife. The local ambulance authorities have co-operated well, though occasional difficulties have arisen because the midwife has had to await the arrival of the ambulance. The patient is informed about the procedure in the unit. She is told that her husband or other relative will be able to accompany her and be with her during labour, and that, as she will be going home within a few hours of delivery, her bed and home should be kept warm and ready for her return. She is also given a list of requirements to take in with her.

GPs are reimbursed by the Executive Council in the same way as if the patient had been delivered at home.

The first year's work

The unit was opened to receive patients in August 1966, but because of the interval between booking and delivery not many babies were born during the first few months.

In 1967, the first complete calendar year of operation, 300 admissions and 279 deliveries were recorded. Fifteen mothers were transferred to hospital from the GP unit before delivery, 11 because of prolonged labour, and 4 because of other complications of delivery. Two were eventually delivered by Caesarean section and 2 by forceps. Five were transferred after delivery, all because of postpartum haemorrhage.

Of the 280 babies (there was one set of twins) 5 were transferred to hospital. One was suspected of having galactosaemia but proved to be normal, 3 were immature, and 2 had asphyxia. There were no perinatal deaths, although between 5 and 15 might have been expected at the local rate for unselected pregnancies. This result may be partly due to selection of cases and partly to the facilities and services of the unit.

The maternal age distribution (Table 8.1) was not as different from that of the related population as the parity distribution which showed a large deficiency of first pregnancies and an excess of fourth and higher pregnancies compared with the local population (Table 8.2).

The birth-weight distribution reflected the policy of arranging hospital delivery for cases with early onset of labour; only four babies (including the set of twins) weighed less than 2,500 g at birth.

The total time spent in the unit reflects the variation in first-stage duration in multiparous women, but the time spent in the unit after delivery shows much less variation (Table 8.3).

The unit was used by 60 GPs. Five practices (12 doctors) accounted for one-third of the bookings; use of the unit was not unreasonably concentrated to a few GPs.

The patient's own GP was present at 70 (25 per cent) of the deliveries, and he conducted the delivery himself in 3·5 per cent of cases.

Not all the booked cases were actually delivered in the unit. Of 460 booked, 57 were delivered at home and 68 were delivered in hospital, having been admitted before labour. Twenty-eight are accounted for by removals from the district, abortions, and other causes, and 10 have not been traced. Thus, those delivered

Table 8.1. *Age-distribution of 294 mothers admitted to the unit*

	Number	*Percentage*
<20 years	47	16
21–30 years	188	63·9
31–5 years	34	11·6
36–40 years	21	7·1
>40 years	2	0·7
Not stated	2	0·7
	294	100

Table 8.2. *Parity distribution of 294 mothers*

	Number	*Percentage*
1st pregnancy	54	18·4
2nd–5th	229	77·9
6th	4	1·4
7th	1	0·3
8th	1	0·3
9th	2	0·7
Not stated	3	0·7
	294	100

Table 8.3. *Time spent in unit by 274 mothers delivered there*

0·1 hour	0
1 hour	10
2 hours	26
3 ,,	35
4 ,,	48
5 ,,	32
6 ,,	54
7 ,,	25
8 ,,	15
9 ,,	13
10 ,,	2
11 ,,	14
	274

in the unit are selected not only by design, but also by accident, a situation which also holds for domiciliary and specialist hospital delivery.

The mothers' views

A detailed survey was made of the circumstances and attitudes of the 200 mothers delivered in the unit between November 1967 and April 1968. Each mother was interviewed within one month of delivery and one of us (E. W.) also interviewed the GPs and the midwives.

ANTENATAL BACKGROUND

Most of the patients were booked for delivery in the unit by their own choice or that of their GPs. When asked where they would expect to have been delivered had the unit not existed, 144 (72 per cent) said their own homes, 5 said relatives' homes, and 50 said maternity hospitals. Thus the unit seems to be recruiting substantially from those who would otherwise have been delivered at home.

All but 11 (5·5 per cent) lived within three miles of the unit. Just over half lived in Salford, and the remainder in the urban Lancashire area immediately adjacent to the city. Only 3 travelled to the unit in their own family car; 68 travelled in the midwife's car, and 131 by ambulance.

