Effectiveness and Decision-Making in a Health Planning Context of Measures for the Prevention of Perinatal Mortality and Morbidity: The Case of Outpatient Ante-natal Care

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Abstract

This thesis draws on the current literature on need and demand to provide some empirical evidence of the cost, effectiveness and implied values associated with current and alternative forms of provision of ante-natal care in the St. Pau's Hospital, Barcelona.

The study is set against the background of a review of the relevant methodology and concepts concerning, particularly, the nature of the goods 'health' and 'health care'. This serves as a base for investigating the concepts of demand, need and the agency relationship.

Given the importance of cost-effectiveness analysis in the applied study, a review is presented of the evaluative role of economics in health care. A full description of ante-natal care generally and that specific to this study are presented and the important notion of 'risk' is highlighted. The way in which need has been defined and the general setting of the empirical study are outlined, together with the design, nature and use of the data in the surveys conducted.

The findings of the study are presented together with the difficulties arising in interpretation but the results appear sufficiently clear-cut to allow confidence to be expressed in the main policy recommendations outlined, i.e. in terms of efficiency, to increase ante-natal visiting of infrequent attenders, particularly those at high risk, even if this has to be done at the expense of frequent attenders, particularly those at low risk.

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Any remaining errors in this thesis are, of course, the sole responsibility of the author.

J.J. Artells Herrero
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CHAPTER 1

INTRODUCTION

An earlier study conducted in 1975, and involving the author, on the resources devoted to preventing mental handicap in Spain (Artells et al 1979) drew attention to some of the problems of decision-making in ante-natal health care. That study set out to explore the size of the problem of perinatal mortality and morbidity and to investigate the existing programmes devised for their prevention. This provided an opportunity to make contact with the groups responsible for prevention in health care and for the future design of such policies: doctors, administrators, politicians, as well as representatives of consumers lobbying on behalf of the mentally handicapped.

Some of the important characteristics of the decision-making process which were highlighted in that analysis and which appear worthy of note are as follows:

(i) The large number of parties involved in the problem and at the same time the small number of types of professionals - mainly doctors and administrators - taking part in the decision-making process.

(ii) The general concern about the 'shortage' of preventive policies formulated in terms of 'targets' or 'standards' and lacking any concept of priority setting: everything had to be done, and 'at once'.

(iii) The pressure for adopting policies that 'must work' purely on the basis that they were working elsewhere, irrespective of any consideration of proven effectiveness or of opportunity cost.

(iv) The general recognition of any policy on prevention of mental handicap having to operate within a framework of valuations of both moral and technical content with political, administrative and ethical constraints but with an equally pervasive lack of recognition of economic constraints.

Interest fuelled by this experience led to an examination of the possibilities for studying the impact of economic analysis in decision-making within the field of ante-natal care. Obstetric care and ante-natal care were chosen because the appeal for a universal and dramatic increase in the provision of ante-natal care in Spain was a good illustration of the 'disjointed incrementalist' kind of thinking underlying official plans (Real Patronato de Educacion y Atencion a Deficientes, 1978). At the same time economic analysis appeared to have excellent potential for tackling some of the peculiar characteristics of obstetric care, namely the variety of subjects involved, two normally healthy patients, the different expectations of 'benefit' arising from obstetric care and the possibility of exploring the rationale underlying the need for choices in such an area.

In addition there was the essential question of approaching an unexplored and particularly problematic topic as yet largely reserved for medical experts and bureaucrats with the skills of a relatively new discipline. Studies using health economics and especially those that could challenge existing health care management and decision-making are still seen as a threat in Spain (as perhaps elsewhere). Hence it was essential to obtain relevant cooperation with the medical profession. This kind of understanding was offered by the Department of Obstetrics and Gynaecology of St. Pau's Hospital in Barcelona. Previous contacts with this Department had shown that they were interested in modern methods of

obstetric care, particularly the need for monitoring the effectiveness of increasing intervention and for taking clients' views into account within the context of initial appraisal of their performance. Such a position is rather exceptional in the context of normally immoderate enthusiasm for recently imported obstetric techniques.

In short, there is all too frequently a lack of recognition of the economic dimensions in the process of planning ante-natal services, with little explicit acknowledgement of the need to make the best use of resources. As a prime example of this, a National Plan for the Prevention of Mental Handicap was proposed in 1977 in which a number of different policies and programmes were recommended without any overt consideration of their effectiveness nor of their cost, the only rationale being the pressure to reduce current rates of reproductive problems and related ante-natal morbidity (Real Patronato de Educacion Especial, 1977). Today the Plan still awaits implementation. No attempt was made to calculate the prohibitive effect (in terms of costs) of translating, into the context of the Spanish health care system the French policy of providing at least 10 ante-natal visits nor to estimate the resource implications of raising the standards of the present obstetric equipment and intensive neonatal care to required levels. Indeed there was no discussion of the questions of how, where, to whom and how much.

Since it is believed that economics can play an important role in improving the present quality of the decision-making process in the health care system, an exploration of the consequences of applying economic analysis to the provision of ante-natal care was thought to be of relevance for the more general questions of rational choice and of priority setting in ante-natal care. In particular it was thought important to address the following questions on the problem of ante-natal resource allocation:

how are choices made and what are their economic consequences?

who is making what choices?

what would follow from some alteration in the economic parameters of these choices?

Resource allocation in ante-natal care is examined in this study within the framework of the caseload of a particular hospital, group patient management and resource planning being the main foci. There is no intention to generalise the empirical findings to any other setting (although the methodology used has general applicability) because of the particular characteristics of the hospital studied (teaching, likely bias in selection of patients, non-standard type of obstetric care, etc.) With this in mind the project set about analysing the patterns of current utilisation of ante-natal care supplied by the Obstetric and Gynaecology Unit of St. Pau's Hospital (Barcelona) from the point of view of its adequacy with regard to first, medically defined 'needs' and secondly, expressed demand, both considered in the light of cost-effectiveness analysis.

Ante-natal care displays a set of unusual and at times almost contradictory characteristics which allow its supply and demand to be viewed from the standpoint of both individual consumer behaviour and that of 'altered' individual preferences, through the merit goods approach, the notion of need and the agency relationship. The study is aimed at analysing the resource allocation consequences of current utilisation and comparing the current use with operative notions of demand and need in order to draw conclusions about the prospects for improving the efficiency of the present deployment of resources.

As is reviewed later ante-natal care, while often mainly preventive can be unexpectedly curative, has some characteristics that imply an unusual amount of information on the part of the potential user. Once the contact with the doctor has been initiated it is he who usually decides the pattern of care commensurate with the patient's requirements, a pattern which is compounded by a large variety of both routine and selective procedures. This serves as the core of the discussion about demand and need and the related notion of the agency relationship.

In this study these concepts are examined both theoretically and operationally. The main thrusts are, first, to examine the effectiveness and cost of the current provision of ante-natal care given the present utilisation of the Unit's resources by existing users. This allows the resource allocation consequences of the current operation of the Unit to be disentangled. Secondly, and on the one hand the nature of the observed differences between current utilisation and need can be ascertained and on the other an investigation of the factors underlying expressed demand for ante-natal care is made. This helps to clarify the extent to which current 'shortage' (i.e. excess demand) is supply or demand orientated. On the basis of this evidence an attempt is made to determine the extent to which the gap between need, demand and utilisation should and can be bridged and the most socially efficient policy instruments to achieve this.

The study is set in the general framework of the new welfare economics within which a refinement of the underlying concepts of consumer sovereignty and merit goods is made. It thus draws on the current literature on need and demand to provide some empirical evidence of the cost, effectiveness and implied values associated with current and alternative forms of provision of ante-natal care. In order to

obtain relevant information to analyse ante-natal care delivery and its main economic implications a special survey was designed and field work carried out. Obstetric and socio-cultural data on 1060 deliveries were gathered, systematically coded and transferred to computer tape. In addition costing studies were conducted of the work of the Unit and these formed the basis of the data used in the empirical parts of the thesis.

1.1 Layout of the Thesis

The report of the study is in seven chapters. Beyond this introduction, chapters 2 and 3 (and in part 4) are largely concerned with reviewing and developing the relevant economic methodology and concepts which underpin the applied study reported later. Thus chapter 2 deals with the nature of economic choice in health care looking particularly at the relevance of economic theory to the goods 'health' and 'health care'. This serves as a base for developing in Chapter 3 the concepts of demand and need, the desirability of establishing a link between the two and the role of the agency relationship in such a link. Essentially this chapter addresses itself initially to a comparison between demand and need (medically determined) before reaching the view that it is more the relationship between the two rather than the choice between them which is the relevant issue not only in health care generally but also more specifically in the context of ante-natal care. Here therefore it is possible to draw some important conclusions for the conceptual framework in which the applied study of ante-natal care is set and in particular to point to the key role of the agency relationship not only in the cost-effectiveness study but also in the analyses of need and demand.

In chapter 4, given the importance of cost-effectiveness analysis in the applied study, a review is presented of the evaluative role of economics in health care, at both a conceptual level and a more empirical level with, particularly in the case of the latter, specific references to other studies of ante-natal care. From this it is then possible to draw various lessons on which to base the cost-effectiveness study reported in chapters 5 and 6, particularly regarding the key issues of setting objectives, measuring output and calculating relevant costs. However perhaps the main lesson to be drawn from this is the relative lack of convincing and thorough economic evaluative analysis in the chosen area for investigation viz. outpatient ante-natal care.

Chapter 5 provides a fuller description of ante-natal care more generally together with the specific nature of the ante-natal care under investigation in this study. The important notion of risk, a key concept in ante-natal care and in the methodology adopted in this study, is highlighted and defined in different ways. The way in which need has been defined (by 'experts') is indicated and the general setting of the empirical study discussed, together with the design, nature and use of the data in the surveys conducted.

The findings of the study are presented in Chapter 6 and the appropriate interpretations made. Difficulties arise at this juncture but on the whole the results are sufficiently clear-cut to allow confidence to be expressed in the recommendations for policy which are outlined in the final chapter. While these will have to be debated in much greater detail than has been possible to date with the staff of the Unit investigated preliminary discussions of the main findings and conclusions have indicated that the Unit staff can see the wisdom and relevance of many of the recommendations arising from the analyses in the study. This bodes well in terms of implementing changes to promote greater efficiency in this particular Unit and indeed more widely in terms of the relevance of the application of economic evaluation to health care policy making.

CHAPTER 1

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CHAPTER 2 THE ECONOMIC NATURE OF 'HEALTH' AND 'HEALTH CARE'

2.1 Introduction

This chapter takes a broad view of the economic theory which is relevant not just to ante-natal care but to health and health care more generally. It considers the nature of these as commodities and what tends to distinguish them, and in what ways, from other commodities. This broader perspective allows the relevant health economic concepts to be presented; the particular facets of ante-natal care are discussed in detail in later chapters.

An economic approach to the measurement of costs and benefits in the context of public health was used as early as the seventeenth century by Sir William Petty (Petty 1683). In spite of this only in recent years has economic analysis begun to be applied systematically to various problems within the health sector. However, the pace of the application of economic techniques has been characterised by very different rates of growth and appeal, with Spain lagging well behind the leaders in North America, the UK, the Netherlands and Scandinavia (Culyer et al, 1977 and Guirriec, 1980). Nonetheless even there a certain level of activity is beginning to emerge (Artells et al, 1980).

The relative youth of health economics can be explained in two ways. On the one hand, there are theoretical problems, not yet fully resolved, surrounding the economic nature of health and health care as commodities. On the other, it is possible to find explanations for its recent growth in the necessity to answer management, administrative and decision-making questions in the health services, which have arisen, at least in part, from the general economic crisis in the 1970's and the associated cuts in the growth of health expenditure (Ashford, 1975). Rickard (1976) has

suggested that the health economics literature of the early 1970's was of an 'exploratory and fragmentary' nature and that this explains its slow growth. He argues,

> 'the philosophical ancestry of Economics is in theory concerned with the market mechanism and only in comparatively recent times have economists considered areas of human activity where market and price relationships appear to be less central'.

Mooney et al (1980), in a similar vein, indicate, in the context of the National Health Service, that

> 'Without prices - as in the case of health care - certain difficulties arise, particularly on the question of how to value services of health care and indeed whose values it is appropriate to use.'

The issue of valuation is one of great importance as Fuchs (1972) indicates by pointing out how there is a generalised belief that a good state of health is a target in itself, the value of which arises quite apart from other purposes of human activity. Here lies one of the most common arguments against the application of economic analysis in the health care field: if we let health be an 'absolute good' it does not allow relative valuation with respect to other commodities.

It seems pertinent then to pose the question: if health services seem to elude the range of traditional economic analysis, what is the contribution of economics to be to the resource allocation problems of the health sector? First, following Williams (1979), there is a useful distinction to be made between economics as a topic - or area of study - and economics as a discipline, that is a way of thinking about the characteristics of the subject. The relationship of the discipline of economics to the topic of economics is not an exclusive one. There is thus no reason why the topic cannot be investigated by other disciplines; conversely, the discipline of economics may be used to investigate other topics. In other words, nobody should, as a matter of principle, reject the possibility that economics, as a discipline, has many contributions to make to topics which are not usually regarded as 'economic'.

However, difficulties do arise when economics becomes involved in such areas. It is in this context that perhaps the greatest 'barriers to entry' arise in the health sector. Arguments for the relevance of economic analysis have tended to centre round the non-existence of a lexicographic ordering of personal priorities with regard to health and the consistency of the foundations of economic welfare theory with regard to the particular characteristics and nature of the goods health and health care.

2.2 Health, Health Care and Individual Preferences

As a prior step to the examination of the economic characteristics of the commodities health and health care, it is important to indicate why these goods are objects of positive value, both for individuals and the community as a whole.

The denying of the relevance of the notion of relative preferences in health care has led to an unfortunate tendency on the part of health care decision makers to ignore the realities of choice imposed by the scarcity of resources. Such a view results in a situation in which the desire for any good is not considered as a candidate for inclusion in the utility function until the desire for the immediately preferred one has been satiated. Such a preference structure would be characterised by the statement that health is priceless and merits consideration above all other goods. If accepted this would result in the denial of any possible trade-off between health and any other good. Yet the most elementary observation immediately suggests a completely different situation. Individuals balance their valuation of a healthy life against the opportunity to enjoy eating and drinking to excess, playing dangerously, driving recklessly, etc. which are all dimensions of life which are also valued. In short there is a trade-off between following a perhaps enjoyable life and a potentially unhealthy way of life.

Thus health as a commodity to be considered alongside other commodities ceases to be at all dominant in the subjective ranking of personal needs and wants. It can be seen as a commodity which falls within the ambit of positive economics; there is a structure of individual preferences within which health and health services can be satisfactorily accommodated.

On the other hand from a normative viewpoint it would be possible to judge how people should behave with regard to the best interests of their health or what should be generally understood to be healthy patterns of living. This sort of approach which includes a wide range of value judgments is neither methodologically incompatible nor exclusive of the statements just made. There is thus nothing in principle which prevents health as a commodity sharing the same point of reference for the formulation of a set of assumptions about the expected rational consumer's behaviour as other commodities (Lancaster, 1966).

2.3 Health and Resource Allocation

Economic analysis is rooted in three fundamental observations about the operation of the world: scarcity of resources, potential alternative uses for them and relative individual and collective valuations translated into priorities. Given these dimensions the basic economic problem can be summarised as being how to allocate scarce resources in order best to satisfy human wants. Against this background of the necessity of choice, Fuchs (1974) presents two lines of argument which can be identified in current discussions on issues of health care allocation. First, there is the 'romantic' view which fails to recognise the necessity for a balance to be struck between people's wants and the available resources and therefore feeds the illusion that no scarcity exists. The second argument is the 'monotechnic' one, frequently found among medical technocrats trained in a narrow application of their particular technology. It is

based on the failure to recognise the multiplicity of individual preferences. Given that problems of choice regarding alternative resource allocation will arise within the area of health services, it becomes necessary to face up to the issue of accommodating different people's preferences. It follows that economic analysis has a place in the evaluation of health care.

Certainly it is true that economics, as a discipline essentially concerned with values, frequently turns to the market for these. This need not be the case although as Williams (1979) states:

> 'since markets are one way of accommodating such diversity [of people's preferences] we economists tend to compare non-market solutions with market solutions if only as an analytical device to highlight differences in outcome about which higher level value judgments will have to be made'.

The need for rational choice, efficiency and the analysis of costs and benefits of improving patterns of resource allocation are, or at least should be, a basic concern for policy makers in the health service (This is discussed in detail by Mooney, 1980).

Accordingly economic analysis is, in principle, appropriate for handling conventional economic topics within the domain of the health sector. In addition, however, there is the much more contentious claim that economics as a discipline can contribute to the identification of new problems or new aspects of problems already identified in the area of health and health policy. As stated by Fuchs (1972):

> 'If economists can help to rationalise and make more explicit the decision making process, provide useful definitions, concepts and analytical tools, and develop appropriate bodies of data and summary measures, they will be making a contribution of their own to health and to the economy'.

In the context of this thesis however it is intended to concentrate on the relevance of economic theory to the economic analysis of health and health care services. This will serve to meet the aim of examining to what extent the allegedly unique economic features of health and health care do or do not deny the validity of certain basic economic theorems as tools for analysing the operation of the health system and the possibility of attaining a socially efficient allocation of resources.

2.4 Benefits from Better Health

The study of the elements which enter into the evaluation of health and health services, normally defined as consumption and investment, has been the subject of concern for writers on health care organisation for some time. Thus Mushkin (1958) indicates the existence of two dimensions of health output first, in terms of working hours made available by means of health improvements, and secondly the future expenditures spared as a consequence of reductions in pathological conditions, these two dimensions providing the orientation of cost-benefit calculations in the health sector in the late 1950's and early 1960's.

Wiseman (1963), thereafter, emphasised a very useful definition which has spawned further research (e.g. Paglin, 1974; and Scheffler and Lipscomb, 1974). With regard to health services and health, Wiseman suggests that an individual's valuation can be explained in terms of a subjective perception simultaneously obtained from two utility sources: good health to the individual which results in enjoyment per se because he or she is free from illness (the consumption dimension); and a satisfactory level of health which allows a return yielding process which is translated into output and earnings (the investment dimension). Thus health care could be considered as 'wealth producing as well as health producing' (Ministry of Health, 1956).

Cullis and West (1979) have more recently indicated that health care should be considered along with certain other kinds of goods and services, such as nutrition and education, which provide the consumer with physiological, psychological and monetary benefits. These authors classified these different benefits as follows.

(i) Benefits which provide utility directly comparable with that from a non-durable consumption good, for example, relief 'from suffering, pain, anxiety, etc., consequent on ill health' in the treatment period.

(ii) Benefits comparable to those of durable consumption goods lasting several periods, related to the enjoyment of a 'good health' standard which is either preserved or restored by some health care consumption.

(iii) Households and consumers, when taking part in the production process, obtain a certain commodity from a combination of their own inputs - time, individual skills, educational attainment, etc. - and market-purchased inputs (Becker, 1965) which provides the third dimension of the benefits of health recovery i.e. restored productive capacity, equivalent to a capital good yielding utility in an indirect way.

2.5 Health and Health Services

Health services are defined as those services provided by doctors, nurses, hospitals, etc. Apart from the impact of health services on health <u>per se</u>, Fuchs (1972) acknowledges other kinds of outputs such as the <u>validation services</u> (social legitimisation of the status of health by a physician) and other consumer services such as the 'hotel' services of hospitals. Economic analysis has shed some light on some crucial aspects

of the relationship between health and health services, particularly by means of research on production functions and the quest for unambiguous definitions and measurements of health service outputs in terms of indices of health status. Again health itself has been considered as a fundamental commodity generating a derived demand for health services. Thus health care can be viewed as if it were a means to attain a preferred level of health rather than a consumption good desired in its own right. However, it is not clear to what extent and in which precise circumstances, health services account for improvement in an individual's or the collective health status.

There does not appear to be a direct, unambiguous relationship between health and health care of the type which exists for most industries with respect to their range of products, in the manner, for instance, of the transport industry as a 'transport' producing entity. Williams (1977) has described the effort to conceptualise, measure and value health as a 'theoretician's dream and an applied economist's nightmare.' Mooney and his colleagues (1980) have stressed the wide range of concepts of health, 'depending upon the definition used and particularly the standpoint adopted.'

Definitions of health are as large in number as the standpoints from which it is viewed. In a recent study by Stacey (1977) she writes:

> 'health and illness are conceived differently in different societies and in different historical periods depending on the prevailing healthiness of the population, its longevity, the effectiveness and availability of treatments, the social situation of individuals within the society and the dominant theories, epistemologies or cosmologies of the society'.

The oft-quoted WHO definition of health, 'a state of complete physical, mental and social well being, and not merely the absence of disease or infirmity', is too general and certainly not capable of use at a practical level. Indeed traditionally health has been defined by its absence, although social values have more recently been emphasised in an 'ecological approach' (Kohn and White, 1976; and Kelman, 1975).

Conventional notions of health have been founded mainly on different views of the human body and the origins of illness. In one of the most widespread, based on the views of Vesalius and William Harvey, the human body is taken as a machine, the good or bad operation of which is reflected in the individual's health level. This view would tend to give a dominant place to curative treatments in the fields of biology, chemotherapy and surgery. In turn this approach has contributed to the acceptance of a functional notion of 'negative' health, stressing the misfunctions of the human body and concentrating on ranking these clinical terms - cases, diagnoses and individual treatments.

Twaddle (1974) suggests that from a biological point of view perfect health may be seen as 'a state in which every cell of the body is functioning at optimum capacity and in perfect harmony with each other cell'. Yet the clinician, because of his training and practice, is little concerned with such abstract definitions and more with the diagnosis and treatment of biological and psychological dysfunctions. Such an approach involves considerable limitations and fails to consider other relevant processes that are central to the understanding of the ways in which people express manifestations of their health or sickness, use health services and avail themselves of medical knowledge. Engel (1962) and Sheldon (1970) have proposed a general systems approach for an understanding of the diversity and complexity of forces involved in the health producing industry. This identifies several levels of internally interacting parts which stretch from man as a micro psychobiological system existing in an external social and physical environment to macrolevel health systems in which scarce resources are organised and allocated to achieve society's objectives in terms of both individual and collective health priorities.

The definition of health is imprecise because it is a function of social values. For this reason, as Williams (1977) has noted, the economist has to be ready to work with different approaches depending on the problem in hand. What counts, according to Mooney (1977), is 'the basis on which decision making is made and in particular whose values are relevant in determining the relative importance of different aspects of health'. Because the defintion of health is neutral with respect neither to the organisation of the health services nor to health policy formulation, the economist's distinctive task consists of examining the underlying value system implicit in a given health system or in a given allocation of health resources.

2.6 The Characteristics of the Commodities 'Health' and 'Health Care'

Having established the empirical and theoretical possibilities for the valuation of health and health care, it ought now to be possible to analyse health and health care as commodities for which consumers express preferences and producers have incentives to produce and distribute. Further insights into the relevance of the economic approach require that the goods and services being analysed do not deviate significantly from the properties and characteristics of conventional economic goods.

The remainder of this chapter considers the ways in which the nature of the commodity health care fits into the current assumptions of welfare economics and the ways in which any allegedly special features affect the applicability and relevance of economic analysis to the allocative problems in the health field. In a seminal, and now classic paper, Arrow (1963) explored the specific features of health care focusing on the differences between the operation of the health care industry and the 'norm' of operation of the competitive model. The maintenance or the

vulnerability of the standard assumptions underlying this model have since been a benchmark in the debate on the efficiency of rival forms of organisation of health care.

In this debate the most extreme and diverse positions may be represented by, on the one hand, Lees (1960, 1964, 1967); and Jewkes and Jewkes (1961, 1963); and Titmuss (1968), on the other. According to Lees, health care can be considered as a pure private consumption good and the competitive market as the unobjectionable mechanism for determining what should be produced, at what price and for whom. As for Titmuss' view the non-economic nature of the good health is in itself an argument, however unproven, for the provision of health care, free of costs, by the state. But generally economists acknowledge the pitfalls of the aprioristic 'nirvana approach' (Culyer, 1971), that is, 'comparing the actual operation of an existing system with the hypothetical operation of an ideal system'. It may be said that the 'mainstream' of health economics sees policy conclusions and recommendations being derived from the appropriate and non selective use of the tools of welfare economics. In this way the lack of accommodation by health care systems of the underlying assumptions for the attainment of social efficiency is taken as the relevant ground on which to form a judgment. Thus non-marketability and absence of the remaining preconditions for the equivalence between decentralised, competitive equilibria and socially optimal states provide the foci for criteria for discussing the relevance of economic analysis to resource allocation in the health care field.

2.6.1. Market Failure

In theory the voluntary exchange model of the competitive market leads to a socially efficient equilibrium. The outputs of the goods and services of the economy are determined competitively in the market in accordance with consumers' preferences and the given distribution of endowments. The market outcome is assumed to be Pareto-efficient in the sense that given the set of factor prices a reallocation of factor inputs could not increase total output between consumers to make one individual better off without making another worse off. These results depend upon the usual assumptions of perfectly competitive markets.

In the stated context the fundamental theorems of welfare economics imply that, given an appropriate distribution of initial factor endowments, if the assumptions hold, an allocation that is efficient and Pareto-optimal can be reached. This is done by allowing all individuals to make their own decisions regarding production, consumption, employment and investment.

When the conditons necessary to achieve such a decentralised market and, thereby, efficient allocations, fail to exist or are contravened in some way, a market failure exists. In the extreme case of complete market failure the 'market' itself may fail to exist so that certain goods will not be produced at all. For this reason both the examination of marketability and the analysis of the possibility of the existence of a competitive equilibrium for the existence of an optimum are prerequisites for the relevant and proper application of economic analysis to the problems of health care resource allocation. If market failure exists, one possible role for the government would be to compensate the allocative function of the market, supplementing (Maynard, 1977) or subsidising (Arrow, 1963) the market or replacing the market by means of public provision.

The most relevant developments on the characteristics of the commodity health care have until now been set against the background of the market failure and its relevant conducive factors (Weisbrod 1961; Arrow 1963; Culyer 1971; Fuchs 1972; Klarman 1973; Le Grand 1975; Detsky 1978; and Mooney 1978).

Among those features responsible for the lack of achievement of efficient outcomes are the existence of

(i) uncertainty;

(ii) lack of consumer rationality;

(iii) monopoly or other forms of imperfect competition;

(iv) public goods;

(v) externalities; and

(vi) the merit good concept.

In the ensuing sections this chapter concentrates on the existence of significant differences in health care when compared with purely private marketable goods.

2.6.2. Uncertainty

In the health care industry the consumer is confronted with uncertainties and information gaps about basic characteristics of health care that fit oddly into the basic assumption about the knowledge and certainty that all the relevant economic agents should have concerning production functions, prices and preferences.

Culyer (1971), Detsky (1978) and Cullis and West (1979) among others, have reviewed the issue of uncertainty suggesting different dimensions according to who is the bearer. Thus the consumer faces uncertainty related to the cost and quality of care. Consumer and producer together face uncertainty about the incidence of illness. Producers are often confronted with uncertainty regarding effectiveness

of diagnostic and therapeutic procedures and the likely pathway of their supposed restorative effects, (Cochrane, 1971 and Bunker et al, 1977). Arrow's (1963) thorough treatment of this problem served to underline its relevance to the rejection of market allocative solutions.

Whereas modern welfare economics can handle the implied violation of uncertainty over the incidence of illness, the non-existence of suitable policies which are actuarially fair indicates the need for intervention in the market. If a probability distribution of expected values of the outcome could be assumed in the utility and production functions, then the market could adjust to take account of these. If 'risk averse' producers and consumers were interested in selling and buying the risk bearing commodities, health insurance would cover (at least some of) the risk of incidence and economic consequences of disease and perhaps also of wrong diagnosis and treatment. But 'moral hazard' on the consumer's side and a combination of risk aversion and transaction costs on the producer's side, lead to important market distortions (e.g. increased demand as a direct effect of moral hazard; incomplete coverage for discriminated sections of the population; the institutional framework of the insurance industry; the conclusion that markets for the services of risk-coverage are poorly developed or non-existent - particularly as non-marketability represents a violation of the first law of optimality.)

Lack of information is not in itself a sufficient condition for sub-optimality, but because of the peculiarities of the doctor-patient relationship, the imbalance of information faced by both consumer and producer may potentially result in a conflict of interest leading to overconsumption, non-optimal pricing and consequent lack of efficiency.

2.6.3. Consumers' Rationality

In the health care sector, apparent non-maximising utility behaviour has been alleged as an impediment to the optimisation of social efficiency through open markets. Culyer (1971) synthesises these arguments:

(i) consumers may be ignorant or myopic with regard to their health condition: 'many consumers though sick, do not desire treatment and may even be ignorant of their sickness'; and

(ii) the mentally sick, emotionally disturbed, children and emergency cases are not in a position to reveal their preferences.

The existence of circumstantial or even chronic lack of personal freedom to make genuinely informed choices with regard to their own health for mentally impaired people, is not to be denied.

> 'The point here, however, is not that the individuals in question are behaving irrationally, violating any of the postulates of utility theory by, for example, acting inconsistently with their own preferences, but that they are behaving inconsistently with the preferences of an entirely different set of individuals' (Culyer 1971).

In fact the effects of such 'irrational' behaviour affect the utility function of other individuals raising the problem of external effects (which are discussed below).

2.6.4. Monopoly

In the health care system it is possible to find some elements of monopolistic power which, may legitimately be argued, call for government intervention. This may be the case when hospital services of sparse small units are concentated in fewer, optimally-sized hospitals. It can also be the case for regulating the fees charged by doctors or health institutions enjoying a local or spatial monopoly. In either situation, a departure from the conventional welfare model can be registered, insofar

as such a model assumes constant returns to scale as the only kind of technology consistent with perfect competition, and no capacity for any producer to alter the price at which he offers his final goods or services by arbitrarily altering the access of any potential consumer to the free exchange framework.

In addition to spatial monopoly, it is also possible to recognise a monopolistic element in the regulation of entry to the medical profession. Such restrictions, together with the existence of medical control over both technical knowledge and capacity for legitimisation of the sick role, serve to act against the full and free operation of the open, decentralised market and, in this respect, they depart from the conventional assumptions for the attainment of a socially efficient allocation of resources.

2.6.5. Public Goods

Another source of market failure arises from the public goods features of some health care. Public health measures and some types of community prevention programmes provide good examples of the concept of public goods. Samuelson (1954) defined these as being such that 'each individual's consumption of such a good leads to no substraction from any other individual's consumption of that good'. In the case of public goods, the concepts of non-excludability and non-rivalness apply. It may not be technically feasible to exclude anyone from the benefit of certain goods such as a successful campaign of immunisation or from enjoying the benefits of malaria eradication.

A public good is thus a kind of commodity for which exclusion is not only not technically feasible but, if it were, expensive to apply. Along with non-excludability, public goods exhibit non-rivalness in consumption as a distinctive characteristic. Whereas public goods which are not excludable are also non-rival in consumption, the reverse is not

necessarily true because in this latter case application of exclusion devices like fees or fares can be used to make them excludable. In fact pure public goods, exhibiting to the full these characteristics of both non-rivalness and non-excludability, are extremely rare. As is the case with most types of health services, between the extreme positions of pure private goods and pure public goods, there is a continuum of 'mixed' goods which can be identified and for which a combination of different degrees of non-rivalness and non-excludability exist. In all such cases the market runs into difficulties and its auctioning function results in non-efficient allocation.

2.6.6. Externalities

Bator (1958) identifies externalities, along with monopoly and public goods, as a well defined type of market failure. In the framework of modern welfare theory the essence of transactions is that they must be explicit and arising from a voluntary choice. A given situation is designated as 'optimal' when the 'improvement' for any individual is related to a change which has been voluntary. Externalities occur when a third party receives some benefit or is forced to bear some costs without having explicitly chosen to do so. Furthermore, externality implies a decision related to production or consumption made by one subject affecting the production or utility levels of other producers or consumers (i.e. the interdependence condition) and the resultant effect goes unpriced or uncompensated (i.e. the non-price condition). When the effect is priced, the external effect is internalised.

The special characteristics of health care provide a variety of external effects. Perhaps the most obvious is related to the external benefits of immunisation or vaccination against infectious diseases. It can be seen that the equilibrium of the private market for such a commodity - vaccination against communicable disease - may be sub-optimal if individual valuations do not take into account the benefits of vaccination to others. The way of overcoming this failure is to include in the model the 'social valuation' which results from adding to the private valuation the value of the external benefits.

Another form of externality related to health care is represented by the set of arguments implied by interdependent utility functions. Whereas in the standard theory of consumption it is explicitly assumed that individual utility functions are independent of each other, in the explanation of social (aggregate) demand for health care, some kinds of interdependence are assumed. Generally stated, the underlying assumption implied by the external consumption arguments in health care is that people do have concern for the amount of health care others receive. Lindsay (1969) defines this interdependence as being based in the general desire for equal treatment for all in equal need. In this formulation the individual's utility level depends not only on his own consumption but also on the access of others to health care. Culyer (1971) has also used the consumption externality approach but, in his view, it is the quantity of health care consumed by others that enters as an argument in the individual's utility function. More recently the same author has shown his preference for the health status of people being the object of concern as the relevant source of externality underlying the rationale of the British National Health Service (Culyer, 1979).

Externality in all its variety of forms constitutes a distinctive departure from conventional, individually-based, aggregate demand functions, and also a source of discrepancy between individual and social valuations, that calls for intervention to overcome market failure.

2.6.7 The 'Merit Good' Concept of Health Care

So far the discussion has examined the extent to which, in the case of public goods, decentralised market institutions fail to achieve Pareto-optimum allocations. This is especially so when public goods exhibit to an extreme degree the properties of joint supply and external effects. In the case of public goods, the need for intervention arises from the failure of the market to allocate resources in accordance with given individual preferences. In contrast, in the case of merit goods, individual valuations are subject to critical assessment and, in the end, are substituted by valuations imposed by a third party. Intervention in the case of merit goods is justified on the grounds of the need to correct individual misperceptions and ill-informed preferences.

Merit goods are defined by Musgrave (1959) as those economic goods whose consumption is considered so meritorious that they are provided publicly in excess of the rates of consumption chosen voluntarily by individuals in the market place.

While the satisfaction of social wants - via public goods - falls within the realm of consumer sovereignty, as does the satisfaction of private wants, the satisfaction of merit wants - by means of the provision of merit goods - implies interference with consumer preferences. As Head (1966) points out: 'merit goods may be defined as those of which due to imperfect knowledge individuals would choose to consume too little' and, for this reason, distorted preferences from corrective interference constitute the essence of the merit good concept. Conversely

demerit goods are defined as those of which, due to difficulties or misperceptions in the individual valuation, individuals would choose to consume too much. In the former case, government intervention is used to encourage consumption - free education, school lunches, and subsidised health care provisions are some cases in point; in the latter, government intervention attempts to discourage consumption - taxation of alcohol and the punishment of those trading in illegal drugs.

Thus merit goods might imply a violation of individual preferences and either the imposition of a set of values defined by experts or society as a whole; or, alternatively, the consent by society at large to form and impose judgments about what society's preferences ought to be if it were better informed. As Culyer (1972) has pointed out, there is a nexus between merit goods and externalities in the sense that the consequences of imposed choices must be externality-effect generating. But while merit goods and externalities share the same technical characteristics, they differ in that the merit want is based on coercion or imposed choice.

What is being questioned by the concept of merit goods is the nature of the value judgments underlying the assumption of consumer sovereignty. If the consumer is to be the ultimate beneficiary in the deployment of his or society's resources, then who is better placed to determine the worth the benefit is to him than the consumer himself? Underlying the concept of consumer sovereignty are some judgments concerning the acceptance by the individual of his own capacity to judge his welfare, his ability to do so and his willingness to build up his preferences and consequently determine his own choices. Should it be demonstrated that in some cases an individual decides that he is not the best person to determine what is in his own best interest, then we have a basis for 'distorting' individual preferences. Head (1966) points out that the

correction of preference distortion due to uncertainty and lack of relevant knowledge may constitute legitimate grounds for government intervention.

The health care field is an appropriate arena for such an argument since incomplete information and basic uncertainty about the likely effectiveness of the available medical procedures generate difficulties with the individual's evaluation of the benefits and, consequently, foster ill-informed attitudes towards preventive and curative health services. In these circumstances, it is quite likely that the individual consumer will voluntarily choose to be guided by his doctor who, as a medical expert, is better placed to provide technical evidence of the patient's state of health, the options open to him by way of treatment and the likely effects of different alternative care regimes upon his future state of health. In circumstances like these individuals may well be prepared to accept the merit good concept of health care, leading to either an increased or decreased consumption of health care as compared with that which would have been voluntarily chosen by the individuals themselves.

At the same time it might be that the imposition of preferences is counterbalanced by the ability of the individual to recognise the relative inferiority of the decision he otherwise would have made. That would be the basis for a consent or voluntary agreement to accept imposed advice without resulting interference. As Mooney (1979) states:

> 'There may be some sort of continuum which stretches from conditions about which the relevant utility and disutility parameters are very well known to others about which he knows little or nothing. This continuum may well be matched by one which reflects a complete ability to form the necessary judgments about the value of health care to complete lack of ability (although this latter continuum may well be influenced by other factors). This in turn will be reflected in a valuation system which stretches from one pole of consumer sovereignty to the other of imposed 'merit goods'.'

To the usefulness of the concept of merit goods when applied to health care relationships, it is possible to add its capability for the attainment of a Pareto optimum independently of who has the right to decide the consumer's (patient) consumption (Culyer, 1972).

Thus merit goods provide a conceptual alternative framework for analysing the peculiarities and special characteristics which are responsible for deviations of the commodity health care from the conventional microeconomic paradigm. It will be used in this way when a general notion of 'need' and, in particular, of need for ante-natal care are discussed in later chapters.

CHAPTER 2

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CHAPTER 3 DEMAND VERSUS NEED IN THE CONTEXT OF HEALTH CARE

3.1 Basic Problems of Valuation in Health Care

The issue of valuation, as the basis upon which choices must be made in deciding how much, which and to whom resources should be allocated in the health care field, is complex, and epitomises the conflict of interest at the centre of decision-making in various systems of health care. Valuation in health care involves the question not only of whose values are to count in taking decisions but also what is the distinctive nature of the judgment of each individual who is involved in the complexity of the interactions in the health sector. If the medical expert is best placed to provide technical judgments, it is no less certain that the patient's perception of his own health status, and its associated utility or disutility, is another legitimate source of valuation which is potentially likely to be in conflict with that of the expert. As Williams (1974) notes:

> 'The heart of the matter ..... is a societal judgement as to who shall play what role according to which rules. The parties in the "who" bit are (a) patients and other potential beneficiaries, (b) "experts", (c) politicians and (d) the electorate at large. The roles to be played are "advertisers", "applicants", "diagnosers", "priority-setters", "treatment assigners" and "researchers". The rules consist of terms of reference and behavioural norms to guide choice within whatever area of discretion is so assigned'.

The way in which the conflict of interests and competing values is solved in practice depends largely on the system of values underlying the organisation of the production, distribution and financing of health care. Thus in a state owned system, such as the NHS, the underlying all-pervasive concept is not individuals' own values and preferences but rather the notion of need as defined by 'society' and medical experts. Conversely in a market orientated system the mechanisms by which values are revealed is more through the conventional concept of economic demand.

Neither demand nor need, however, are concepts which can transmit social values in some absolute way. Mooney (1977), among others, has shown that even in a centralised system, such as the NHS, demand has its own place as an aid to resource allocation. In fact, while the consumers' sovereignty approach implied by the concept of demand cannot provide a universal answer to every question related to the expression of individual health wants, neither can a narrow merit goods approach (the theory of which underlies the concept of need) be wholly acceptable if patients, potential beneficiaries of the health care system and society at large are to play their role in the matter of distinctive valuations.

Whereas in some situations the individual is able to make his own judgment in a fully informed manner with regard to his health condition and the choices open to him, in others he may or should accept that he is not so well placed. Even with basic information and relevant knowledge at his disposal the individual may be too risk aderse, myopic or irrational with regard to his health interests and consequently, in realisation of this, may accept that someone, an expert third party, should take decisions on his behalf regarding health care consumption. Indeed, as discussed in the previous chapter, society faces a continuum of valuation systems which encompasses both poles: from consumers' sovereignty through to merit goods.

3.1.1 The Standard Approach to Demand

Utilisation of medical care has played a considerable role in the rapid increase in health expenditures. For this reason explanations of and research into the underlying forces responsible for the shaping of both individual and aggregate utilisation have been increasingly pursued. Quite obviously prices of health services and variations in individual or

household incomes may affect the amount of health care which is demanded by patients. Economic analysis when applied to this problem could hardly refrain from making use of the standard tools of analysis and prediction, namely the theoretical framework of the market. Within this context as noted by Lee (1979) it is only natural for economists to call upon conventional demand theory in order to start from a well established framework of reference.

Demand to the economist is an elaborate but clearly defined concept. Yet as Feldstein (1972) and Evans (1975) have suggested, utilisation and expenditure, on which much research effort has been directed, are only the visible faces of a complex process of interaction between the many decision-makers involved in the production, distribution, financing and consumption of health care. In any case the interplay of supply and demand provided by the neoclassical microeconomic paradigm would provide a method, already established, of dealing systematically with the complexity of the health care industry. As noted by Bailey (1954):

> 'the rationale of the economist for viewing the production of health services as an industry is based largely on the observation that medical services are produced and sold in a manner not very different from the way in which other goods and services are sold'.

Moreover if health care services met the test of the market place, in the sense that demand indicated that individuals were prepared to make claims upon them, backed by their willingness to pay (because of reasonable expectations of health care benefits), there would be nothing in principle to prevent the application of the conventional individual maximising utility model. It is not surprising therefore that the neoclassical demand model has received a good deal of attention. Parker (1980) and Maynard (1980) review the use of the demand concept in their survey of pricing and social services, pointing to the role that

demand analysis has played and its importance in the renewed interest in the effects of charges and exemptions in the use of take-up of social services including health care.