Antenatal care for 47·5 per cent had been provided at the GP's own surgery and 41 per cent at the local authority clinic. A few mothers had received care in more than one place.

DELIVERY AND PUERPERIUM

A total of 192 patients spent three to eighteen hours in the unit. Only 47 spent more than ten hours after delivery and of these 36 had been delivered during the night and waited for a convenient daylight hour before returning. Ten mothers were held up by delay in the arrival of the ambulance. For only one mother, whose baby had mild neonatal asphyxia, was there a clinical reason for a prolonged stay.

Thirteen mothers were transferred to the adjacent specialist unit before delivery; 6 because of prolonged labour and 6 because of foetal distress; 1 because of prolapse of the cord.

Six mothers were transferred to the hospital after delivery—all because of postpartum haemorrhage. Three required manual removal of the placenta and 2 blood-transfusions. Seven mothers needed domiciliary medical or surgical treatment after delivery —all for trivial conditions which quickly resolved.

Seven babies were admitted to hospital from the unit after birth. Two had asphyxia, 2 were premature, 1 had spina bifida, and 1 had congenital heart disease. One had rhesus haemolytic disease and should have been delivered in hospital. Fortunately the disease was mild and did not require transfusion.

Three babies were admitted to hospital after return home. One had a chest infection at three weeks but made a good recovery. One was not feeding and was admitted at twenty-four hours of age. He recovered. One had congenital heart disease.

There were 3 perinatal deaths among the 200 deliveries. Two were babies with congenital heart disease and 1 was a still-birth following a forceps delivery in the unit.

All the mothers were attended by a midwife or doctor during labour in the unit. Eighty-nine had only the midwife or a doctor, but 111 were also attended by husbands, relatives, or friends, and 99 were so accompanied during the whole of their stay. Eighty-one had their husbands with them, 27 their mothers or a close female relative or friend, and 3 had their husbands as well as their mothers.

In 47 deliveries the husband was present during the actual birth, and 64 of the other mothers said that they would have liked their husbands to be present if other commitments had permitted. Only one mother whose husband was present would have preferred him not to be there.

Of the husbands 104 favoured the unit as the place of delivery, 45 favoured the specialist hospital, 44 had no views, and only 7 (3·5 per cent) preferred a domiciliary delivery.

Forty-three mothers were looked after at home by the husband alone and 68 by the husband with the support of

relatives or friends. Eighty-one husbands lost no time from work and all but 34 (17 per cent) lost less than a week.

Only 3 mothers had had a previous delivery in the unit, and only 18 had had all previous babies at home. Thirty-one were primigravidae.

VERDICT OF MOTHERS AND ATTENDANTS

Of the 200 mothers 193 would use the unit again, and 192 were enthusiastic about the scheme. Reasons for their satisfaction were many and varied. A big advantage is that there is no mess at home, and 93 mothers mentioned this. They also appreciated returning home quickly (88 mothers), and mothers with families were glad to get back before the other children missed them and yet be out of the way of the children during the delivery. Seventy-one mothers were reassured that the resources of the main hospital were so near at hand, and 3 recalled that oxygen was available in the unit itself when the baby needed it. Another popular point is that mothers can have their own midwife and doctor with them, and that husband, relative, or friend can stay (mentioned by 55, 5, and 22 respectively). The mothers realized that the unit offered them the amenities and safety of the hospital, but with less formality and fewer restrictions. Typical comments were, 'as nice as being at home', 'not like hospital, like being in an hotel'. They had peace, quiet, and privacy, and yet there was no moving from one bed to another and everything was in the same room. Thirty-two mothers described the unit as pleasant, clean, warm, and friendly and found the meals good. One experienced mother said that the delivery at the unit had been the pleasantest experience of all her 3 confinements.

Criticisms were few, but 8 mothers between them offered 9 adverse comments. Two mothers thought that the move to the unit had not been worthwhile; another had no complaints but 'just preferred to have her baby at home'. One mother reported that her midwife had said that 'it was no different from having the baby at home'. Two mothers made more precise complaints. One had waited 1½ hours for the ambulance

and the baby was nearly born on the way to the unit. Another mother felt that she had come home too soon. Two other criticisms—that there was no night nurse duty on and that a doctor was not always on duty—were not correct.