On the same subject, but more specifically on the issue of pricing health services, Cairns and Snell (1978) surveyed the considerable amount of work, partly theoretical but mainly empirical, that has been conducted in the last few years on this topic. Lee (1979) has also made the point that demand analysis can be useful as an explanatory and predictive tool in planning health care. Newhouse (1980) has surveyed the American contribution to the application of demand theory in the context of alternative co-insurance schemes, all set in the light of a model of the operation of the market. To Lee, even in a non-market setting, as is the case with the British National Health Service, the neoclassical demand model is potentially useful provided that a distinction is made between money price and the cost falling on the consumer, for the removal of price as a variable does not mean that every consumer of health care faces the same vector of access. As Maynard (1980) points out:

> 'A price consists of a money payment which is made or surrendered by a consumer in exchange for the provision of a good or service ..... Cost is what the consumer has to surrender to acquire a good or service. Cost may include other variables in particular the opportunity cost of time'.

Thus some effects of health care consumption and utilisation have been approached through the conventional model of demand. In doing so individuals indicate their preferences in the market place. Thus the demand function reflects the tension between subjective valuations about available bundles of goods and services on the one hand, and objective constraints on the other. As Cairns and Snell (1978) summarise:

> 'Under a pricing system an individual would not seek treatment unless its value to him was at least as high as the price he had to pay for it. If the price charged for any treatment were to be equal to the cost of treating an additional patient, no individual would receive care unless his valuation of that care were greater than the cost of providing it. The existence of any excess demand in such circumstances would suggest that some individuals currently not obtaining treatment would be willing to pay the cost of supplying additional treatment.'

Accordingly the neoclassical paradigm of rational, utility-maximising consumers lies at the foundation of one of the most widespread health care models, the crucial assumption of which is the ability and willingness of the individual to make a rational choice between alternative opportunities for consumption in order to maximise his utility.

The model assumes, as a central value judgment, that only the individual's assessment of benefits counts. The rational consumer allocates his income to alternative opportunities of consumption in order to maximise his welfare, given the current prices of goods and services available in the market. Consequently, the quantity of medical care demanded by a given individual should be regarded as depending on the individual's wants, preferences and tastes, the relative prices of medical care as well as of other available commodities, and his income (Klarman, 1965). Culyer (1976) has noted however that in addition to the conventional explanatory variables like price of health care, prices of other commodities (including potential substitutes for health care) and income, the implicit influence of the individual's state of health should be taken into account as well as the 'shaping' of individual 'tastes' by means of prevailing health education. Most of the developments of the demand model however do not mention these factors explicitly, and hence appear to constitute a quasi perfect microeconomic model of consumers' behaviour.

Taking this theoretical model as a starting point the major steps for the economist in studying the behaviour of demand in the real world are the specification of the demand function according to observable data and the testing of the nature and direction of the relationship between medical services demanded and changes in the level of any one of the predictors or determinants of demand. The concept of elasticity provides the mechanism for analysing the direction and the degree of responsiveness of quantity demanded to each change observed in the relevant variable (other variables remaining constant) as is normally assumed in the framework of static comparative microeconomic analysis.

3.1.2 The Demand for Health

Dowie (1975), Culyer (1976), Williams (1977) and Hurst (1979) all comment on the contribution of Grossman (1972) on demand as one of the most important examples of the particular insight of economic analysis into the health care field. The individual utility maximising model, apart from being built on somewhat simplified assumptions about the nature of the individual's utility function, has another fundamentally important premise. It is assumed that the potential patient wants and seeks precisely the same health product which he is ultimately offered by the supplier. In the field of obstetric care for instance patients rarely 'demand' betaminetic agents when faced with a threat of premature delivery but they do ask for (and indeed are willing to pay for) say, aestriol tests or screening for asymptomatic bacteriuria. Instead of a patient-consumer making explicit claims on the precise nature of an alleviating, preventive or curative treatment, Grossman suggests that people may be seen as demanding health rather than health care for maintenance and restoration of health which might be considered as an investment in human resources.

Instead of the consumer obtaining utility from consumption of specific medical care per se it seems closer to the observed facts that he values the health improvements derived from such care in that they enable the consumer to provide both marketed services and non-marketed, leisure time, goods. The traditional theory of consumer behaviour, being mainly concerned with the explanation of how changing quantities of goods purchased in the market generate instantaneous changes in the consumer's utility function, misses the point in describing what for Grossman is the fundamental nature of the process of health care consumption. He not only treats health 'per se' within the household production and consumption framework but he also considers it as a durable capital asset. Thus two main theoretical developments lie at the heart of the model: the new approach to consumer theory (Lancaster, 1966) and human capital theory (Becker, 1964 and 1965 and Ben-Porath, 1967) which are combined in order to produce a distinctive approach to the demand for health. As for the new consumer theory, consumers are viewed as producers of market and non-market commodities using inputs of market goods as well as their own non-market resources.

The insight afforded by the extensions of the theory of consumption (and hedonic price analysis as its empirical foundation) suggest that the goods and services which consumers purchase or use can be seen as tractable inputs devoted to the achievement of personal and household objectives. Consumer behaviour can be better understood in terms of specific functional relationships and objectives, which goods and services and their combinations can serve by virtue of their particular properties, given the limits of consumer income, time and other resources (Terleckyi, 1975).

Health is viewed as a fundamental commodity and people are seen as producers of health. 'Health is produced by households not by doctors and hospitals' (Dowie, 1975). The household, apart from producing health, have demands for some intermediate goods such as food, housing and physical exercise which are seen not so much as direct objects of utility but as desirable for the sake of their health producing 'characteristics' or attributes (Lancaster, 1966). In such a perspective, individual patterns of consumption and ways of life may indeed make a negative contribution to health production. There is also, of course, a derived demand for allegedly health promoting goods from outside the household, such as medical and hospital care. Furthermore the supply of labour services by the household to the economy may be either health promoting or health destroying. The household is thus seen as having an active role in promoting its own health which may be enhanced by the provision of health information and the effects of detrimental inputs rather than simply the provision of health care per se.

While acknowledging the importance of Grossman's model, it is not really clear to what extent health care expectations are always correctly considered as 'investment' when sometimes they relate to conditions of ill-health or discomfort to be traded off against the preservation of life. Also there remains a need to explain how, precisely, education generates a higher demand for health. Finally, without an agreed understanding and conceptualisation of what constitutes health status for different sectors of the community, it is difficult to derive the relevant demand functions.

3.2 Need and Its Economic Implications

3.2.1 Introduction

The appropriateness of traditional notions of demand has been questioned especially in circumstances where the supply of health care is provided largely at zero-price at the point of consumption and the individual is no longer seen as being in a position to assess his own health status and select the appropriate treatment. It has therefore been suggested that a conveniently redefined notion of need would be appropriate as a resource allocation device. This is particularly true if need is defined in such a way that it has clear connections with the economic concept of a merit good. It is assumed that since the individual's preferences are not clearly defined with respect to his own health interests someone else (experts, society) has to assess his need for some form of treatment and whether such treatment should be implemented by committing scarce resources to this end.

Need is often invoked as an allocative notion and indeed its use as a concept with economic content has recently been the object of revision and sometimes contradictory interpretations. Thus Culyer, Lavers and Williams (1972) wrote about the confusion surrounding what they then christened 'needology':

> 'the word 'need' ought to be banished from discussion of public policy, partly because of its ambiguity but also because ....the word is frequently used in ... 'arbitrary' senses ... Indeed ... in many public discussions it is difficult to tell when someone says that 'society needs' whether he means that he needs it, whether he means society ought to get it in his opinion, whether a majority of the members of society want it, or all of them want it. Nor is it clear whether it is 'needed' regardless of the cost to society'.

Four years later Culyer proclaimed his conversion to the doctrine of needology:

> 'Economists will be surprised at my conversion to the language of 'need'. At one time, indeed, I had quite convinced myself that the word was an incubus on the back of any serious student of the NHS or of health problems in general. I am now, however, equally convinced that ... it is an indispensable and profoundly useful tool of both analysis and policy.' (Culyer, 1976)

Culyer uses such a definition of need in terms of health status (Culyer, 1978) to build up an elaborate rationale for resource allocation within a publicly provided health care system such as that of the British National Health Service. According to Culyer (1978):

> 'A need for health care exists when:
>
> (i) the potential for avoidance of reductions in health status exists (prevention and some care)
>
> (ii) the potential for improvements in health status above the level it would otherwise be exists (cure and some care).'

While acknowledging the theoretical robustness of the concept of need as developed by Culyer such notions do not, unfortunately, appear to apply in practice because of the complexity involved in and the somewhat slow progress in measurement of health status, particularly in the context of the impact of health care on community health status. Instead, a medically or administratively defined concept of need is often present in decisions which have implications for resource use. In what follows such notions will be raised, before drawing comparisons with the concept of demand. The potential role of the agency relationship will then be discussed as a means of bridging the gap between demand and technically defined need.

It has to be conceded that while economists debate the appropriateness of their analytical tools in explaining trends and patterns of health care expenditure, decisions on what type of care to

produce, how to provide it and to whom it should be made available, are being made irrespective of the degree of formal involvement of health economics. Given that this is the case there should be a positive benefit in directing the attention of the economist to the criteria on which such decisions are currently being made. These are either already explicit, even if not frequently so, or capable of being identified and may well show differing degrees of consistency when they are scrutinised from the point of view of the rationality of resource allocation. Against the background of these criteria the technical and social administrative approach to need will be examined.

3.2.2 The Manifest Demand Approach

The first attempt to define the concept of need in the context of a resource allocation device in the field of health care is attributed to Bailey (1954, 1956), who proposed queuing theory as an adequate rationale for measuring and forecasting needs. His approach, called 'the manifest demand approach' by Feldstein (1964) was used as a basis for the Hospital Plan (Ministry of Health, 1963) when a 'norm' based on beds per total population was proposed. According to Bailey's approach, such 'norms' are defined with reference to the average number of outpatient visits or inpatient admissions and the net increase in the waiting list. Such a way of establishing the dimensions of need is deemed to have serious shortcomings largely because it is based entirely on information on existing resources and utilisation (inputs and throughputs) and therefore excludes any possibility of comparison with alternative allocations of resources and their respective potential achievements and outcomes.

In fact the underlying rationale for a great deal of 'norms', guidelines and standards is frequently close to the 'manifest demand approach'. This is perhaps unsurprising in health care since its supply is in part associated with the clinical idea of normality in that the criteria refer to what is usual or normal as derived from average utilisation or measures of deviation from that average. The idea of setting 'norms' of provision or need against what is actually being provided not only fails to measure the degree of need which has to be met but does little more than 'reassure planners that the current allocation was correct' (Russell, 1976). Furthermore this approach does not take into account the fact that there may be different intensities of need and, when it comes to planning, the relativity of need is ignored and absolute levels of total need are defined as objectives, thereby making it difficult to determine any structure of priorities. Questions such as who is to have first claim, which types of resources or combinations to choose under different technologies and how much of each type of service to provide, are likely to remain unanswered.

3.2.3 The Social Administrative Approach to Need

Spek (1972) and Bradshaw (1972), both prominent 'needologists', tackle the treatment of need by means of a comprehensive and systematic taxonomy. In dealing with their approach, Williams (1978) stresses, as its main characteristic, the fact that the values of every party involved are taken into account. The fundamental point here is who is to assess the needs of whom, where 'who' can be one of three parties: society, individuals and experts. Judge (1978) refers to the adverse economic climate of the mid-1970's and the urge for closer scrutiny of the distribution of public resources as a background explanation for such a

demand orientation to need. The social administrative approach to rationing is mainly concerned with how and why public goods and services are distributed as they are. The study of the procedures by which clients obtain access to social policy goods is thus the distinctive starting point from which the concept of need is elaborated in the social administrative context. This is the process of transforming effective individual and societal wants into legitimate needs and finally into demand.

3.2.4 The Medical Approach to Need

In his widely quoted exegesis of the concept of need, Williams (1978) selected a definition of need by Matthew which is considered as a paradigm of the medical or technical approach. Such a notion of need seeks to provide decision-makers with criteria for resource allocation in the form of a list of needs which exhibit some implicit or explicit precedence of one need over another and which are interpreted as being objective facts - instead of opinions or third party judgments about who ought to get what - and dependent solely on medical expertise for their measurement. Matthew (1971) provides an early contribution to such an approach. As he states:

> 'The need for medical care must be distinguished from the 'demand' for care and from the use of services or 'utilisation'. A need for medical care exists when an individual has an illness or disability for which there is an effective and acceptable treatment or cure. It can be defined either in terms of the type of illness or disability causing the need of the treatment or facilities for treatment required to meet it. A demand for care exists when an individual considers that he has a need and wishes to receive care. Utilisation occurs when an individual actually receives care. Need is not necessarily expressed as a demand and demand is not necessarily followed by utilisation, while on the other hand, there can be demand and utilisation, without real underlying need for the particular service used.'

As Mackenzie (1975) points out, a subjectively claimed need requires independent and technical verification in order to be 'legitimised' as medical need. Williams (1978) has stressed the underlying quasi-supply notion embraced by the medical approach to need:

> 'a need exists so long as the marginal productivity of some treatment is positive. Only when the efficiency of treatment has become zero at the margin does 'need' disappear. People may be still sick, but since there is nothing we can do for them, the implication is that they are not in need.'

The medical approach represents a considerable improvement on the lack of explicit criteria underlying the use of norms or standards built upon the unique consideration of resources used. For one thing, need defined by doctors expresses objectives in terms of the outcome of health care or the implementation of treatments or programmes known or estimated to have a positive and acceptable effect on the level of health of patients. Thus the criteria of 'technical efficacy' is explicitly recognised. (Kaser (1974) provides a discussion of the variant use of efficacy, effectiveness and efficiency in the context of the economic and non-economic use of the concepts of need and demand.)

The medical approach to need pinpoints something extremely important which has not yet been developed in full. The patient cannot be totally ignored as having no potential for indicating his concept of need. In other words an individual may perceive needs - felt needs - in terms of the likelihood that his health status may be less than his desired one. However the medical approach does not allow for the presence of these other allocative influences such as felt need. Consequently under medically defined need it clearly falls to the expert to legitimise and affect supply (or not) and to redefine need in terms of 'adequate' treatment.

Thus, in the medical definition of need, for planning or allocative purposes only medical judgments embodied in the concept of need will count. However, it is almost inevitable that, in this approach, the lack of a role for the patient, potential patient or the community which may care for them, will create some problems and it is doubtful whether such a technical valuation can hold in practice without any adjustment. For example, people may make claims on particular services which have no observed effectiveness; yet in some such cases it may be difficult to argue that they should be restricted from getting them. Such is the case of people in need of terminal care, or seeking solely reassurance and information instead of, or in addition to, medical care. A strict medico-technical approach to the concept of need may fail to recognise such situations as deserving any clearly defined provision. Furthermore, evidence of technical efficacy does not necessarily imply that need, technically legitimised, should be implemented. The medical approach, as Drummond (1980) points out, lacks a suitable dimension or criterion against which the implications of resource allocation can be justified in economic terms:

> 'can the estimation of medical effectiveness alone provide one with a suitable framework for deciding upon what is the best use of resources? One could argue that the identification and elimination of ineffective treatment gives a guide to efficiency since ineffective treatments will normally be inefficient too, as they consume scarce resources yet produce little value to the community.
>
> Nevertheless a major problem arises when, given the overall restriction on resources available for health care, it is necessary to choose between effective treatments. If the choice is (say) between two (mutually exclusive) alternative treatments for the same condition, is the more effective treatment to be chosen every time, regardless of relative cost? It may be that when relative costs are taken into consideration, a decision taken in accordance with the efficiency criterion may result in the selection of the less effective (but less costly) treatment.'

In summary, the medical approach to the concept of need implies more a purportedly factual approach than an evaluative one. Yet everything shown to be effective may or may not be 'needed'. In any case such an approach by no means makes it clear whether to meet a particular need, to what extent nor indeed to whom it should be directed. For instance, allocating the same amount of resources to all patients suffering from a given condition fails to recognise the possibility that not only may patients differ in their valuation of health and of health care but also that the benefits accruing from a given effective treatment are likely to conform to the law of diminishing returns. For all these reasons the medical definition of need, if taken at its face value, may lead to serious misallocations of resources.

3.3 Demand and Need for Health Care

The conventional theory of consumers' behaviour is based on the assumption that the individual wants to make and is capable of making an explicit and rational choice between alternative sets of goods and services in order to maximise his utility. Such an assumption implies that the individual has the capacity to set out a logically coherent structure of preferences or priorities for consumption. In such circumstances, it is held that expressed demand will improve allocative efficiency by encouraging the flow of information about consumer preferences to aid resource allocation. In exercising his choice the consumer demands a quantity of a good or service such that his marginal valuation of the commodity equals the marginal cost to him. All the relevant information about the valuation of every commodity is contained in the conventional demand curve which shows the price the consumer is willing to pay for successive units of the good.

If the commodities of health and health care were normal (in the sense of not having any unique properties) the concept of demand would be as appropriate as a mechanism for efficient resource allocation as it is for most other goods and services. But there are several departures from the conventional characteristics of economic goods that tend to deny the appropriateness of conventional neoclassical economic analysis to rational utility-maximising behaviour. In particular, as was suggested in chapter 2, uncertainty and lack of information by consumers about their health status, and about the effects of alternative treatments on that status, are likely to result in a divergence from the conventional assumptions of demand theory. Nonetheless different conclusions follow from different assumptions which might be made regarding the extent of this divergence.

At one extreme the consumer may be viewed as having the information and ability to choose his health state (Grossman, 1972). In this way, health is viewed as a fundamental commodity, generating demand for its own sake. The consumer is assumed, in this model, to choose his preferred health status and the rate at which it deteriorates. The demand for health care thus becomes a derived demand from the demand for an optimal level of health. In this sense, the demand for health care is the end result of one process that begins necessarily with some kind of self perception about the fact, or the likelihood, that current health status is, or may be, lower than the individual's desired one, now or in the future. It is this perception or felt need (Bradshaw, 1972) which initiates the process by which the individual decides to seek health care and back his wants by his willingness to make calls on his own resources. Unless the desire to meet felt need is made effective by ability and willingness to pay it is not demand in an economic sense.

Once the factors determining whether an individual presents himself to the supplier of health care have been identified, another entirely different question arises. This centres on the issue of the set of criteria underpinning the decision about the redefinition of the individual's felt need and the consequent response to his demand in terms of suggested or imposed decisions about health care consumption. For this reason, a demand analysis is only 'one-half of the analysis needed to explain variations in the use of health care services' (Feldstein, 1964). Thus, at one extreme, the consumer is viewed as having the capacity and information to choose his optimal health status by means of demand decisions for health care; at the other, he is deemed incapable of such decisions. Under the assumption that the consumer, apart from experiencing felt need, lacks the relevant information to forecast his state of health and the effects of alternative health care treatment open to him, it is the doctor, as the supplier of information and health care, who decides the quantity and type commensurate with the health status of the patient. It follows that the consumer does not demand care on his own initiative. Instead, it is the doctor who decides the amount and nature of health care he needs for restoring the individual's health status to the desired level. This 'needs' approach is thus characterised by the existence not only of an effective treatment but also of an assessment of the health status of the patient and an 'expert's'decision about the quantities needed by the patient.

The 'needs' approach is derived from the notion of merit goods in that it reflects the judgments and preferences of an expert elite, in this case medical experts, which are 'imposed' upon patients. As such, the concept of need seriously conflicts with the notion of consumer sovereignty. Yet, as was discussed in chapter 2, it may sometimes be justifiable to distort or correct preferences because of uncertain,

misleading or non-existent information, possibly exacerbated by the technical complexity of the choices to be made. However, there is a debate among economists about the usefulness of the concept of need, particularly with regard to the normative question about who should formulate the relevant valuations. The fact remains, nonetheless, that some concept of need is explicitly or implicitly being used in health care planning and evaluation and, perhaps, as Russell (1975) and Culyer (1976) argue, the proper role of the economist is to criticise the non-economic approaches to the concept of need and demonstrate the advantages associated with the economic approach.

Summarising, both the concepts of demand and need are potentially useful for analysing the current pattern of utilisation of health care and, much more importantly, the implications for planning and policy making. The notion of demand retains the basic feature of the individual's own assessment of benefits. On the other hand, the economic concept of need, encompassing assessment of effectiveness and the potential for considering alternative ways of meeting the need, is also an important basis for resource allocation. It is argued that while both should be taken into account when a particular operation of a health service is being examined, neither 'demand' nor 'need' by itself provides sufficient information for decision making. Unless an effort is made on the one hand, to match the often conflicting values of patient and doctor on the benefit side and incorporate relevant information on costs on the other, a substantial lack of appropriate decision-making will remain.

3.4 The Concept of the Agency Relationship

The reconciliation of demand and need lies in the notion of the agency relationship, by which the expression of individual wants is related to the available information on effective treatments and to the extent of existing supply. Feldstein (1970) was one of the first authors to direct attention to supplier-induced demand for physicians' services indicating that a demand equation could not be estimated because permanent excess demand may prevail in the market. He raised the question of whether the observed quantities 'demanded' actually correspond to the amounts demanded by consumers. This led to the recognition of a situation of paramount importance i.e. the fact that physicians not only prescribe the care that patients should have, but also provide that care.

More recently, Evans (1974) pointed to the potential problems of trying to interpret the aspects of both production and consumption in the health care system without adequate recognition of the professional relationship which results in the delegation by the patient of his capacity to make decisions on demand to the doctor. Interpretation of utilisation data in the health care system may be misleading because it is not sufficiently clear whose decisions are reflected in the data. Inability to distinguish clearly between the behaviour of the doctor and patient can lead to a misleading identification of utilisation with demand or with the expression of patient preferences at given prices. According to Evans (1974), the basis for the agency relationship is the perception by a patient of a significant differential in information between himself and the physician. On the basis of this perception, the patient delegates his ability to make choices related to his health status (and welfare) and the appropriate treatment to be followed (and the consequent pattern of consumption of health resources) to a physician

who is then expected to make choices on the patient's behalf. The physician accepts this delegation, and acts on behalf of the patient allocating medical resources, in order to best serve his patient's welfare. This is the 'agency relationship'.

Another reason for the agency relationship arising, which is different from that of the alleged lack of information on the part of consumers, is the presence of third-party financing. In fact, both types of agency relationship arise clearly from an analytical framework which is set primarily in the context of an individual patient-physician relationship. Wolfson (1976) considers the agency relationship as a decision-making process that doctors try to optimise in terms of the patient's wellbeing. He agrees with Evans in accepting that lack of information is the primary reason for the agency relationship and establishes carefully the nature of the information required in order to optimise the decision process involved in the agency relationship. He indicates three main sources of relevant information:

(i) basic medical knowledge i.e. the type of information patients characteristically are not expected to have, consisting of specialised knowledge for assessment of health status and identification of feasible treatments.

(ii) descriptive information about patients' circumstances, which may involve knowledge of patients' symptoms, their medical history and environmental circumstances, and which allows the doctor to apply his more general knowledge to the patient's particular case. In addition the descriptive information also refers to the financial position of the patient and the resources at his command.

(iii) information about the patient's own valuations that include individual preferences with regard to alternative treatments, his attitude to risk-bearing and his valuation of likely trade-offs between different dimensions of well-being, such as relief from pain at the expense of a reduction in certain attributes affecting life style, or accepting additional, present discomfort for the sake of the increased probability of avoiding future illness.

The identification of health status and the implementation of the recommended treatment are seen by Wolfson merely as the provision of services. What constitutes in his opinion the core of the notion of the agency relationship is the maximisation of the patient's utility. The agency relationship is thus viewed as a decision process concerned with the efficient allocation of resources in circumstances where the consumer is not able to perform the three normal roles he would undertake in the market place, benefit-receiving, cost-bearing and decision-making, i.e. the implicit cost-benefit evaluations associated with the ordinary consumer of goods and services in the market. In the market for health services, lack of information on the part of the consumer results in the separation of the decision-making process from the other two functions; the doctor is then present not only in an information-giving capacity but also as a substitute for the consumer in his cost-benefit calculus.

According to Wolfson's view, the agency relationship plays an integrating role which compensates, at least in part, for the separation of the three main functions of the decision-making process. Thus the rationale for the existence of the agency relationship is the need for optimal allocative decisions to try to ensure the integration of the relevant technical information with the benefit-receiving and cost-bearing dimensions.

In the agency relationship, therefore, the physician is cast in a consumption-agent role and, as such, is expected to act to maximise the patient's welfare. But the decision-making process implied by the agency relationship has a dual nature. On the one hand doctors are expected to make decisions to promote or enhance patients' health; on the other these decisions are (at least under many health care systems) constrained by the patient's financial resources. As Wolfson points out 'there are two agency functions but since benefit-receiver and cost-bearer are the same person, only one agency relationship need be established'.

Still in the context of an individual-centred, patient-doctor relationship, the introduction of third-party financing, such as public or private insurance schemes or public provision of health care, results in the separation of the cost-bearing and the benefit-receiving roles. In this new situation, the patient receives the benefits, the third party bears the costs and the clinician retains the delegated decision-making power. Provided that the new cost-bearer shares the patient's lack of information with respect to effective treatment, the previous split of the decision-making process holds. This explains the duality of sources of agency relationships mentioned earlier and indicates that optimal allocative decisions require doctors to integrate the relevant interests of the other parties and patient preferences, as well as the interests of the financing third party, with their control over the relevant information.

An alternative way of viewing the agency relationship, instead of patients' (consumers') preferences being integrated in the decision-making role of the doctor, is to think of the physician exercising his potential for altering or influencing patients' preferences or 'tastes' and thereby, the latter's demand for health care (Jacobs, 1980).

Both views represent an 'ideal' definition of the agency relationship, conducive to allocative efficiency. However, the actual relationship is less than perfect in reality and usually exhibits some deviations that provide a justification for implementing policy instruments for controlling the effects of such imperfections (peer review systems, malpractice insurance, etc.) Major reasons for these imperfections are the neglect of the patients' own values and the disregard of costs. Often doctors' own preferences or patronising attitudes are involved, instead of the genuine preferences of patients being promoted. Perhaps even more frequently, the potential for generating demand for his own services or referrals to other doctors, arises as a possible source of friction between patient and doctor (Cooper, 1975). As Wolfson (1976) states:

> 'The physician in his agent capacity can, at his discretion, create demand for his own services as a technical provider. As a supplier he will wish to create demand at least as great as the amount he is willing to provide at the going price. As an agent for his patient he may wish to demand somewhat less than his level of services. To the extent that the "supplier's" interests get introduced into the decision-making process, a serious distortion in the agency relationship results.'

Another potential source of imperfection is associated with an observed disregard of considerations of cost by some doctors, especially when the costs are borne by a third-party. The efficient agency relationship would thus require the presence of a set of elements that are in fact implied in the cost-benefit calculation: information on the potential for deriving benefits from treatment (effectiveness), a deteriorated health status, or the likelihood of such deterioration, patients' valuations, social priorities and costs.

3.4.1 An Enlarged Concept of the Agency Relationship

The concept of the agency relationship can be widened to cover a situation centred on patients in a collective sense (Williams, 1979) in which the

medical decision-maker, individual or team, is concerned with all the patients for whom he (they) are responsible. This is the most pertinent to the case study on ante-natal care reported in later chapters in that the Unit under study faces a similar situation, with a staff of doctors, assumed to act as a collective decision-making body, having responsibility for the welfare of all the patients who present. In such a situation, decision-making on the patients collectively is required and the implications tend to differ from the individually-centred situation. Here the relative intensities of need of all patients have to be considered, as well as third-party financing. Basically it is possible to identify the following sources of valuations:

doctors

patients

society

third-party financing agents

In such a situation, the decision-makers have to take into consideration the relative efficacy, in terms of the potential for obtaining different good outcomes, of devoting more or less resources to one patient vis-a-vis another. Implicitly they are faced with weighing one patient's welfare against another, or, in other words, with the comparison of the benefits arising from different patterns of resource deployment. This is again a situation in which the nature of the judgments required is no longer a technical matter but rather a matter of trading-off social priorities and community valuations. Clearly here, as stressed earlier, the underlying rationale of the efficient agency relationship is closely associated with the cost-benefit calculus. The agency relationship, thus conceived, would potentially achieve an efficient allocation of resources if it takes into account basic information related to:

(i) effectiveness;

(ii) social costs; and

(iii) the valuation of all the relevant parties involved in the relationship.

The agency relationship is thus seen as a framework of decision-making enabling doctors to act in accordance with the key parameters which have a role in a socially efficient allocation of resources. The underlying cost-benefit calculus is the backdrop against which demand (patient generated) and need (as defined by experts) are brought together and are compared, one with another, in terms of their respective economic implications. It is in this guise that the agency relationship is one of the key facets of the analysis of ante-natal care of later chapters.

CHAPTER 3

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CHAPTER 4 ECONOMIC EVALUATION IN HEALTH CARE

4.1 Economic Evaluation in health care

Thus far this thesis has examined those parts of economic theory which are relevant to health and health care (and indeed to ante-natal care, the specific area of interest). The literature on health and health care as commodities, and on need, demand and the agency relationship have provided a framework (to be developed further in the next chapter) for the applied study on out-patient ante-natal care. However, since economic appraisal is central to that study, this chapter discusses the development of cost-effectiveness and cost-benefit analysis as tools of evaluation in health care and reviews the existing literature on the application to ante-natal care of these techniques.

It is not intended that this review be comprehensive. As is indicated below others have already conducted broad surveys of economic appraisal in the health sector. Rather the purpose is to point to some of the main problems of using what Williams (1974) has called 'the cost-benefit approach' in health care evaluation, issues such as identification and quantification of relevant outputs valuation and measurement of costs and benefits and whose values to use. It is not suggested that difficulties with these issues are insurmountable. Rather the points are made in an attempt to place the applied study reported in chapters 5, 6 and 7 in a broader perspective.

This is particularly true of the latter part of this chapter which is a review of applied studies specifically related to various aspects of ante-natal care. Clearly these are of direct relevance to the study reported in this thesis; none of them however was sufficiently similar and methodologically sound to allow it to be used as a model for this study.

In recent years, health economics has witnessed major developments in the appraisal of health care programmes as a form of analysis of alternative options and with a view to assisting choice. Choices in health care are made in two broad dimensions. On the one hand, the individual patient-centred choice involves decisions on what particular treatment is best for a particular patient; on the other, decisions have to be made about what option or programme is best in terms of the allocation of health care resources for a whole group of patients or for the community at large.

In this context the economic dimension of such appraisal is to be seen as having the objective of allocating resources in a more efficient way. In the health care field, as in all others, resources are scarce but objectives many and competing. It follows that there is a need for rational choice which can be enhanced by the underlying values related to economic efficiency through identification of potential Pareto improvements (i.e. situations where the amount the gainers from a project would be prepared to pay to ensure that the project was undertaken exceeds the amount that losers would accept as compensation to allow it to be undertaken).

Recently economists (Klarman, 1974; Williams, 1974; Culyer, Wiseman and Walker, 1977; Maynard, 1978; and Drummond, 1980) and doctors (Bunker, Barnes and Mosteller, 1977; and Kerr and Parboosingh, 1978) have surveyed the literature on economic evaluation in an attempt to outline the principles of evaluative procedures.

Economic evaluation in principle seeks an answer to the question of the extent to which the benefits from a particular action outweigh the costs. The answer provided is that services whose costs exceed their benefits should not be undertaken and only for those services where the converse is true should they be provided in an efficient health care system.

Economic evaluation in health care can be pictured as having the following dimensions:

(i) Economic efficiency: i.e. the notion that available resources should be used in order to obtain the greatest social benefit vis-a-vis social costs.

(ii) Opportunity cost: i.e. the view that sacrifices have always to be made, when choosing courses of action which consume resources, in terms of the benefits they would have produced in another activity.

(iii) Valuation: both inputs consumed and outputs produced by any health programme, ideally, should be valued in commensurate terms.

From an economic point of view, any health care measure, for example, for the prevention of perinatal mortality and morbidity, apart from its medical effectiveness, is considered to consume scarce resources which might be alternatively used, either in the context of perinatal prevention or, indeed, elsewhere with possible potential benefits. From this such questions arise as to whether new resources could be better spent on primary prevention or more interventionist services such as intensive obstetric procedures. If it is shown that they are better spent on preventive care, the question then arises as to which forms of prevention result in the best outcome for the additional resources thereby consumed.

Questions like these are being answered implicitly in the day to day operation of any health care system. Economic evaluation attempts to provide a formalised framework for such decisions by means of a systematic and explicit study of the benefits that can be expected to arise from alternative programmes and the change in the use of scarce resources that the implementation of such programmes would involve. The criterion of economic efficiency is essential in the consideration of the best use of resources and provides the criteria for economic evaluation

of choice between alternative health programmes. Cost-benefit and cost-effectiveness studies are the practical application of the economic principles underlying such economic evaluation.

4.1.1 The Framework of Cost-Benefit Analysis

While in health care the term cost-benefit analysis is used somewhat loosely, the current literature (Williams, 1974; Culyer, 1976; Drummond, 1980; and Mooney, 1980) is agreed in applying it to studies that analyse alternative health care programmes through consideration of all consequences, both adverse (costs) and advantageous (benefits), accruing to all members of the community. In such studies, total social benefits and total social costs are compared one with another through the use of monetary valuations which make the different dimensions of benefits and costs commensurable. However, as Mooney, Russell and Weir (1980) point out many studies in health care that claim to be cost-benefit studies are in practice cost-effectiveness studies. In cost-effectiveness analyses the quantification of benefits is restricted to physical units such as years of life gained, perinatal mortality avoided or handicap reduced.

> 'Cost-benefit analysis rests on the proposition that we should provide services only if their benefits outweigh their costs .... cost-benefit studies stress the simple truth that the decision whether or not to pursue a particular course of action depends on both cost and benefits' (Williams, 1974).

Thus, the basic philosophy of cost benefit analysis is simple and appeals to the very central proposition that only options where benefits exceed costs should be pursued, that judgments as to what constitutes costs and benefits should be made on the broadest possible societal framework and that the valuation of benefits and costs is better made by those who are to benefit or be penalised by the effects of the project (of which more discussion in section 4.2).

4.1.2 Benefits and Costs

In economic evaluation, by benefit is meant increase in utility, which in turn can be interpreted either as increases in pleasure, or decreases in pain or discomfort. The most obvious effects of health treatments in terms of life extended or improved quality of life represent benefits, since individuals and 'society' value good health per se (consumption benefit) and for the benefits to be derived from 'being healthy' (investment benefit) such as increased capacity for production of marketed and unmarketed goods and services.

Cost implies sacrifice or benefit forgone or, in other words, 'opportunity cost'. In terms of health care policy, this means that in choosing to pursue one particular option the opportunity of using the resources for some other desirable end is forgone. Therefore, cost-benefit analysis emphasises the need to consider not only the benefit obtained but also the benefit forgone. A further aspect of cost-benefit analysis that merits emphasis is that it is not concerned solely with the costs and benefits to the 'firm' or organisation directly involved but with the costs and benefits to society at large.

One strand of cost-benefit analysis which tends to arouse hostility in non-economists is the idea that the costs and benefits should all be expressed in monetary terms. However, if comparison of costs and benefits is to be made explicit, a common measuring rod is needed to allow a 'balance sheet' to be drawn up.

In economic analysis, there is no conceptual difference between a cost and a benefit. In the health sector both are particular consequences or effects of health programmes but are valued with opposite signs: unfavourable effects being 'costs' and favourable effects being 'benefits'. An ideal economic evaluation of health programmes (Drummond, 1980) should cover the enumeration and quantification of the following aspects:

(a) effects on health state, including the valuation of changes therein by the patient, experts and other members of the community;

(b) changes in resources that refer not only to the health service (financial aspects of treatment) but also to those resources supplied by the patient himself, such as time, which is typically not priced;

(c) changes in resources that fall outside the health sector, for instance, on local authorities and voluntary bodies; and

(d) changes in productive output due to changes in mortality and morbidity.

Often, problems of ignorance about the benefits of therapies emerge. This forces the analyst to make different judgments about the likely benefits, to subject them to sensitivity analysis and, thereby, to study the impact of these variations on the results of the appraisal.

4.2 Some Observations on Applied Cost-Benefit Analysis

It is difficult to deny the appeal of the objective of the cost-benefit approach to health care decision making i.e. to assist to maximise the net benefit of health care to society. If the costs of all available options were known, together with the relevant production functions (i.e. the relationship between the inputs - both health service and society's more generally (e.g. patients' time) - and the outcomes of health care); if the various outputs of health care could be measured satisfactorily; and if such outcomes could be valued in monetary terms, then the use of cost-benefit analysis would point automatically to the pursuit of all those things where the benefits were greater than the costs and, at the same time, lead to the avoidance of all those options where the costs exceeded the benefits. Everything would be rational in this world of perfect information. Unfortunately, this ideal situation

does not exist and because of this less than perfect reality, it has to be recognised that various difficulties arise in applying cost-benefit analysis in health care planning and resource allocation.

4.2.1 Issues of Identification and Quantification

First, while cost data regarding the resource use effects of health care programmes are available in general (although not so often in the precise form required) or are relatively easy to estimate, this is less likely to be the case for those costs falling outside the health sector. This is particularly true of the intangible costs falling on the patient and his or her relatives. While economic analysis has a comparative advantage over other disciplines in recognising the validity of including such costs, the measuring of them has been far from satisfactorily resolved especially with regard to the valuation of time and inconvenience costs associated with a given treatment or programme.

In the area of ante-natal care this is certainly the case; studies aimed at estimating the costs of maternity services (Gray and Steele, 1979; and Feldstein, 1967) or even studies aimed specifically at appraising ante-natal care in the framework of cost-effectiveness analysis (Ferster, 1976) have not taken explicit account of such costs.

Secondly, the nature of outputs in health care is such that they are both heterogeneous and difficult to measure: reduced mortality and morbidity, and increased quality of life. In this respect, and referring to perinatal care, Chalmers et al (1980) point to the tendency of studies in this field to give simple explanations based on dubious measures of perinatal outcome, such as crude death rates. For instance, the extent to which improvements in poor outcome in pregnancy are related to medical technology is debateable for:

> 'even if medical practice had remained unchanged in Europe and North America maternal and perinatal mortality rates would have continued to fall because of the relatively greater decline in fertility rates among groups at increased risk of maternal and perinatal death' (Chalmers, 1977).

In particular, insufficient knowledge of cause-specific perinatal mortality and insufficient differentiation between underlying environmental, social and biological factors contribute to make the measurement of perinatal health status difficult. Chamberlain (1979) and Chalmers (1979) also point to the fact that, at the conceptual level,a great many problems related to the inadequacy of the definition of perinatal outcomes arise from 'technocratic' notions of health which fail to define it as a dynamic process of interaction between the organism and a changing environment.

Thus, it is not surprising that problems arise with identification and measurement of health care outcomes. Nonetheless, it is important to try to overcome these problems because of the ambitious nature of economic analysis in seeking a means of measuring all possible health states and changes on some unidimensional rod in order to quantify health status not only ordinally but also cardinally (Culyer, 1979). However, as Wright (1978) has suggested, output measurement in health care is an area in which economists have been responsible for some of the better research conducted to date, perhaps because of the relevance of utility theory (Culyer, Lavers and Williams, 1972) and the new theory of consumers' behaviour (Lancaster, 1966) as a conceptual basis for building such health status indices.

Related to this issue of the problems of outcome measurement, there is the question of the effectiveness of alternative regimes of medical care. While most of the practices of medicine undoubtedly produce some improvement in health status, very often the extent of the improvement remains unquantified. Medical science is reputed to be able to identify the efficacy of alternative therapies though often only clinical opinion is available rather than causal inference (Cochrane, 1972). This difficulty is acknowledged by Pole (1968) in his review of the economic appraisal of different screening procedures. In the area of perinatal health care three obstetricians also acknowledge the problem:

'we propose that a more rational framework for the evaluation of obstetric practice is needed: the quality of medical care depends on the extent to which interventions of proven effectiveness are properly applied to those who can benefit from them. Although there is nothing particularly novel about these views there are grounds for believing that these principles are widely ignored' (Chalmers, 1976).

'It may be both misleading and dangerous to attribute improvements in pregnancy outcome to our own professional efforts, and to underestimate the possibility that changes operating within society were at least partly responsible for this change ... Most of us who practise obstetrics are prone to make such optimistic statements - 'We have managed to get our mortality figures down by 3 per 1000 this year'. However the uncritical assumptions which underlie these claims are potentially misleading' (Kerr and Parboosingh, 1977).

While there are methodological and ethical problems in mounting controlled trials - specially in ante-natal care - to determine the extent of such effectiveness these are problems which only the medical experts themselves can solve. 'Cost-benefit analysis can encompass what is known to medical science, but it cannot be expected to make good what is not known' (Williams, 1974).

4.2.2 Issues of Valuation and Outcome Measurement

While it is not for the economist to establish how effective various programmes or treatments are, it must be stressed that unless this knowledge is forthcoming there is a possibility that the benefits forgone from pursuing relatively ineffective programmes may be substantial. Furthermore, as Culyer (1978) indicates, the problems of output measurement stem not only from the multidimensionality of health outputs but also from the fact that weighting health status for comparative purposes (whether ordinal or cardinal) involves a value judgment. Thus, the measurement of health cannot be divorced from the valuation of health and consequently from the problem of whose values are to be taken into account.

Again Kerr and Parboosingh (1977) make this point clear, by reference to the maternity services:

> 'Without advocating a retreat back to medieval practices it remains to be established that sophisticated methods of assessment of fetal welfare have influenced pregnancy outcome ... Furthermore a review of the obstetric services over the past 30 years leads us to the conclusion that there is an urgent need for detailed prospective evaluation studies to be carried out on many aspects of the maternity services; it is unsatisfactory to use retrospective - observational data to establish causal relationships. As well as examining the outcome of pregnancy by traditional perinatal statistics, evaluation studies should take more account of consumer satisfaction by ensuring adequate feedback information from patients'.