It was possible to interview 48 relatives who had been present during delivery. Forty were enthusiastic, 3 were favourable but with reservations, 2 were non-committal, 1 made an unfavourable comment, 2 did not comment.

A midwife was present throughout labour in 194 deliveries and in only 1 was the midwife absent for more than three hours. In 179 deliveries the midwife felt that her other work had not been disturbed by the unit delivery, in 17 that her other work had been slightly affected, and in 4 that it had been considerably affected. Midwives thought the unit had provided a good service for 192 patients, a fair service for 6 cases, and an unnecessary service for 2.

Conclusions

The general experience gained from the two years that the unit has been running and the more detailed findings of the survey shows that the unit has been a success, and confirms that it has brought the advantages Sluglett expected.

There has been continuity of care.

The ease of dealing with complications in mother or baby developing suddenly in an otherwise normal labour has been demonstrated on a number of occasions.

Midwives have repeatedly stated that working in the unit relieves them of a feeling of isolation, since they know help is freely available, and they also have better liaison with their hospital colleagues.

The unit has relieved some pressure on specialist beds, but this has not been substantial.

Many grand multiparae who could not be persuaded to come into hospital have been delivered in the unit.

Units of this kind are economical to build and to run. The number of deliveries in our unit of four beds could easily be

doubled, and no doubt will be when deliveries in such units are accepted by the Central Midwives Board as domiciliary deliveries for Part II of the training scheme. The mean time from admission to delivery is approximately 3¾ hours and from delivery to discharge 5¾ hours. Thus a bed is occupied on average for 9½ hours per patient. At no time has our unit been hard-pressed; on only a few occasions have three patients been in at the same time, and only once have all the four beds been occupied. In the unlikely event of a bed not being available, one could always be 'borrowed' for a few hours from the specialist unit. Thus these units do not need many beds. All the domiciliary deliveries in this area could be dealt with by a unit of eight beds.

It is unlikely that all deliveries will ever take place in hospitals, GP units, or in the more conventional GP maternity hospitals. Some mothers will always insist on staying at home. Others will be delivered too quickly to be transported from their home to the unit. Not even the most fervent protagonist of institutional delivery would suggest that a taxi, or even an ambulance, is a safer environment than the home in which to deliver a baby. Out of 460 mothers booked at our unit, 57 (over 12 per cent) were delivered at home because they were too advanced in labour to move. In any event, GP units are really only suitable for urban areas; 94·5 per cent of our mothers lived within three miles of the unit.

Whether delivered in the unit or in the home, the mothers are under the care of their own GP and midwife who thus have the opportunity to continue to practice obstetrics. Sixty of the 200 mothers volunteered the information that they were pleased to have their own midwife and GP with them. Midwives and doctors, with few exceptions, have welcomed the scheme, and the GPs continue to make more requests for bookings than the agreed number. In a few instances the unit was the wrong choice for the patient, but these were exceptional, and the help of the specialist unit has usually been sought early and available promptly.

Unfavourable comments were few and minor. Two doctors had a personal bias in favour of home confinements and only

booked the cases because they respected their patients' wishes. 'A straightforward normal delivery is better at home within easy reach of GP.' One complained of lack of suture materials, spotlight not working, and water-pressure low; these deficiencies have been remedied. Two doctors thought that patients would have been better off with an eight-day stay, but this was an opinion based on hindsight, since their patients had had to be admitted to the specialist unit because of complications.

Of the 200 mothers, 193 would use the unit again. In addition to the advantage of returning home to their families before their children missed them, they welcomed the peace, quiet, and privacy of the unit. They were able to have their husbands or relatives with them, as they do at home, yet without the mess and upheaveal of a domiciliary delivery.

The babies have not suffered any ill effects and any early misgivings have proved to be unfounded. Over 600 babies have been discharged from the unit and even in winter they have travelled well. Babies are transported home in heated ambulances in a carry-cot (with a hot-water bottle) and, most important of all, it is easy to keep the home ready and warm to receive the baby. Only one baby suffered from cold and this was because the arrival home coincided with very bad weather and a shortage of fuel.