The problem of valuation is partly methodological and partly political. Attention is first focussed on the methodological issue. Of those studies which have attempted to measure benefit in monetary terms, the most frequently encountered approach is that which uses averted health service consumption and, employing the human capital approach, averted lost production in terms of age-earning profiles (Mushkin, 1962; Weisbrod, 1961; Klarman, 1965; Rice, 1966; and Conley, 1973). In this method the reduction of lost output is taken as the goal.

Less common is the approach of willingness to pay on the part of the individual. This is the more conventional demand orientated method involving trying to determine how much people are prepared to pay to avoid reductions in their present health status. One example is provided in the study by Jones-Lee (1976) where estimates of the value of life were obtained by presenting individuals with a hypothetical situation where safety was to be traded-off against extra income. Another example is that by Acton (1973) in his evaluation of different programmes to reduce mortality from heart attacks.

In other studies, no explicit attempt is made to measure benefit. In some of these it is implied that the costs are so great that the potential benefits could not possibly be of sufficient magnitude to justify these. An example of this type of study is provided by

Neuhauser and Lewicki (1975) who estimated, in a protocol given approval by the American Cancer Society, that the marginal cost of detecting a case of colonic cancer was $47 million. In other studies, it is implied that the costs are so small that the benefits are bound to be of a sufficient size to justify the project. An example of this is Chamberlain's (1980) estimate, in her study of family planning services, of the cost of avoiding an unwanted child.

The problem of whose values to apply is one of the key questions faced by any decision maker in health care in determining resource allocation. Drummond (1980) identifies three potential sources of values namely: the views of policy makers, the judgments of experts and the values of consumers. Economists frequently take the view that the consumer (the patient or potential patient in the case of health care) is the best judge of his own welfare or of the extent to which his utility is affected from a particular good or service. As Arrow (1974) has stated, this value judgment is 'based on the general presupposition that an individual is more informed about his own wants and needs than anyone else.'

4.2.3 Decision Makers' Valuations

As was discussed in chapter 3, the extent to which consumer sovereignty is applicable or appropriate in health care is open to debate. In particular, the type of care relevant to a patient's needs would seem to be more the province of the medical profession. What the cost-benefit approach does imply is that individuals and society should be the ultimate judges of the relative worth of alternative forms of output of health care. At the same time it has to be recognised that individuals do suffer from considerable imperfections of knowledge and information with regard to their own health status and the likely impact of health care on it, frequently act inconsistently with respect to their health and face major uncertainties.

It has to be concluded, however, that there are relatively few studies in the health care sector which have been conducted as full cost benefit analyses. This paucity of applications of this ideal concept arises largely because in the real world situation perfect information and measurement do not exist. It is also partly explained by the controversial nature of the goods health and health care (as examined in chapter 2) which often require some redefinition of conventional economic tools. Thus, cost-benefit analysis is perhaps better considered as a framework within which health care valuations and decisions can be made systematically and explicitly thereby exposing these internal calculations to verification and justification.

At an applied level, with regard to the nature of the analysis, much will depend on the level of appraisal which is appropriate and this in turn will be dependent on the correct specification of the objectives of the analysis. Thus, if the issue is how to pursue a given objective, without consideration of relative worth and value of outcome, then cost-effectiveness analysis is sufficient. This still means in practice that enumeration and quantification of all the relevant tangible and intangible effects of a given set of options must be considered (changes in health service resources, changes in the resource of patients and the community, changes in health status, etc.). If difficulties with outcome valuation are important, but too costly to overcome, it may be possible to use the implied values approach to compare the relative efficiency associated with present decisions and allow decision makers to become more consistent and more efficient.

In practice, the analysis of implied values is aimed at identifying the value associated with an additional unit of output within the options being appraised. If the analysis reveals that for the same type of output the implied value per 'marginal' unit of output is higher in one

case than another, then this implies overspending in the former option relative to the latter. Therefore, by redeploying resources from the former option to the latter, the trade-off in output should be such that the reduction in output in the former area will be more than offset by increased output in the latter and an overall net gain in efficiency will be obtained. Consistent and efficient decisions would suggest that at the margin in each option for like outputs like expenditure should be incurred.

In this way, while the principles of cost-benefit analysis are not avoided, a simplified algorithm of economic evaluation can increase the efficiency of decision rules. Since it is impossible to have perfect knowledge of all the implications of all the different options, health care policies, programmes, treatments, etc., the cost-benefit framework nevertheless does allow for different flexible approaches to examine the following aspects implied by an efficient choice:

(i) the resource use or costs involved by the programme being appraised in whatever way these can be measured;

(ii) the outcome achieved by the programme in whatever way this can be measured;

(iii) the opportunity cost involved in opting for one option rather than another, considered over a range of options.

Economic evaluation can thus make a contribution to the improvement of health care decision-making, particularly in the sense that the cost of poor decision-making is the forgone benefit involved in not pursuing a more efficient policy, with a resultant loss of health for the community.

In such circumstances, whether consumer sovereignty can or cannot be appropriately applied in health care decision making is a key issue. In the end, this decision is a matter for social or political judgment. In the meantime, and in practice, decision and policy makers are already implicitly valuing benefits in health care.

It has been suggested (Mooney, 1977; Sugden and Williams, 1978) that the valuation of outcomes could be pursued by disentangling such 'implied values'. This would mean accepting that the consumer is not sovereign in health care and that he would consent to, or even welcome, the intervention of an 'informed third party' or 'expert' to bear the costs of the frequently difficult decisions to be made. The use of these implied values in economic evaluation would in essence require the acceptance of the concept of need, as defined earlier, as opposed to that of conventional economic demand. An example of how, in practice, decision makers are implicitly valuing benefits in health care is provided in the study of dialysis by Buxton and West (1975) which indicates the 'implicit social value' attached to the benefits of such care. This is derived by deducting the measurable economic benefits (i.e. health service costs averted and lost output saved) from the treatment costs and suggesting that the 'gap' remaining is filled by the 'implied value' of the non-measured benefits. In similar vein, Gould (1971) has shown that the implied value of a child's life in the UK Government's decision in 1971 not to introduce legislation to make drug containers childproof was less than £1000.

The determination of these implied values underlying existing policy making is thus aimed at ascertaining possible inconsistencies in the framework of the cost-benefit approach. In this way, resource allocation can be made more efficient.

4.3 Economic Evaluation in Ante-natal Care

In this section the use of economic appraisal in ante-natal care is reviewed. An early study by Levin (1968) on cost-effectiveness in maternal and child health provides an example of a particularly poor approach to cost-effectiveness analysis. With the possible exception of the estimate of costs, all the other stages of the analysis are incorrectly approached. First, the objective of the study is defined in the most wide and general terms: 'making needed maternal and child health services available and accessible to all, and particularly to all expectant mothers and children in health depressed areas' (which were taken to be 56 counties of the United States). In addition three subordinate objectives were proposed: 'to reduce the incidence of infant mortality rates, to reduce unmet dental needs, and to reduce the incidence of preventable handicapping conditions and the prevalence of uncorrected handicapping conditions in children'. Secondly, the programmes appraised are all self-contained and are not presented in 'choice' situations. These include fluoridation, family planning services, intensive care for hip-risk neonates, etc.

While costs were estimated as a financial appraisal of the resource use of every programme and did not focus on alternative use of resources, either those of the health care sector or of patients, the identification of benefits was based on piecemeal information 'from several municipal health departments' combined with published and unpublished data, experience and professional judgments. No effort was made to quantify effectiveness by experimental, epidemiological or medical evidence. The weakness of this information was made worse by the way in which the analysis of cost-effectiveness was conducted. For the $10,000,000 hypothetically spent on each programme the author ranked the cost-effectiveness ratios as if the outcomes were comparable with each other. He thereby broke a basic rule of cost-effectiveness analysis in that, only if output is genuinely comparable, can alternatives be compared.

Another study, which is also nationally orientated, is the cost-effectiveness evaluation which supported the Perinatal Care Programme implemented by the French Ministry of Health between 1970 and 1975 (Ministere de la Sante Publique et de la Securite Social, 1970). This constitutes an improvement over that by Levin. First, the objectives were clearly defined in terms of a projected rate of reduction in perinatal mortality and morbidity. Secondly, a group of seven programmes was identified and considered as reaching the same objective in terms of reductions in rates of perinatal mortality and morbidity. The cost study identified and valued resource use, including that in the community. A major effort was made to measure the relative effectiveness of each programme through a nationwide epidemiological survey (Rumeau-Rouquette et al, 1974) on the conditions of pregnancy, delivery and health status of the neonate. No effort was made to value the benefits attributed to each programme but effectiveness was quantified in terms of the number of deaths and handicaps avoided for a period of 15 years. The ratio

$$\frac{\text{Cost over 15 years}}{\text{Number of lives saved without after effects}}$$

was used for purposes of comparison.

Hagard, Carter and Milne (1976) undertook a cost-benefit analysis of the secondary prevention of births affected by Down's Syndrome, the programme consisting of routine ante-natal diagnosis of Down's Syndrome with termination of affected pregnancies. Costs of running the programme were calculated and different rates of expected incidence were used to estimate incidence by five-year maternal age groups. Benefits were, however, interpreted rather narrowly as the savings to the community of the care - permanent care, education, lost maternal income, etc. - of averted mongoloids. The identification of costs took account not only of the running costs of providing the programme but also costs of work time lost, travelling and other patient-associated resource use. No

attempt was made to identify the intangible costs. Under certain reasonable assumptions it was estimated that the economic benefits, calculated as avoided extra expenditures, would exceed costs.

The same authors (Hagard et al, 1976) used a similar scheme of calculations to assess the costs and benefits of a screening programme for spina bifida and concluded that screening may be worthwhile only in populations in which the incidence of spina bifida is high. While perhaps useful as a systematic way of approaching the problem of calculating the costs of screening and the costs of caring for a cohort of handicapped, the analysis does not indicate what would be required to determine whether or not to proceed with the programme.

Glass (1975) also conducted an economic evaluation of a preventive programme for Down's Syndrome in a similar manner, noting that for women over 35 the financial savings were less than the costs borne by the public sector and by the families. The savings exceeded the costs in the case of screening all women over 40, whereas the same programme administered to women aged 35 to 39 showed that costs were greater than savings.

Conley (1973), as a part of his comprehensive work on the economics of mental retardation, undertook an appraisal of the social value of preventing handicap using cost-benefit analysis as a basic framework. He set out to evaluate the worthwhileness of four preventive programmes on Down's Syndrome, phenylketonuria, rubella and measles. While the costs were estimated by reference to previously existing estimates, the 'value of prevention' on the benefit side was clearly based on the human capital approach and relied on the identification and measurement of the differences in earnings, productivity gains, and savings in institutional, developmental and maintenance costs between a mentally retarded and an 'average' person. In each case the evaluated programmes were found to be

clearly justified. Conley, in this study, made a distinction between the 'replacement' situation - termination followed by a further pregnancy - and the 'non-replacement' situation - one in which there is not a subsequent pregnancy, thereby raising interesting questions about the welfare of the potentially affected fetus and the analytical treatment (i.e. is a fetus part of society?) of benefits accruing to it. While acknowledging the limitations of this study - mainly associated with the human capital approach used - it is worth noting its value as a benchmark to which later applied work has referred.

The work of Bush, Chen and Patrick (1973), on evaluation of the New York State PKU (phenylketonuria) screening programme, represents an interesting departure from the limitations of Conley's study in that they develop a health status index which incorporates not only a quantified measure of changes in health status in terms of weighted ability to function according to each level of mental retardation, but also an empirically determined estimation of the attached social values. Such an approach based upon the identification of key dimensions - mobility, physical activity and social activity - of health and a ranking of social values associated with each combination of dimensions has been considered (Drummond, 1980) as an important improvement in the search for better ways for assessing changes in health status per se.

These examples show the problems of conducting a full cost-benefit analysis but at the same time point to useful insights. For example, in any attempt to explore the consequences of a screening programme an important point is to study how costs and benefits accrue at different points in time. Glass, in his study on Down's Syndrome, deals with this kind of problem, making his estimates of costs and benefits on a range of assumptions about the mortality rate and age of institutionalisation of mongols. But some limitations are also present. Again uncertainty

may arise on reliable estimates of prevalence (see, for example Kushlick and Cox, 1973; and Neligan et al, 1974) because of a basic lack of relevant information and wide differences among available estimates.

In a recent survey on the application of economic evaluation to perinatal preventive programmes, Akehurst and Holterman (1978) point to the tentative and still unsatisfactory balance of contributions in Britain, especially when compared with the use of economic appraisal techniques in ante-natal policy in France (Rousseau, 1975). More recently the Parliamentary Report on Perinatal Policy (HMSO, 1980) has confirmed this present lack of comprehensive economic evaluation of perinatal programmes. Akehurst and Holterman, after a review of published work, suggest ante-natal care and neonatal intensive care as the most promising areas where cost-benefit analysis could usefully be directed but they also refer to the lack of relevant evaluative epidemiological and clinical information.

It is not surprising that Hurst's study (Hurst, 1977) underlines how little is known about the evidence of a positive and unambiguous causal relationship between improvements in ante-natal care and reductions in adverse perinatal outcomes. Regression analysis of annual changes in neonatal mortality indicated that the only statistically significant explanatory variable was the change in the number of births of low weight. Neither an index of maternity service inputs nor a measure of the availability of special care baby facilities was found to be statistically significant. Such superficial indication of the performance of ante-natal services attributed to maternity care inputs was also found by Ashford et al (1973) who reported as much better explanatory variables, low and high birth weight.

Absence of relevant epidemiological and clinical appraisal in the provision of ante-natal care is also stressed by Chalmers (1977 and 1979) in his critical account of the state of causal inference in obstetrics and the general misuse of conventional measures of perinatal mortality and morbidity.

An earlier investigation by Ferster et al (1976) on the economic aspects of ante-natal care, involved a retrospective, cross-sectional study of the current provision, practice and utilisation of ante-natal care in three different districts of England, in order to assess their economic consequences and to identify relevant patterns of ante-natal care which were effective in improving performance. The ultimate aim of the study was "to suggest a set of cost-effective policies which could be implemented in different local situations as well as to suggest guidelines for selective revision of national policy'. Patients' hospital notes, hospital obstetric records and patients' general practitioner notes were used as a primary source of information on the resources provided during the ante-natal period for two populations: perinatal deaths and births surviving at least seven days. In addition information on maternal characteristics, type of delivery and duration of hospital stay was also gathered. Evidence was obtained on different patterns of provision of ante-natal care and selected measures of perinatal outcome and obstetric intervention.

The results confirmed that women not seen at the consultant unit either during their pregnancies (i.e. prior to the 28th week) or prior to delivery exhibited higher perinatal death rates and used relatively more NHS resources. Alternative strategies of ante-natal care provision were compared by means of an alogrithm enabling a distinction to be made between different patterns of ante-natal care according to type of ante-natal supervision recorded as well as the corresponding period of

gestation. Also important in this study was the discussion on the most useful measurement of perinatal outcome, giving rise to the use of birth weight based indicators and to not so convincing throughput measures such as intensity of care provided and length of in-patient post partum stay. No other evaluation of changes in health status of the neonates was pursued. The study pointed to the possible benefit for women receiving consultant-unit ante-natal supervision at some stage in their pregnancies and consequently suggested changes in the current system of ante-natal care introducing a more consistent high risk screening mechanism were made. More selective use of intensive care for low-risk patients was also proposed: 'A cost-effective use of the consultant-unit facilities would, however, not necessarily be to devote intensive care to high numbers of low-risk patients throughout their pregnancies.'

Conclusive evidence, based on a fairly complete economic appraisal, was not available from this study because of the fact that the costs associated with each alternative were not quantified in full. In the absence of a proper assessment of the relevant costs and benefits and thereby a systematic comparison of the outcomes associated with each pattern of care and its cost the conclusions reached were divorced from any very clear decision rule.

This review of existing studies has allowed an appraisal of the existing and potential problems involved in economic evaluation of ante-natal care. At the same time, while some useful studies have been conducted on a few specific screening programmes in ante-natal care, no wholly satisfactory economic appraisal of ante-natal care per se has been conducted. Thus while it has been possible to draw from existing research, there has been no 'model' study on which to base the economic analysis of ante-natal care conducted by the author and which is described in detail in the next two chapters.

CHAPTER 4

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CHAPTER 5 ANTE-NATAL CARE: CHARACTERISTICS AND PROVISION

5.1 Ante-natal Care: Overall Objectives and Means

As is apparent from a study of any textbook on obstetrics, ante-natal care has come to be accepted as one of the basic ingredients in the provision of good obstetric practice (Gibbs and Gibbs, 1979; Caldeyro-Barcia, 1980). It consists of all the procedures in the care of a pregnant woman from, and including, the diagnosis of pregnancy to the onset of labour. It is primarily preventive medicine for the pregnant woman but potentially, at least, may be curative (or tertiary preventive) if diagnosis of complications of pregnancy and identification of the high risk patient indicate hospitalisation and/or special treatment.

As Davies (1977) states, unlike almost any other specialty in medicine, the care of women in pregnancy is mainly a physiological one - there is nothing abnormal in the process itself. As a result the overall objective of ante-natal care is normally taken to be the prevention of abnormalities, or, where they do occur, to recognise and diagnose them at a sufficiently early stage to minimise their effects. The problem is not pregnancy per se but rather certain complications that may threaten its successful conclusion. Ante-natal care is thus best viewed within the context of the broad spectrum of maternity care services, the objectives of which have been defined by the WHO Expert Committee on the Midwife in Maternity Care (WHO, 1966) as follows:

> 'The object of maternity care is to ensure that every expectant and nursing mother maintains good health, learns the art of child care, has a normal delivery, and bears healthy children. Maternity care in the narrower sense consists in the care of a pregnant woman, her safe delivery, her post-natal care and examination, the care of her newly-born infant, and the maintenance of lactation. In the wider sense it begins much earlier in measures aimed to promote the health and wellbeing of the young people who are potential parents, and to help them to develop the right approach to family life and to the place of the family in the community. It should also include guidance in parent craft and in problems associated with infertility and family planning.'

Against this background, ante-natal care might then be described as the complete supervision, surveillance and management of the pregnant woman designed to maintain, protect and promote the physical and emotional health and wellbeing of the woman and the newborn infant.

A historical perspective illustrates the changing scope and nature of ante-natal care. Ballantyne in 1900 (cited by Chamberlain, 1976) summarised the aims of ante-natal care as:

(i) the ante-natal diagnosis of monsters

(ii) the treatment of medically defined disease

(iii) the prevention of fits.

Chamberlain pointed out that the general aims of ante-natal care can be summarised as the pursuit of problems of early detection in order to prevent conditions predisposing to handicap and to present the mother and fetus to labour in the best possible state. He has also laid down the following objectives for ante-natal care:

(i) management of detectable conditions;

(ii) presymptomatic screening of disease; and

(iii) psychological preparation for childbearing.

It is thus possible to identify, as relevant dimensions of the objectives of ante-natal care, <u>prevention</u>, <u>treatment</u> and <u>information generation</u> for the improvement of the management of labour.

5.1.1 High Risk Screening

Ante-natal care is thus aimed at

(i) <u>screening</u>: assessment of risk during pregnancy;

(ii) <u>monitoring</u>: surveillance of obstetric complications which may arise during pregnancy;

(iii) <u>treatment</u>: management of obstetric complications identified.

While it is accepted that the management of the complications of pregnancy requiring in-patient hospitalisation is part and parcel of the concept of ante-natal care, this present study concentrates in general on (i) and (ii), and consequently on out-patient ante-natal care.

There appears to be a general consensus that a crucial dimension of ante-natal care lies in the identification and selection of pregnant women whose fetuses and/or themselves are 'at risk' (Baird, 1954; Aubry, 1973; Hobel, 1973; American College of Obstetricians and Gynaecologists, 1974; Rumeau-Rouquette et al, 1976; OMS, 1977; British Births 1970, 1978).

Following Stenbera (1976) high risk pregnancies can be defined as 'any homogeneous subpopulation within which the probability of occurrence of perinatal mortality and morbidity is much higher than in the population at large'. Examination early in pregnancy can help in forecasting many abnormalities which may occur during pregnancy. Contemporary obstetrics has witnessed the universal practice of identification of high risk and a number of schedules of these risk factors, often disaggregated into different groups and presented in terms of increasing gradient of risk, have been published.