Conventional early discharge from a specialist unit (after forty-eight hours) depends for success on close liaison between hospital, domiciliary midwife, and GP. This liaison is sometimes deficient, especially when a sudden influx of hospital deliveries at night necessitates the discharge of recently delivered mothers the following morning, when the mother and baby may go out to a home not prepared to receive them.

Infection has been negligible and the low foetal mortality is probably partly due to prompt treatment of foetal distress, prolapsed cord, uterine inertia, and similar unheralded emergencies. Maternal complications have been dealt with without an ambulance journey for the mother or a flying squad visit to the home.

In sum, we believe that the venture has worked smoothly and that the snags have been extraordinarily few.

We are grateful to the Manchester Regional Hospital Board for a grant to carry out the detailed survey. We are also grateful to Dr. Burn and Dr. Elwood (Medical Officers of Health for Salford and the relevant division of the Lancashire County Council respectively), their Maternity Supervisors, the midwives who have co-operated so well, and the GPs who provided the necessary information.

9

Family responses to early discharge

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Family responses to early discharge

The pattern of maternity care in the United Kingdom has changed steadily over the past twenty-five years. Domiciliary confinement with the family doctor in attendance has gradually been replaced by hospital delivery supervised by midwives and specialist obstetricians. More recently two notable developments have been the establishment of GP maternity units and the practice of allowing selected mothers and their babies to return home 48–72 hours after delivery. When first introduced, planned early discharge was, understandably, a controversial issue, but papers published in this country and in the United States have confirmed that for mother and baby there is no apparent increased risk.

A scheme of planned early discharge forty-eight hours after delivery was started in the Princess Mary Maternity Hospital in 1960. At first it was reserved for patients living in or near Newcastle upon Tyne, where collaboration with the city Medical Officer of Health and his domiciliary midwives is close. In the past few years the arrangement has been extended to include patients living in adjacent rural and urban areas, and there has been the same close collaboration with the local health authorities. Selection begins at the first antenatal visit when the senior sister in the clinic makes a preliminary selection of suitable patients (social circumstances, parity, past obstetric history, etc.). These cases are 'flagged' for the attention of the consultant doing the clinic who makes the final decision. The names are then passed to the local supervisor of midwives who arranges for a domiciliary midwife to visit the patients' homes before final agreement is reached and the clinic sister notified.

Table 9.1. *Complications causing cancellation of early discharge*

MOTHER	
Forceps delivery	22
Caesarean section	10
Large perineal tear	5
Membranes incomplete	3
Manual removal of placenta	2
Postpartum haemorrhage	3
Vaginal haematoma	1
Genital tract infection	3
Chest infection	1
Eclamptic fit	1
Urinary-tract infection	1
Tubal ligation	1
Alteration in social circumstances	2
	55
BABY	
Still-birth	3
Prematurity	11
Cerebral irritation	1
Feeding difficulty	1
Congenital abnormality	1
Exchange transfusion	1
	18

The family doctor is told of the proposal and his co-operation secured. After delivery a very careful review is made by obstetric and paediatric staffs before mother and baby are sent home after forty-eight hours. Our experience has confirmed that the medical risk for mothers or babies discharged in this way is not increased.

Against this background we mounted in April 1966, a study of some of the more sociological aspects of planned early discharge in which one of us (M. M.) visited patients during their short spell in hospital and again in their own homes. The social and medical events associated with early discharge were carefully noted. During the eighteen months of the survey 285 patients were booked on an early discharge basis, but for 73 births (25 per cent) the arrangement had to be cancelled because of a complication in mother or baby (Table 9.1).

Table 9.2. *Social classification of patients*

	Number	*Percentage*
I	12	6
II	19	9·5
IIIA	27	13·5
IIIM	94	47
IV	20	10
V	30	15
Not stated	2	

Table 9.3. *Parity of patients*

Pregnancy	*Patients*
1	50
2	64
3	32
4	28
5	14
6+	16

THE DISCHARGED MOTHERS

Of the 212 mothers who returned home after forty-eight hours all but 8 were visited in hospital and in their own homes. Most patients were seen for the first time during labour. (A few who were admitted antenatally for some complication were seen at that time.) A first home visit was paid the day after discharge and a second seven or eight days later. Probably because of careful preparatory explanation (to doctors as well as to patients) no difficulties or antagonism were met during these home visits, which the patients and their families welcomed as part of an inquiry into the circumstances of early discharge. The social classification of the 204 patients is shown in Table 9.2 and their parity in Table 9.3.