Such identification has normally been based on studies of the incidence of perinatal mortality and morbidity associated with particular populations and particular factors. Tables 5.1 and 5.2 show different approaches to this issue, from which it can be seen that any assessment of risk must be derived from the presence of various objective factors arising (age, social class, parity, etc.) and more subjective conditions to be determined after examination of the woman. Usually the assessment of risk is a dynamic process which continues throughout pregnancy and which uses an antepartum data base as a baseline against which potential problems can be identified. Such problems vary clinically: it may be a diagnostic

Table 5.1

Risk factors in pregnancy

Risk factors by history:

1. Patient less than 15 or more than 35 years of age
2. High parity (>5)
3. One or more previous premature labours or history of low birth weight infants (<2500 grams)
4. Excessively large previous infants (>4000 grams)
5. Previous Caesarian section or uterine operations
6. Previous significant dystocia
7. Two or more previous abortions
8. Previous stillbirth or neonatal loss
9. Suspected incompetent cervix
10. Medical indication for termination in previous pregnancy
11. Previous diagnosed abnormalities of the genital tract
12. Previous history of need for special neonatal care
13. Previous infant with a known or suspected genetic or familial disorder
14. Previous severe emotional problems associated with previous pregnancy or delivery.

Risk factors which develop or are present in early pregnancy:

1. Maternal diabetes mellitus
2. Psychiatric disorder
3. Marked nutritional abnormality
4. Malignancy
5. Unresponding urinary tract infections
6. Suspected ectopic pregnancy
7. Suspected missed abortion or trophoblastic disease
8. Severe hyperemesis
9. Exposure to potential teratogens
10. Positive serologic test for syphilis
11. Pregnancies complicated by medical disease (endocrine, renal, cardiac, hypertensive, etc.)
12. Anemia not responsive to iron therapy
13. Drug addiction including alcoholism
14. Rh isoimmunization (or positive irregular antebody screen)
15. Severe, unresponding infection.

Risk factors which develop in later pregnancy:

1. Third trimester uterine bleeding
2. Toxemia of all classes
3. Polyhydramnios or oligohydramnios
4. Prenatal fetal demise
5. Thrombo-embolic disease
6. Multiple pregnancy
7. Need for fetal maturation studies
8. Inappropriate fetal growth for gestational age
9. Persistent abnormal presentation
10. Postdate pregnancy

Table 5.1 (contd)

11. Premature rupture of membranes
12. Premature labour
13. Induction of labour
14. Tumor or other obstruction of birth canal
15. Suspected feto-pelvic disproportion
16. Active genital herpes
17. Abnormal glucose tolerance test

The following conditions may require consultation and/or high level of specialised care:

1. Severe pre-eclampsia and eclampsia
2. Severe isoimmune disease
3. Intra-uterine growth retardation
4. Unexplained previous perinatal death
5. Labour at less than 34 weeks gestation
6. Anticipated severe neonatal infection
7. Anticipated need for neonatal surgery
8. Major complications which may significantly alter the usual management:
    a. Diabetes mellitus requiring insulin;
    b. Severe toxemias of pregnancy;
    c. Serious cardio-respiratory disease;
    d. Serious renal disease;
    e. Malignancy;
    f. Severe, unresponding infection;
    g. Severe haemoglobinapathy;
    h. Drug addiction.

Source: Committee on Perinatal Health, USA, 1976.

Table 5.2 Perinatal mortality causes and associated risks during pregnancy

Neonatal (perinatal) Mortality Causes and Associated Risks/Complications

Mortality Causes	Associated Risks and Complications During		
	Preconception	Pregnancy	Labour Delivery
Prematurity with or without: hyaline membrane disease CNS bleed other anoxic damage infection hypocalcemia hypoglycemia requirement of tube feeding with aspiration risk asphyxia requiring resuscitation with attendant risks, or stillbirth	previous stillbirth previous premature birth previous neonatal death parity ≥ 5 previous uterine malformation weight < 100 lbs. birth interval < 17 months maternal education < 12 years poor maternal nutrition previous Caesarean section (C-section)	incompetent cervix Rh sensitization smoking (>pk/d) kidney infection amniotic fluid infection multiple pregnancy poor nutrition narcotic abuse social stress hormonal deficiency eclampsia, toxemia induced abortion mistake in gestational or maturity clinical assessment	premature labour (<37 weeks gestational age excessive anesthesia fetal acidosis premature labour induction premature C-section
Malnutrition with or without: pneumonia asphyxia hypoglycemia hypocalcemia pulmonary hemorrhage	previous stillbirth previous neonatal death parity > 5 maternal age > 35, < 17 hypertension renal disease diabetes (>class A) poor nutrition chronic lung disease Rh negative disease	placental insufficiency ischemia associated with one or more of the following: severe toxemia severe diabetes hypertension smoking (> 1 pk/day) poor nutrition multiple pregnancy low oxygen tension Rh isoimmunization hormonal deficiency causing poor fetal growth fetal distress with meconium in fluid	pre-eclampsia eclampsia meconium aspiration

Table 5.2 (continued)

Mortality Causes	Associated Risks and Complications During		
	Preconception	Pregnancy	Labour Delivery
Infection	maternal infections urinary tract genital herpes tuberculosis	rubella, 2nd and 3rd trimester herpes simplex cytomegalovirus syphilis tuberculosis toxoplasma E. coli, Listeria, etc. premature rupture of membranes	hospital borne staphylococci streptotococci viral infection
Isoimmunisation with or without: kernicterus heart failure hypoglycemia anemia prematurity	Rh negative mother with Rh positive father	Rh sensitisation amniocentesis complication trauma fetal anemia jaundice fetal death	premature labour induction or C-section
Lack of Oxygen with or without: resuscitation with attendant risks CNS bleed anemia	birth interval < 17 months previous placental/uterine pathology parity > 3	abruptio placenta	fetal distress/anoxia associated with one or more of the following: abrupto placenta placenta previa premature placenta separation prolonged labour cephalo-pelvic disproportion cord prolapse compression, knor or entanglement around neck excessuve pitocin uterine rupture delay in emergency C-sect excessive anesthesia

Table 5.2 (continued)

Mortality Causes	Associated Risks and Complications During		
	Preconception	Pregnancy	Labour and Delivery
Birth Injuries	diabetes	small fetus large fetus	abnormal presentation forceps Caesarean section prolonged labour excessive pitocin precipitous labour cephalo-pervic disproportion
Congenital Anomalies	maternal age > 35 previous fetal anomaly chromosomal defect other genetic problem habitual abortion maternal diabetes	rubella alcoholism drugs radiation polyhydramnios oligohydramnios fetal death	

Source: Modified from Hobel, 1976 and Swyer, 1975

problem - diabetes, anemia; a physical malfunction - heart disease, gynaecological disorder; historical reproductive performance - previous caesarean section, previous perinatal loss; related to a laboratory test - positive serological finding; or a medical condition - uterus large for dates.

Thus, the assessment of risk consists of a continuous evaluation of the prognosis for both mother and infant throughout the pregnancy. Such risk assessment is aimed at ensuring that the patient's needs (medically defined) first are identified and thereafter qualify for being met in accordance with the priorities attached to such need (again normally medically determined). It has become increasingly common to estimate the relative severity of risk in order to separate different groups of risks, on the basis very often of awarding points or weights to different severities, thereby allowing the computation of scores of weighted risks. This is the system used in the last British Perinatal Survey which is reproduced in Table 5.3.

The nature of ante-natal care can be complex. Routine clinical investigation with physical examinations, laboratory analyses and special tests (when required) may contribute to the identification of obstetric complications or other major causes of reproductive inefficiency. For example amniocentesis can detect congenital abnormalities; the main dangers of toxaemia, diabetes and haemorrhage can be reduced through early recognition. From the point of view of this study these points help to emphasise

(i) the importance of early ante-natal assessment;

(ii) the desirability of surveillance throughout the gestational period; and

(iii) the dynamic nature of any system of risk assessment.

Table 5.3 Risk factors and scoring for ante-natal prediction

(Source: British Births 1970, 1978).

	Score
Maternal age	
20-29	0
<20 and 30-34	1
35 and over	2
Parity	
1 and 2	0
0 and 3	1
4 and over	2
Social class	
I and II	0
III	1
IV, V and unemployed	2
Unsupported mothers (single, separated, divorced and widows)	2
Previous obstetric performance	
Still birth	4
Neonatal death	4
Abortion	4
Caesarean section	4
Medical history	
hypertension (BP 140/90 or more before 20 weeks gestation)	4
Diabetes	4

An additive score from the above constitutes the basis of the Ante-natal Prediction Score in the following tables. If any attempt were made in the future to use a scoring system for the population as a whole on the prospective basis, it is suggested that the following items be added to the above.

Height <62"	1
Smokes 5 cigarettes or more per day	1
Previous obstetric history	
Antepartum haemorrhage	2
Postpartum Haemorrhage	4
Immature delivery 36 weeks or less	2
Low birthweight infant 2500 gms or less	2
Previous or present medical history	
Cardiac disease	4
Chronic respiratory disease	4
Chronic renal disease	4
Endocrine disease	4

5.2 The Provision of Ante-natal Care by the Unit under Study

5.2.1 The Health Care System in Catalonia: An Overview

Catalonia, as a recently administratively autonomous Spanish region, has the same characteristics regarding its health care system as Spain. Thus both are based on a mixture of national health insurance (social security) and private market orientated medical care. Over 85% of the population is covered by social security which provides comprehensive health care, zero-priced at the point of consumption and which is financed by means of a combined contribution, essentially a tax on both employers and employees. The economically active population, and others entitled to benefit, also obtain cover for their dependants.

In this particular study part of the observed population used a mixture of private ante-natal care, provided outside the Unit and 'free' social security cover. The reason for this split is due in part to the nature of the regulation by social security of maternity care. Expectant mothers seek and receive attention from general practitioners. Normally consultant care is only provided from the sixth month of pregnancy onwards. Earlier attendance requires a special request from the GP, backed by the district medical inspector. Although this is the general pattern of 'shared' care there are a few exceptions to this which are difficult to explain on purely institutional grounds. (For example, hospital personnel, nurses, doctors and their relatives, tend to take advantage of special regulations.)

The Unit normally operates under conditions of excess demand partly because of its own resource (particularly manpower) limitation; but also because of the lack of well defined hospital boundaries or 'catchment' areas for the intake of clinics. At the moment any woman living even outwith the limits of the Metropolitan Area of Barcelona can present herself to the Unit and ask for ante-natal care provided she is covered by social security and has the agreement of her social security inspector.

A further reason for pressure on the Unit lies in the uneven distribution of good quality and 'free' obstetric care in Barcelona, which results in a situation whereby, as people become better informed about the feasible alternatives, they tend to try to be admitted to the better departments. This is the case of the Unit under study, the Department of Gynaecology and Obstetrics which belongs to a social security and charity based hospital, namely Saint Pau's Hospital in Barcelona,

5.2.2 Description of the Unit under Study

The Unit under study is situated in a general teaching hospital which has a contract with social security to provide ante-natal and obstetric care at zero-price, to users covered by the social security system. Private care is also available but seldom demanded. The Department of Gynaecology and Obstetrics is also attached to the Autonomous University of Barcelona. The Unit has close contact with the hospital because of the joint use not only of surgical, laboratory and ancillary services but also of other departments and specialities (e.g. Endocrinology, Cardiology and Urology). The services provided by the Unit are as follows:

Ante-natal out-patient services

Ante-natal in-patient care

Obstetric care (labour, delivery and post-natal care)

Intensive post-natal care

Gynaecological out-patient clinics

Surgical gynaecology

Gynaecological post-operative care

The current operation of the Unit has been described in detail elsewhere by Esteban-Altiriba (1979) the chief consultant at the Unit. The conduct of pregnancies is based on a general screening study at the first visit, followed by routine monitoring of normal pregnancies or alternatively through selective screening and special control of high risk pregnancies in those cases identified as being at risk. The operation of selective criteria is thus the hallmark of the system, accounting for both the clinical decisions on the management of every pregnancy and, less explicitly, group patient management.

The general screening study provides the data base for all patients on which to estimate the date of delivery, to make an assessment of nutritional levels, to make an early assessment of the level of risk, and thereby to plan the appropriate course of pregnancy care, management of labour and post-partum care.

The main components of general screening are:

(i) History: e.g. demographic data (age, marital status, etc.) and history of past pregnancies (number of previous pregnancies, interval since last delivery, etc.).

(ii) Physical Examination: e.g. blood pressure, height and weight.

(iii) Laboratory Tests: e.g. complete blood count and serology.

Selective screening may include:

(i) Tests: e.g. genetic counselling, determination of estriol levels and amniotic fluid.

(ii) Ultrasound and sonography: these are used to assist in e.g. the diagnosis of pregnancy, confirmation of fetal life and growth, fetal heart rate monitoring, visualisation of suspected malpresentation.

The medical staff is composed of: 1 chief consultant (who is Head of Department), 3 consultants, 2 senior registrars, 9 registrars, 5 senior house officers and 4 junior house officers

and non-medical staff: 4 chief nurses, 4 clinic nurses, 4 labour-room nurses, 6 ward nurses, 1 chief administrator and 4 clerks.

The Unit delivers approximately 1500 births each year.

The ante-natal care section operates mainly on an out-patient basis, though there is also an in-patient service. Doctors conduct general check-ups and examinations, and prescribe routine and special tests, which are conducted by the general hospital laboratory department, and treatment. Nurses perform routine tasks such as weight measurement, urine tests, and blood pressure examinations. Administrative staff are in charge of the booking system and administration more generally.

Table 5.4 shows the composition of the current medical staff during the period in which the study was carried out (October 1979-October 1980) together with estimates of their time spent on ante-natal care and other duties.

5.2.3 Nature of the Care Provided

At the Unit, the first visit by a woman is considered to be the most important because it is then, reflecting in part poor communication with GPs, that assessment is made of gestational age, previous obstetric history and medically associated conditions. From these a decision is made on the appropriate stream of care to be followed during the remainder of pregnancy. Subsequent visits allow confirmation of the appropriateness of the pattern of care previously set, early screening of unexpected obstetric complications and the diagnosis of conditions of risk calling for further intervention.

Table 5.4 Monthly schedule of medical staff at the Department of Obstetrics and Gynaecology

	Number	Total hours	Ante-natal clinic	Gynaecol. clinic	Surgery	Labour and delivery wards	Ultrason-ography	Post-natal (others)	Management
Head of Department	1	30	-	-	-	-	-	-	30
Consultants	3	95	10	25	15	10	-	5	30
Senior Registrars	2	74	10	10	10	34	-	10	-
Registrars	9	321	23	78	45	136	20	19	-
Senior House Officers	5	270	40	30	25	170	-	5	-
Junior House Officers	4	216	15	30	20	136	-	15	-

Routine pregnancy care includes systematic controlled maternal adaptation, control of fetal growth, supervision of maternal nutrition, updating of the risk assessment and of plans for the remainder of pregnancy, and labour and postpartum periods. Routine tests include:

(i) Physical examination: e.g. blood pressure reading and weight control; and

(ii) Laboratory tests: e.g. urinalysis for albumin and sugar control and testing for syphilis.

In both routine and high risk cases it is the philosophy of the Unit's staff to increase the frequency of visits in the last few weeks of pregnancy, especially once the full gestational age is reached. For neither group, however, is there provision of patient education, parent-craft or support programmes to assist women in labour and delivery.

The identification and assessment of abnormal laboratory and/or physical findings in combination with other sources of information (past obstetric history, general medical condition, etc.) leads to a decision on which patients can be managed safely as out-patients and which should be admitted as in-patients. Table 5.5, from the survey undertaken for the study, shows the distribution of causes of admission for in-patient ante-natal care during the period of the study. Of those admitted over 90% were from the high risk groups.

5.2.4 Organisation of and Access to Ante-natal Care

Once the patient has been accepted at the Unit for ante-natal care, the general pattern, thereafter, consists of a first visit to assess risk level, followed by a variable package of visits combined with selective and/or routine tests which differ in frequency and indications according to the first risk assessment and subsequent reassessments during gestation. However, this systematic method of management of ante-natal care, with

Table 5.5 Reasons for in-patient ante-natal admission

	Number	Percentage
1. Control of high risk:		
(i) threat of pre-term labour	30	40.0
(ii) other reasons[1]	39	52.0
2. Gynaecological	4	5.3
3. Other	2	2.6
Total in-patient admissions	75	100.0

1. Other reasons include vaginal bleeding, toxaemia, renal failure and fetal growth retardation.

reference to the risk criteria, does not apply to the procedures for initial admission. Three main factors contribute to an explanation on how access operates: the system of ante-natal and obstetric arrangements under the Spanish social security system (already outlined); the peculiar position of the Unit within the overall framework of ante-natal care in the region; and the way in which the Unit's waiting list for ante-natal care operates.

Patients seeking ante-natal care are confronted with three possibilities:

(a) obtaining some basic ante-natal care through their GPs;

(b) getting private ante-natal care from private doctors;

(c) applying, as early as possible, to the Unit and getting either (a) or (b) during the waiting time.

The Unit performs, unofficially at least, the role of a specialised referral centre for high risk cases. Indeed, a considerable number of obstetric patients with problems or obstetric emergencies from all over Catalonia can be, and are, referred to the Unit. The absence of a formal perinatal network in the region, together with the lack of established catchment areas to regulate cross-boundary flows of patients, results in there being no recognisable or systematic pattern.

With the exception of emergency cases, access to the Unit for a first visit is based on administrative criteria, rather than any medical criteria of priorities. Thus a woman who seeks ante-natal care at the Unit will be told to come and queue at the Unit on the first of the month following. On that day women will be allocated, on a first come first served basis, a first visit during the next month, and even then only insofar as capacity exists in that month to take on new patients. Those at the end of the queue simply have to try again on the first of the next month (or obtain ante-natal care elsewhere). For the purposes of this

study, the main consequence of such an organisational framework of access is that it is these administrative arrangements, together with the willingness of the potential users to spend time queuing (the latter very much a consumer sovereignty and hence demand based phenomenon), rather than any pre-assessment of risk factors, which are crucial in any consideration of access, confirming the importance of the timing of the first contact with the Unit.

5.3 The Setting of the Applied Study

Data Collection

A survey was conducted, over the period from 21 October 1979 to 31 August 1980, of 1060 consecutive women attending the Unit. The initial design of the two questionnaires, one for the women and the other a clinical one, was composed, by the author, after a review of the relevant literature and of questionnaires used in other surveys and studies related to perinatal health services (Birth Record - Cardiff Hospitals and Cardiff Domiciliary 1970; Scotland Perinatal Mortality Survey 1977; British Births 1970, 1978.) Dr Chalmers provided advice on current literature. Early advice on questionnaire design was obtained from Mr Mazzarino of the Institute of Economics and Statistics at the University of Oxford.

A first draft of the questionnaire was piloted by the author during the last two weeks of September 1979 and redrafted early in October. At the same time a pilot of the clinical questionnaire was performed in one week by a junior registrar of the Unit in order to adapt the first draft to take account of the system of records and files kept by the Unit.

The final design of the questionnaire (see Appendix 5.1) was available by the second week of October 1979 and incorporated both changes from the pilot with regard to the understanding of and communication with

patients as well as the results of a discussion with Dr Esteban Altirriba (Head of Department) Dr Calaf and Dr Cabera (Consultants) together with Dr Escribano (a junior doctor who remained in charge of the administration of the clinical part of the questionnaire throughout the study.) The questionnaire form was pre-coded and both users' and clinical questionnaires were linked for punching and type recording.

From 21 October to 15 November 1979, the author administered the questionnaire and supervised the training of two junior doctors (Dr Hernandez and Dr Prat) who took over the administration during the rest of the survey. In May 1980, a postgraduate economist (Mr Orriols) became involved in the administration of the questionnaire as well as that of the costing questionnaire. (Details below.) The punching and type recording was done in the computer centre of Boeringuer Laboratories in Barcelona. The computer analysis and statistical advice were provided by the Statistician (Miss Fordyce) of the Department of Community Medicine, University of Aberdeen.

The patients' questionnaire was administered to all women who delivered singletons at the Unit during the survey period. They were normally interviewed during the third or fourth day of post-partum stay at the lying-in ward of the Department of Obstetrics. Every effort was made to contact and interview women at home who, for various reasons, were discharged earlier or were not interviewed at the ward. No refusal to this interview was reported. The patients' questionnaire provided information on the variables shown in Appendix 5.1.

The clinical questionnaire was administered by the same doctors throughout the whole study period. This involved the shift of the recorded information for every woman from her obstetric file to the precoded questionnaire. Gaps in the appropriate data in these files was the main reason for not having complete information for every patient.

This was reflected in a rate of missing values of 13.1% (which was particularly evident when the composite variable 'risk groups' was produced). This resulted in a loss of information on 141 cases. There is no reason to believe however that such omissions in any way resulted in a biased sample.

5.4 Economic Analysis and Ante-natal Care

There are at least two important aspects to the relevance of economic analysis in the allocation of ante-natal care. First, ante-natal care consumes scarce resources, skilled personnel, equipment, time of users, etc., and is a scarce commodity itself, as is evident from the size of the waiting list of the Unit under study and from the fact that some patients have to go without ante-natal care despite having applied for it. Secondly, ante-natal care is the object of valuation from different perspectives and for different groups of individuals. Experts view ante-natal care as being beneficial not only to a woman's health status but also to that of the child. Indeed, obstetrics is unique in the way in which it affects two individuals, whose interests may not coincide. Thus while there is normally a coincidence of interests between the pregnant woman and the fetus it is not uncommon for 'society' to take an active role on behalf of the fetus. A case in point is that of abortion in predominantly Catholic societies. Undeniably state intervention has increased in controlling the process of reproduction, amidst growing concern for the present and future welfare of the fetus as well as that of the mother, to the extent on occasion of removing from her the individual capacity to decide on her demand for ante-natal care (as witnessed recently in France (Wynne and Wynne, 1976)).

However, it is important to view ante-natal care as dependent on 'co-operative' behaviour. Pregnant women are not passive recipients of preventive services. On the contrary, only the willingness of the individual consumer to seek care and, thereafter, to participate in the medically orientated plan of control of her own pregnancy, can provide the best guarantee for the fulfillment of the purposes of ante-natal care. It may appear to state the obvious, but the implications underlying the personal commitment and understanding of the benefits accruing from ante-natal care will be different to the extent that the active role of the patient is or is not taken into account. In economic terms, this issue revolves round the relevance of the individual as a potential generator of demand.

It is also true that part of ante-natal care, especially some selective tests, and even more so of in-patient intensive ante-natal care are associated with the notion of preventive co-operative behaviour, in that the capacity to monitor individuals, regarding decisions on allocative consequences, are quite severely restricted. Indeed, when faced with a diagnosis of a condition that, in medical terms, qualifies for admission to ante-natal in-patient care, the childbearing woman can scarcely make any choice beyond simply agreement or disagreement.

Furthermore, as Chalmers (1979) points out, clinicians and experts tend to see the whole question of reproduction as a largely pathological process in which success or failure is measured in terms of medically defined outcome measures. The childbearing women, on the other hand, tend to regard the process of pregnancy as a normal and desirable part of their lives. Usually no ill patient is involved in pregnancy; therefore the mothers tend to value the success or failure of their reproductive experience - including the medical care received - in terms

of 'their own satisfaction with the experience and the impact it has on their lives' (Chalmers et al, 1980). Macintyre (1977), in summarising her views on the current management of pregnancy in contemporary Britain, suggests that 'women are not referred to ante-natal clinics as they are to gynaecological outpatient clinics, because something is suspected or known to be wrong with them; but rather because something is right with them.'

Such circumstances may play an important role in the configuration of different judgments and potentially conflicting objectives. That a difference in objectives in ante-natal care exists is well illustrated by the, by now, long and persistent debate on the general issue of consumers' versus doctors' conflicting views on maternity services (Chalmers, 1976). In the case of ante-natal care, it may well be that its objectives are formulated in a rather restricted professional way, for instance the constant reference to decreasing perinatal morbidity and mortality as the only dimensions of the objectives of ante-natal care. This may conflict with other possible definitions which might involve the social and emotional problems of the pregnant women and which require quite different solutions which cannot be provided solely by medically sophisticated technology. In other words the women may demand emotional support, information and reassurance.

It is not surprising that the so-called father of new ante-natal care in Britain, Ballantyne suggested eighty years ago (cited by Chamberlain 1976) that 'the removal of anxiety and dread from the mind of expectant and puerperal patients' should be the primary objective of those caring for childbearing women.

Thus, with regard to issues related to the content and objectives of ante-natal care, at least four different parties are involved:

(i) the childbearing woman;

(ii) the fetus and, potentially, its vicarious representatives in 'society' (law, etc.);

(iii) the professionals involved in the process of giving ante-natal care; and

(iv) society itself.

The debateable nature of ante-natal care, the various possible objectives, and the multiplicity of subjects and plurality of values placed on the outcome of ante-natal services, account for the essential elements that allow economic analysis to be applied to the matter of efficiency and allocative consequences of present and alternative forms of ante-natal care.

This short summary shows the potential that ante-natal care has for being interpreted in terms of economic analysis. Its main characteristics are the surveillance of a non-pathogenic condition and information gathering for labour management. One can therefore conclude that demand - a concept based on individual preferences and personal freedom of choice - might be a perfectly proper concept upon which to analyse present and future patterns of utilisation and resource allocation. At the same time, however, the alleged potential for preventing perinatal mortality and morbidity and the increasing concern of society to ensure widespread coverage of ante-natal screening suggest the appropriateness of the 'merit good' approach and, thereby, of a suitably defined concept of need. In any case, the importance of an early ante-natal assessment and the indication of a pattern of surveillance commensurate with the diagnosed level of risk, also suggest that, to some extent, the patient is bound to delegate some decisions to her medical agent. Consequently, there are good grounds for believing that various economic aspects of ante-natal care can be handled by means of some combination of the concepts of demand and need, and the interrelated concept of the 'agency relationship'.

Scarcity of resources for producing ante-natal services and the priorities for their allocation among competing groups of patients have obvious resource use and efficiency consequences, especially when it is apparent that agreement on the nature and valuation of benefits arising from ante-natal care is far from universal. In such a context, the application of the concept of need can be developed in meaningful economic terms e.g. explaining the economic consequences of attempting to meet current unmet need. Within this same context, the application of the approach defined in terms of individuals' demand will bring into consideration the frequently neglected valuations of the patients and their consequences in terms of current and expected utilisation.

The starting point of the analysis is the agency relationship which is translated in terms first, of utilisation and secondly, of outcome. While utilisation is the result of the complex behaviour of both producers and consumers, in terms of resources used, outcome is seen as the end product of the operation of the Unit and is defined in this study as the healthy condition, as assessed by medical personnel, of the neonate. The nature of the agency relationship, involving patients (pregnant women), the Unit's staff and third party financing (social security) are defined in relation to the operation of three elements: the concept of need, the patient's demand and budget constraints. Interaction between these three elements is reflected in current patterns of utilisation. By virtue of the concept of need, it is possible to focus attention on the rationale by which the medical decision-maker assesses the likely benefits of treating a given patient in a particular way, and in so doing committing scarce Unit resources to that patient. Need is defined not with regard to an individual patient but to the entire group of patients for whom the Unit is responsible. It thus embraces both the initial claim of the patient for attention and the alleged basis for the best technical answer to this claim. As is

discussed later, the concept of need, as used by this study, refers to the technical and socially (delegated) dimension for legitimising the conversion of individual wants for ante-natal care into demand and then into utilisation. It is defined in relation to three components: the current operational concept of risk, the associated, commensurate - and technically defined - 'ideal' pattern of ante-natal care, and the perinatal outcome.

Every precaution has been taken to translate, as accurately as possible, the current practice of the Unit in terms of need, as it is explicitly defined. Apart from providing a key to explain the way in which the observed agency relationship works in practice i.e. what are the criteria for assessing benefits against costs, interpreting the woman's tastes, and trading off her interests against those of other patients, the concept of need permits an investigation of the nature of unmet need or, as it is perhaps more commonly known in the medical administrative language, the nature of the 'shortage'. Furthermore, the operationalised concept of need allows for the testing of its implied effectiveness by comparing the extent to which patients, with their need being met in the medical sense, exhibit different outcomes as compared with patients for whom medically defined need has not been met. At the same time, the cost of meeting this unmet need is a measure of the extent to which present budgets or available resources fall short of what would be required to meet 'total need'. Information obtained on use of resources and social costs associated with the current utilisation of the Unit allow this costing of unmet need and an estimation of the underlying values which, by implication at least, are being placed on meeting such need. By virtue of such a study, it becomes possible to measure the extent of resource consumption which would be required to be invested for an average additional successful outcome when the definition of need was fully applied, that is, to estimate the implied valuation incorporated in the definition of need.

However, the agency relationship should ideally also incorporate the patients' interests. The extent to which the doctor, in his role of delegated decision-maker for the patients' welfare, succeeds in integrating patients' preferences is directly related to the degree of efficiency with which the agency-relationship operates. Demand is thus used as the analytical tool to bring the consumers' (or patients') preferences into the analysis. Thus, an aim of the enquiry was to determine to what extent individual patients' choice of consumption of ante-natal care was influenced by the medical decision-makers and to what extent that influence takes into account patients' preferences, in the form of the demand function for ante-natal outpatient care at the Unit. Inclusion of demand is an indispensible requirement for incorporating a crucial dimension of efficiency. It may well be that, under present circumstances, the way of running the Unit does not accord with patients' preferences. Willingness of potential high risk women to attend for early ante-natal care may be a case in point. There is thus a potential conflict within the current definition of the maximand of the Unit, i.e. to effect the highest possible level of successful births. Patients' preferences may well conflict with medically stated objectives. The example here is related to the feeling expressed (want, desire) that ante-natal care, as it is provided now, should include parentcraft, emotional support and more scope for information and discussion of matters related to reproduction, labour and delivery. (See Table 5.6.) If this is the case then the present definition of objectives of the provision of health care will not take account of patients' preferences in the social welfare function to the extent to which this is desirable.

Another piece of the fabric of the agency relationship, without which it is incomplete, is the extent to which the financing third party has its interests integrated with the patients' and the decision makers' criteria. In this study, it is assumed that the third party's values

Table 5.6 Topics about which mothers wanted more information

	Proportion wanting more information		Proportion content with amount of information received		No reply/don't know		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Information on fetal growth and course of pregnancy	238	22.5	816	77.0	6	0.6	1060	100.0
Information on nutritional status and diet	241	22.7	813	76.7	6	0.6	1060	100.0
Information on ante-natal exercises (breathing, pushing etc.) and parentcraft	871	82.2	183	17.3	6	0.6	1060	100.0
Information on basic facts about labour and delivery	741	69.9	313	29.5	6	0.6	1060	100.0
Discussion of management of labour	583	55.0	472	44.5	5	0.5	1060	100.0

regarding the desirability of ante-natal care and the relative priorities to be attached to different patients coincide with those of the medical decision-makers, i.e. the financing third party accepts the values underlying the concept of need, medically defined.

Society, as the provider of third party financing, becomes involved in the maximand and indeed in the agency relationship, largely because of the very fundamental constraint of the scarcity of societal resources. This dimension, the amount of society's resources devoted to the health service provision of ante-natal care, is clearly a relevant part of what are considered as costs (e.g. staff time, equipment and buildings). However, other costs are relevant, such as the patients' use of their own resources (e.g. work and leisure time).

Given that the current operation of the agency relationship is influenced by need, demand, and costs, as reflected in utilisation, the extent to which the existing agency relationship presently operates efficiently is assessed. To do so, the cost-benefit calculus underlying the agency relationship has to be identified. Indeed comparing the current agency relationship, and its economic implications, with a more efficient one requires the assessment of the extent to which the agency relationship operates efficiently, both technically and economically, and how these differ. Consequently it is necessary to define the dimensions of technical efficiency more precisely.

In the context of the Unit, a quasi-supply concept of need is used, (Williams, 1978) since the programmes being analysed exhibit positive marginal productivities, that is 'potential for avoidance of reduction in health status exists and potential for improvements in health status exists' (Culyer, 1978). But this raises the question: for whom? The 'whom' bit is important because effectiveness is being assessed in a rather complex situation. It can be argued that the effects of ante-natal care should be related not only to the care of pregnant women but <u>also</u> to

that of the unborn child. The choice has been made, in line with obstetric opinion, that the main objective of effectiveness relates to the child. However, and this is a unique characteristic of obstetric care, any effects on the health status of the child are the result of the intake of ante-natal care by the child-bearing woman. For analytical purposes women are seen as the consumers but the offspring is largely the beneficiary.

The consequence of all this is that in the definition of the relationship between ante-natal inputs and outcome i.e. the production function, the women are seen as consumers of ante-natal visits while the outcome is assessed with reference to the health status of the child.

The main objectives of the economic analysis can thus be summarised as:

(1) to identify to what extent with the existing level of resources redeployment of resources leads to a potential for reducing the current incidence of adverse perinatal outcomes through the uptake of ante-natal services;

(2) to point to the efficient use of resources associated with increased/decreased availability of resources;

(3) to consider the desirability of redefining need;

(4) to assess the relevance of the agency relationship; and

(5) to determine the prospects for influencing consumer demand for ante-natal care at the Unit.

Bringing together the relevant relationships examined in this and earlier chapters provides the basis for the empirical analysis. Thus information on effectiveness, need, utilisation and cost allows an analysis of current resource deployment, of possible increased/decreased resource deployment and of the implications in terms of costs and implied values, of attempting to meet total need, as defined by the obstetricians.

Thereby, it is possible to make recommendations on:

(i) the desirability of and prospects for 'shaping' future utilisation of ante-natal care;

(ii) the requirement (should it emerge) to redefine 'need' as a potentially useful policy tool; and

(iii) the reallocation of current and/or future resources both to and within the Unit under study.

The implementation of such recommendations can be fostered through the agency relationship of the Unit's staff, when presented with the relevant information on effectiveness, cost and patients' preferences.

5.4.1 Utilisation and Demand

The aim of the study on utilisation was to obtain an overall picture of the use of the Unit's ante-natal out-patient services by the relevant population of women attending. Utilisation is viewed as the observable consequence of patient management and data thereon are the most commonly available on consumption of health services. Feldstein (1966) and Evans (1974) warn about the shortcomings and limitations of using such data for demand predictions and for analysis of efficiency. This study has tried to take account of such warnings.

In the literature on evaluation of ante-natal care (Shwartz, 1962, 1965; Kane et al, 1964; Johnson and Hefferin, 1977; and Sokol et al, 1980) data on utilisation normally refer to

(i) number of visits during pregnancy; and

(ii) timing of the first visit and subsequent distribution of follow-up visits.

Some authors (Schwartz, 1962, 1964; Kane, 1964) point to the deficiencies involved in simply comparing quantitative patterns of care without standardising for gestational age, which, if not done, can have misleading consequences in the case of prematurity. The variables used

here to measure utilisation attempt to take account of this. Furthermore the distinction made between a first visit and a follow-up visit allows for the separation of the measurement of the two. On the one hand the start of ante-natal care, measured in terms of the gestational week at which the first visit took place, is considered to be the best variable available on which to base the measurement of quantity demanded by the patient. In effect it seems that, given the conditions of access to the Unit, with a waiting list of two months, and the characteristics of the administration of ante-natal care, the decision on <u>when</u> to present for the first visit is taken largely independently of medical suggestion or advice and is much more related to the patient's information, tastes and past experience. The <u>number</u> of visits is considered to be more a measure of doctor-induced demand for ante-natal care at the Unit. The decision to split visits in this way, apart from its conceptual basis, was taken because of the nature of the operation of the Unit i.e. a first general screening visit and thereafter allocation of the patient to different patterns of follow-up visits according to the assessed risk. (The 'defaulting' rate for follow-up visits, which was calculated for a sample of 2726 visits, is so small - just over 5% - that induced demand appears to be little affected by the option of patients to default.)

Thus, ideally, the estimation of demand would require the calculation of the quantity of ante-natal care that utilisers were willing to receive and back up with their resources, in terms of real assets such as time and comfort, assuming no resource constraints on the Unit. However, the analysis accepts this distinction between 'patient generated demand' and 'doctor generated demand', drawing on the discussion of this issue in chapter 3, in order to look beyond the crude data on utilisation to explore the underlying factors responsible for the individual consumer's behaviour as opposed to the behaviour observed in terms of the agency relationship. The demand for ante-natal care is thus taken to be the

process by which the pregnant woman perceives her need for ante-natal care and decides to make a call upon the provider. It is thus assumed to refer to the explicit claim for a first visit appointment at the ante-natal clinic of the Unit. Three considerations have to be taken into account here:

(i) The supply of ante-natal care is zero priced at the point of consumption, because it is financed by social security.

(ii) Unless an explicit claim is made, the Spanish social security only allows zero-priced ante-natal care from the sixth month of pregnancy onwards. Exception to this administrative rule requires the agreement of the medical inspectorate, normally granted only if there is a threat to the pregnancy.

(iii) Despite the location of the Unit in a particular district of Barcelona, the current Spanish health care system does not have defined hospital boundaries or catchment areas so that any pregnant woman willing to bear the time, travel and inconvenience costs can present herself to the Unit. The only other constraint lies in the available supply of ante-natal visits in the Unit, which is translated into a waiting list.

Having delineated the general assumptions and institutional constraints on demand for ante-natal care, as it is operationally defined for this study, demand is to be seen as the relationship between a vector of factors predisposing, enabling and limiting access on the one hand, and the quantity of first visits 'demanded' from the obstetric clientele during the relevant period on the other. In other words, demand for is not equivalent to use of ante-natal services. As stated earlier, utilisation is instead seen as depending on the assessment of need made by the staff and translated into a largely 'imposed' pattern of consumption of ante-natal services, measured in terms of number and distribution of visits.

5.4.2 Need

In the context of this study, the notion of need used is a medical one. In consequence, need indicates what type of ante-natal care each patient should receive according to the assessment of her risk, under certain assumptions about the effectiveness of the ante-natal care currently being provided by the Unit. As such, the relevant value judgments underlying the allocative consequences of need so defined are in principle technical ones and, by implication, the dimensions of the effect of ante-natal care are also technically defined. For these reasons, three main dimensions are involved in the definition of need in this study: risk assessment; the patterns of care commensurate with risk levels; and the definition of outcome. The main aims of the analysis of need were:

(1) to estimate the extent and nature of met and unmet need in terms of the definition of need as laid down by the Unit's staff;

(2) to indicate the cost of meeting such need;

(3) to obtain evidence on the effectiveness of meeting such need; and

(4) from the definition of need and estimated effectiveness to derive the implied valuations (in terms of cost and outcome) underlying the meeting of need in full.

The Unit staff was asked to state what they saw as appropriate patterns of care, commensurate with defined levels of risk. Their assessments are summarised in Table 5.7.

Table 5.7 Definition of 'need' by the Unit's staff: in terms of number of visits

Risk levels[1]	0		1		2		3	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Age at birth								
32 ⩽ 40 weeks	5	6	6	9	9	9	14	15
41 weeks	9	-	11	-	11	-	18	-
42 weeks	12	-	14	-	15	-	21	-

1. As defined in Table 5.8 below

The objective of risk assessment is to distinguish in the population of patients those groups deserving different degrees of ante-natal supervision. The staff of the Unit use the concept of risk of the WHO Expert Group (OMS, 1977) as the basis for redeploying resources as well as that of statistical risk reported by Rumeau-Rouquette et al (1976) from which, for the first time in France, the effects of various factors on adverse outcomes of pregnancy were identified.

The rationale underlying the operation of the ante-natal out-patient provision of care at the Unit under study consists of a screening process by which patients are assessed in relation to their probability of being at risk and thereby recommended to follow a pattern of ante-natal care. The current practice of the staff of the Unit thus consists of:

(i) identifying the presence of some risk factors;

(ii) assessing its importance; and

(iii) deciding to which risk group the patient is to be assigned.

The classification of patients by risk group thus becomes the overriding criterion against which the appropriate control of the pregnancy is tailored. Whereas at the individual, clinical level differences in the management of individual patients within the same risk group are possible, what is more relevant to this study is the aggregate pattern of management for the totality of patients in any risk group. When attention is directed to the whole population of patients receiving ante-natal care a normative 'ideal' (medically defined) pattern of visits related to each risk group emerges.

The definition of the staff of the Unit of groups at risk is based on the accumulated experience of the incidence of various factors in the obstetric population under the control of the Unit over the last 10 years. (See Table 5.8.) In this definition, if more than one risk factor in a given pregnancy is present the woman is categorised according to that factor which falls in the highest risk group. Thus the scoring of multiple risk factors is <u>not</u> additive.

Table 5.8 Definition of risk categories used by the Unit under study

Risk Group 0

Women seen at the Unit without any of the risk factors listed below

Risk Group 1

Interdelivery period (i.e. since last delivery) less than 12 months
Social class 4, 5
Associated pathology (health since conception, present illness)
Past pregnancy history (potential problems arising from past pregnancies)
First day of the last menstrual period (LMP) unknown or uncertain
Rhesus incompatibility
V.D.R.L. positive
Urinary tract infection
Hypertension (chronic)
Diabetes A
Heart disease I
First trimester uterine bleeding
Multipara, 4+
Age (<16, >35).

Risk Group 2

Toxaemia (mild condition)
Diabetes B or C
Heart disease II
2nd, 3rd trimester uterine bleeding
Suspected fetal growth retardation
Maternal infections (toxoplasmosis, listerioris, cytomegalovirus, rubella, etc.
Isoimmunisation
Malpresentation
Uterine malformation
Perinatal recurrent mortality
Endocrinopathies
Essential hypertension
Essential anaemia
Essential hypertension plus mild toxaemia

Risk Group 3

Toxaemia (severe)
Essential hypertension plus toxaemia (severe)
Eclampsia
Diabetes D
Heart disease III, IV
Placenta praevia (bleeding, central, marginal)
Threatened premature delivery
Renal failure

Other

Missing from the risk categories are women not seen at the Unit and those for whom incomplete data on risk factors were recorded.

Table 5.9 shows the observed distribution of risk among the population attending the Unit during the administration of the questionnaire. Those patients not seen at the Unit prior to their delivery could not, by definition, be categorised by risk. For some others (141 observations) there was not enough information in their records to allow for such classification. However there is no reason to believe that the omission of this group will in any way bias the results.