HELP IN THE HOME

Our patients depended mainly upon the willing co-operation of mothers, mothers-in-law, husbands on holiday or shift work, other relatives, or friendly neighbours. Two homes had full-time resident domestic help, 5 arranged extra daily help, and only 7 used the home help service of the local authority. Twenty families lived with their parents, and a further 21 went to them temporarily for a week or so at the time of the delivery and puerperium.

Usually help came from 2 or 3 different sources, but a mother or mother-in-law came to live with 22 of the families, came daily to 45, and occasionally to 17. Other relatives gave regular help to 22 families.

In 97 families the husband was the main help during the early puerperium at home. We were impressed by the ready co-operation of these husbands and by the cheerful and efficient way they tackled their unaccustomed duties. Most of them arranged to take annual paid leave at this time. Thirty-five took two weeks, 39 one week, and 3 three days. This did not seem to disturb the families, but many husbands admitted that they found it very restful to return to work. Only 4 of the confinements fell too wide of the expected date of delivery for the husband to be able to cope with the home arrangements. Of the other husbands, 5 were on 'sick leave', 7 on suitable shift work, and 8 unemployed.

Grumbling among the husbands was unusual but two of the men who were 'on the sick list' felt that they were being 'put upon'. One husband who had intended to take a full week off, decided after three days that housework was 'too much for him', and he returned to work leaving his family to get on as best they could with the help of relatives and friends. Those on shift work gave valuable help and must have been stretched to the limit, yet none complained.

The help given by mothers and mothers-in-law generally worked well, but there were one or two minor family upsets. One family returned home after a week because of disagreement between husband and mother-in-law. Two or three husbands remarked wryly that they would have managed more easily without help or interference, and one spent an afternoon mending the washing machine after the mother-in-law had broken it.

We were surprised how little the home help service was used. Several families had considered having a home help, but had decided against this because of cost. It was our impression that many families had not been used to paying for domestic help and were not prepared to alter their attitude.

RE-ADMISSION TO HOSPITAL

Two mothers had to be re-admitted to hospital on the fifth day of the puerperium because of secondary postpartum haemorrhage

Table 9.4. *Maternal complications treated at home*

	Mothers
Stilboestrol to suppress or regulate lactation	21
Chest infection	1
Asthmatic attack	1
Perineal infection	1
Phlebitis of leg vein	2
Urinary-tract infection	2
Excessive lochia	2
Perineal irritation	1
Allergic rash	2
Indigestion	1
	34

Both required blood-transfusion but recovered well and were soon back in their own homes.

Three babies were re-admitted; one with thrush and gastro-enteritis on the 13th day, a second with vomiting on the 13th day, and a third with vomiting and loose stools on the 6th day. All these babies did well.

COMPLICATIONS TREATED AT HOME

Thirty-four mothers required medical treatment at home, the commonest cause was the need to suppress lactation (Table 9.4). Twenty-seven babies required treatment from GPs for such complaints as sticky eyes, diarrhoea, feeding difficulties, thrush infection, and sore buttocks.

Summary

At the time of the second home visit, 31 families out of 204 said that in retrospect they would have preferred that mother and baby stayed in hospital for a week or even ten days. The arrangement was most popular among women having their second and third babies, but most mothers and their families were grateful and had no serious criticisms. Nor did the local authority midwives raise any serious objection; most agreed readily that planned early discharge is increasingly popular with patients and is now securely established as part of the contemporary pattern of maternity care.

Provided that care is taken over the initial selection of cases and that obstetric and paediatric circumstances are reviewed during the forty-eight hours after delivery, planned early discharge is safe and acceptable to most patients and their families and to doctors and midwives. On Tyneside the most acceptable form of help in the patients' homes was given by other members of the family, relatives, or neighbours; paid help brought in for the occasion seemed to be unpopular as well as infrequent.

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