Table 5.9 Distribution of Risk Levels

	Number of patients	Percentage in each risk group
Risk group 0	251	31.9
Risk group 1	394	50.1
Risk group 2	72	9.1
Risk group 3	70	8.9
Total of risk groups 0-3	787	100.0
Women not seen	132	
Missing observations[1]	141	
Total	1060	

1. Women seen at the Unit with incompletely recorded risk factors.

In the definition of need, the concept of risk plays an important role in that it is against the defined levels of risk that the recommended patterns of ante-natal care are established. Patterns of care were defined in terms of a range of visits according to gestational age and corresponding level of risk, gestational age being incorporated as a reflection of the policy of the Unit to give close, 48 hour control to pregnant women with a gestational age greater than 40 weeks. The definition of need thus provides the medical rationale underlying the consequences for resource allocation of providing care at such a level

as to meet all need for women currently being delivered at the Unit and thereby the implicit valuation of need.

The application of the concept of need to the observed patterns of consumption of ante-natal care allows for the identification of adequate, inadequate and excess patterns of care, according to their respective specifications. Thus a patient in risk group 1, delivered between 37 and 40 weeks, would be classified as having inadequate, adequate or excess ante-natal out-patient care depending on whether she had less than 6 visits, 6 visits, or more than 6 visits respectively. While it is useful to be able to quantify 'excess' consumption, as defined by need, the major implication of such an analysis lies in identifying 'met need' and 'unmet need' (since adequate can be taken as being commensurate with met need and the difference between adequate and inadequate can be taken as being commensurate with unmet need.) The amount of unmet need when related to the effectiveness of ante-natal care and compared with the effectiveness associated with met need, together with the relevant information on costs, can then provide a picture of the current position as compared with the 'ideal' in terms of resource consequences and effectiveness i.e. what the increase in costs and effectiveness would be if all need, as defined, were met.

Perinatal mortality rates, which are the most commonly found measure of adverse perinatal outcome used, are, on their own, inappropriate in this study because of the small number of perinatal deaths occurring (21 in toto of which 6 were of fetuses of less than 1000 gr). The total figure is reduced to 15 if a strict definition of perinatal mortality is employed (i.e. numbers of still births and deaths of babies weighing more than 1000 gr in the first week of life). Congenital abnormalities were also small in number as were other available (though not so widely accepted) measures of perinatal morbidity. Such small figures for the

most adverse perinatal outcomes need to be emphasised because it is clear that the study was concerned with a Unit that is almost certainly close to technical efficacy according to current professional standards and wider environmental considerations. In effect, for 1975, the most recent year for which all the figures are available, whereas the crude perinatal mortality rate of the Department of Obstetrics was 15.7 per 1000, the rate for Barcelona was 17.7, for Catalonia 19.6 and for Spain as a whole 21.0 (Instituto Nacional de Estadistica, 1978).

A decision had to be made on what measure of adverse outcome to use to quantify effectiveness. Following some discussion with the staff of the Unit it was decided to use low birth weight and its potential adverse effects. As Chalmers (1979) has pointed out, although birthweight in itself is not a direct measure of perinatal outcome, it is clearly the best known underlying factor associated with death, clinical complications of the first week after birth and longer term effects on the quality of survivors (Neligan, 1976). Birth weight in association with gestational age provided two clearly defined groups of potentially adverse outcomes: light for dates and premature or preterm babies. Neligan identified both groups as having abnormalities of intra-uterine growth and used them in a comparative longitudinal study of their long-term effects. It was decided to follow Neligan's suggestion and use birth weight and gestational age to define the groups of smalls and preterm babies as key variables in separating the surviving population into normal and adverse outcomes. Whilst the definition of prematures consists of live births with gestational age lower than 37 weeks (as assessed by the Unit's staff), the definition of 'smalls' was based on the assessments by Lubchenco (1963) and Gruenwald (1966) of fetal growth and development curves showing the range of normal birthweight at each gestational age. Thus term babies with poor intra-uterine growth (i.e. 'smalls') were defined as all single

liveborns with gestational age equal to or greater than 37 weeks and with a birth weight less than the 10 percentile level, based on the distribution of weight and gestational age of the population delivered at the Unit over the previous 10 years. Figure 5.1 shows the relevant intervals for the distribution of birthweight and gestational age at the Unit.

A further group included as potential adverse outcomes was large neonates, defined similarly to smalls, but having a weight greater than the 90 percentile. In addition to these groups, infants referred to the Neonatal Intensive Care Unit (INCU) were also classified as adverse outcomes. Thus 'normal' outcome was defined as any livebirth with a gestational age of at least 37 weeks, not 'small', not 'large', not referred to the INCU and free from congenital abnormalities. 'Normal' and 'adverse' were then used as the indicators of effectiveness i.e. the more effective the pattern of care the higher the percentage of outcomes which would be normal.

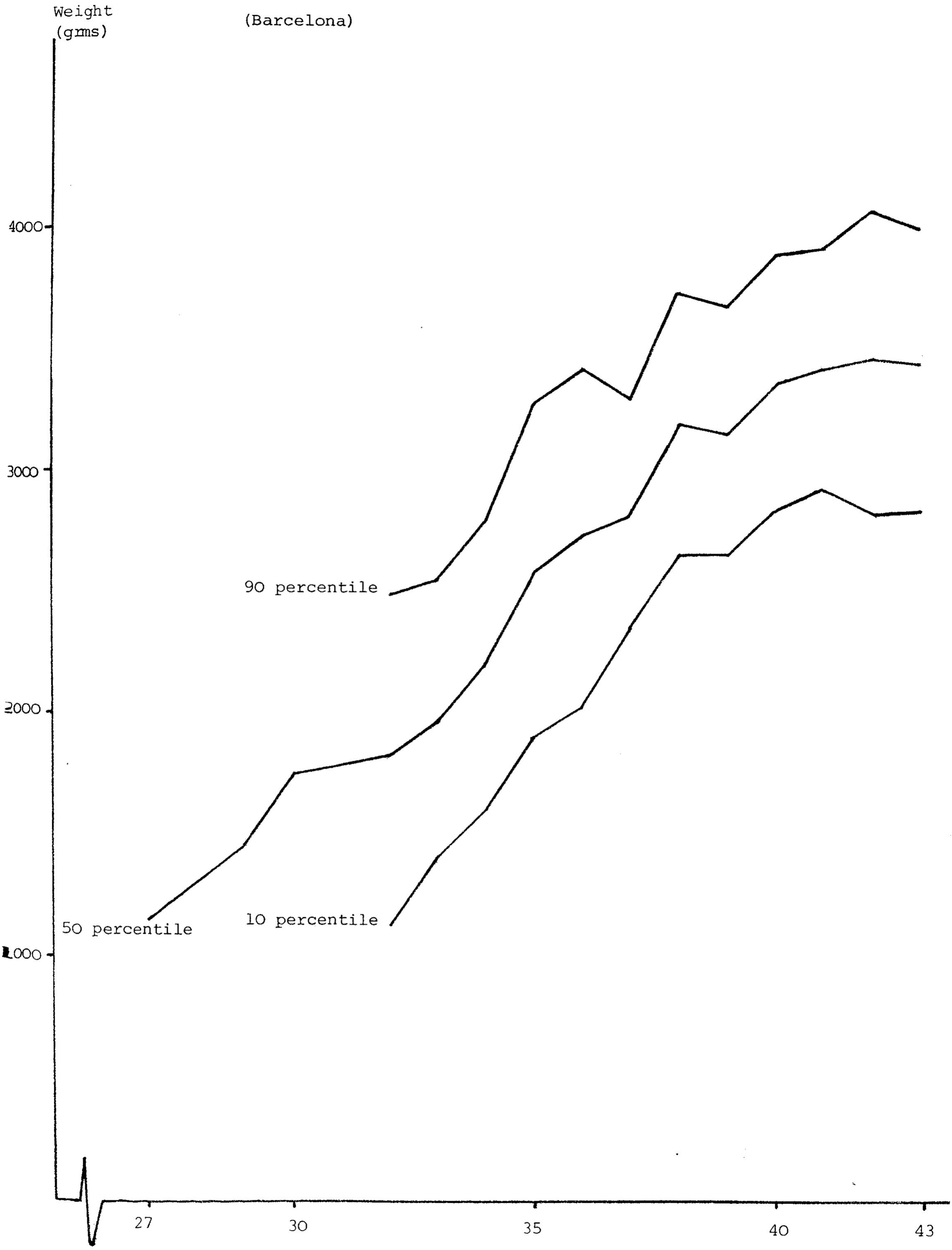
5.4.3 Effectiveness Study

The study of effectiveness was aimed at providing evidence on the effectiveness of ante-natal care as currently provided by the Unit. It attempts to estimate the effect of incremental utilisation of ante-natal care by groups at different risk levels, in terms of reductions in adverse outcomes. In other words the analysis is directed towards indicating, from the data generated by the current operation of the Unit, whether there is a potential for ante-natal care to improve the health status of the relevant perinatal population. Furthermore, it was possible to show how this potential is distributed among groups of utilisers who differ in terms of their respective risk conditions.

Figure 5.1 Birthweight and Gestational Age

St Pau's Hospital, Department of Obstetrics and Gynaecology

(Barcelona)



The records of the Unit together with survey information from surveys conducted specially for this study were used to obtain evidence on the extent to which observable patterns of utilisation of out-patient ante-natal care made a significant difference in terms of adverse outcomes, as defined above.

5.4.4 Costing Study

A further objective of the study was to estimate costs per visit. To this end a special survey, based on the approach of Magee and Omolski (1978), was conducted. In addition to information on the costs falling on the hospital some estimates of the social costs in terms of the users' time and other surrogate variables were available from the survey.

The technique used involved a special survey of a sample of 658 visits, aimed at determining the use of resources and the nature and distribution of such resources by type of visit and selective and routine procedures. The information obtained was as follows:

A. Average direct costs of:

(a) first visit (risk)

(b) first visit (normal)

(c) routine procedures, analyses and tests

(d) selective procedures, analyses and tests; and

(e) follow-up visits of each type as recorded by the Unit

B. Indirect costs, which were taken as:

(i) a proportion of the Unit's overheads, allocated first to ante-natal care (as opposed to other activities of the Unit) and then allocated pro rata with each type of ante-natal visit; and

(ii) a proportion of that part of the general hospital overheads attributed to the Unit was allocated to different types of ante-natal visit in the same way.

APPENDIX 5.1

QUESTIONNAIRES I AND II

PART I

Social, cultural and environmental information provided by the patient:

Questionnaire number

Clinical history number

Area of residence

Type of coverage (Full cover of ante-natal and obstetric care by social security (free)

Ante-natal and obstetric care partially covered by social security (and partially or totally private care).)

Number of visits during pregnancy without compensation from social security

Marital status

Period since last child

Size of household

Number of children under five years of age

Other people in need of care (e.g. handicapped) living with the patient

Difficulty in attending because of children under five

Who looks after children/ handicapped relatives during ante-natal visits

Occupation and working status before birth of baby

Normal hours per day at work

Leave of absence before birth

If leave of absence, length of time

If married, husband's employment status

Work status (manual or non-manual)

Skill (skilled, semi-skilled, unskilled)

Occupation, profession, trade (or description of activity). (Later used in classifying by social class).

PART I (continued)

Working status (employer, employee, self-employed)

Social class

Home ownership

Size of dwelling (number of rooms)

Car ownership (none, one, two, more than two)

Educational attainment

Level of completed educational studies

Source of confirmation of pregnancy

Month pre-natal visits started

Number of times seen by a social security doctor

Number of times seen by a private doctor

Number of times seen by a doctor belonging to the Unit

Total number of times seen

Seen enough (or not) during pregnancy

Satisfied with information on:

fetal growth

diet during pregnancy

ante-natal exercises, etc.

Total time per visit (including travel and waiting time)

Longest time for a visit

Type of transport used to get to the Unit

Time on waiting list

Source of referral to the Unit

PART II

Medical information

Age

Parity:

Term pregnancies

Still births

Premature

Live births

Medical history (e.g. diabetes, heart disease)

Obstetric history (e.g. previous Caesarean section)

Stage of pregnancy at first ante-natal attendance

Number of ante-natal visits at the Unit

Distribution of ante-natal visits during pregnancy

Obstetric risk factors (excessive weight gain, anaemia, rubella, toxaemia, etc.)

In-patient stay before delivery

Gestational age at admission

Length of in-patient stay

Reason for in-patient stay

Data on neonate

Gestational age at birth

Sex

Survival or mortality

Weight at birth (grams)

Data on neonate (continued)

Apgar score (at 1, 5 and 10 minutes)

Congenital abnormalities (by type)

Resuscitation required

Neonatal referral (e.g. to intensive care)

Reasons for referral to Neonatal Intensive Care Unit

Length of stay at Neonatal Intensive Care Unit

Labour and delivery data

Delivery (normal, induced, etc.)

If labour categorised as 'risk,' causes according to WHO classification

Administered drugs (occitoxics, sedatives, for slowing contractions)

Type of delivery (spontaneous, forceps, breech, etc.)

Post-partum in-patient length of stay

CHAPTER 5

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CHAPTER 6 ECONOMIC EVALUATION OF ANTE-NATAL CARE PROVISION

This chapter describes and analyses the present operation of the provision of ante-natal care by the Unit from the point of view first, of efficiency and secondly, of technically defined need. Current utilisation is appraised in terms of observed 'effectiveness' and an assessment is made of the extent to which women are receiving 'adequate' care, in terms of their technically defined need, according to their assessed risk. Both estimates are linked to relevant information on costs in order first, to conduct a cost effectiveness analysis and secondly, to estimate the cost of meeting need and to disentangle the implied valuations underlying this definition of need.

6.1 Background of Current Utilisation

The main characteristics of the population of users are presented in Table 6.1. More than 40% are from outwith Barcelona City which is some indication of the special role of the Unit as a referral centre within a health system with no formally defined geographical boundaries nor with a well established hierarchy of institutional in-patient, outpatient or community perinatal services. This explains why 15.5% of the intake of pregnancies have associated pathologies or bad medical histories and 12.7% have had previous bad obstetric performances. While some selective criteria such as average age of users as well as the relatively low proportion of multiparae seem to qualify them as a good obstetric population - more than 88% are between 17 and 34 years old and 96.5% 'supported' mothers - there is a clear predominance of lower social classes - 63.5% in Classes III manual, IV and V. Just over half the users are gainfully employed but nearly 60% have either no or very little formal education.

As mentioned earlier, in Chapter 5, there are several organisational constraints which militate against early attendance at the Unit. This pattern of delayed onset of ante-natal surveillance is illustrated by the fact that only 20% of the population have been seen for the first time by the 19th week. This means that systematic provision of screening procedures - such as alpha-fetoprotein screening - would not reach 80% of users (See Table 6.2). Mirroring this pattern

Table 6.2 Relative and cumulative percentage of users by onset of ante-natal care at the Unit (gestational age at first visit)

Gestation in weeks	No. of women seen for 1st time at the Unit	Relative percentage	Cumulative percentage
Less than 13 weeks	70	6.6	6.6
13 to 19 weeks	141	13.3	19.9
20 to 28 weeks	324	30.6	50.5
29 to 32 weeks	184	17.4	67.8
33 to 36 weeks	146	13.8	81.6
37 weeks and over	60	5.7	87.3
Not seen by the Unit	131	12.4	99.6
Not known	4	0.4	100.0
Total	1060	100.0	100.0

of late attendance, the overall pattern of visits is such that 20.8% of users have fewer than four visits and 12.5% none, i.e. they attend for delivery without any prior contact with the Unit. (See Table 6.3).

Table 6.1 Some users' characteristics (percentage of total population, N= 1060)[1]

Area of residence	% of total population
Barcelona (City)	57.4
Barcelona (County)	8.1
Outwith	34.5
	100.0

Age Distribution	% of total population
< 16	0.7
17 < 20	5.9
20 < 29	59.2
29 < 34	22.3
> 35	12.1
	100.0

Social Class	% of total population
I, II	13.5
III non-manual	23.0
III manual	38.5
IV, V	25.0
	100.0

Marital Status	% of total population
Married	96.5
Single and unsupported	3.5
	100.0

Education	% of total population
None	19.0
Primary school only	40.2
Elementary school	21.9
Arts and applied professional	14.1
University	4.7
	100.0

Time since last delivery	% of total population
Less than 18 months	8.2
From 18 months to 2 years	7.1
From 2 to 3 years	10.3
More than 3 years	30.0
First delivery	44.4
	100.0

Parity	% of total population
Primiparae	44.4
1	31.7
2	15.3
3	5.9
4 or more	2.7
	100.0

Gainful employment	% of total population
Working	50.9
Not working	49.1
	100.0

Medical History	% of total population
No associated pathology	84.5
Diabetes	4.0
Heart disease	1.5
Neurologic disorders	1.5
Obesity	1.0
Renal disease	0.7
Endocrinopathology	0.6
Other	7.0
	100.0

Past Obstetric Performance	% of total population
No obstetric condition	87.3
Perinatal loss	4.2
Prematurity	3.8
Caesarean section	2.0
Instrumental distocic delivery	0.7
Other	2.0
	100.0

1. There were some missing observations in these tables (in no case exceeding 1% of the total)

6.3 Distribution of ante-natal outpatient visits at the Unit[1]

Number of visits	No. of users	Percentage of users
1-4 visits	221	20.9
5-7 visits	350	33.1
8-13 visits	336	31.7
More than 13 visits	20	1.9
Not seen by the Unit	132	12.5
Total	1059	100.0

1. One missing observation

The expected inverse relationship between gestational age at first visit and the total number of visits was apparent. (See Table 6.4).

Table 6.4 Relationship between number of visits and gestational age at first visit

Number of visits	Median Gestational Age at First Visit (weeks)
1 to 4	32.5
5 to 7	27
8 or more	22

One of the possible reasons underlying this late onset of care could be the way in which the waiting list is administered with a clear lack of any positive or systematic attempt to discriminate in favour of those exhibiting some objective risk factors: age, parity, past obstetric performance, etc. While it it not clear to what extent the Unit's staff could play a more active role by effecting changing patterns of access to the waiting list (within the current

administrative rules of the Spanish Social Security which is the main funding institution) there are solid grounds for reassessing the management of the waiting list: 19.6% of women have to wait from 4 to 8 weeks while nearly a third wait more than 2 months for a first visit. Further study shows that a sizeable proportion of users try to compensate for the delayed first visit by substituting ante-natal care provided elsewhere, namely at the social security GP's surgeries and by private doctors. Thus some 52.4% of users reported having seen a GP ante-natally at least once and 26.8% reported having been seen by a private doctor. However the poor linkage system and the unreliable obstetric information carried by the women using these other services are the main reasons alleged for the Unit's staff treating a woman presenting herself for the first time at the Unit as a first ante-natal contact irrespective of whether any ante-natal supervision has already been obtained elsewhere.

When utilisation, in terms of the total number of visits at the Unit, is analysed by social class, it is apparent that women in social classes I and II had, on average, more visits than those in the lower social classes and they also attended earlier in their pregnancy. (See Table A6.1 in Appendix 6 where all tables prefixed 'A' are located.)

As for parity, the relationship obtaining in this study seems to support previous findings and behaviour reported elsewhere (Butler 1969; and Chamberlain et al, 1978). While primigravidae and women with parity 1 and 2 are more likely to attend early as compared with women with parity 3 and over, higher intake of ante-natal visits also appears to be related to primigravidae and low parity women. On the other hand, the highest proportion of women delivered at but not seen ante-natally at the Unit belongs to those with parity of at least 3: 26% of the latter compared with 10% of primigravidae. (See Table A6.2.)

Less clear is the association between utilisation and levels of risk which is dealt with in more detail in the following sections. As was foreseeable, an attempt to explain variations in utilisation without a clear explanatory model is likely to lead to limited conclusions. For our purposes, utilisation of ante-natal care provided by the Unit under study has been seen as what emerges as the effect of supply behaviour, doctor orientated but intertwined with demand behaviour, related to the extent to which users are able and willing to express their preferences. While the latter part of the analysis, i.e. the demand study, is conducted to try to explain the relevant factors influencing the onset of care (timing of the first visit to the Unit) the supply orientated side will be dealt with by means of a simple, but comprehensive, model of the agency relationship in which, having established the grounds for effective provision of care, doctors are faced with costs and users' preferences in order to reassess the current efficiency of their resource allocation decisions. The following sections establish and develop the various pieces of the analysis conducive to a study of cost effectiveness and implied valuations upon which the assessment of the efficiency of the Unit and recommendations for change are made.

6.2 Effectiveness Analysis

The effectiveness analysis is aimed at providing information on the relationship between the inputs involved in the provision of ante-natal care and the outcome observed in the relevant population. It attempts to determine whether there are significant differences in the proportion of adverse perinatal outcomes associated with different observed regimes of ante-natal outpatient care, within a given group of patients

defined as having a particular risk level by the staff. To this end, groups of patients categorised by risk level and attending for different numbers of visits are compared and the observed proportions of 'adverse outcomes' are calculated. However, prior to this examination of the observed effectiveness, some of the potential sources of bias associated with factors like preterm deliveries, intake of in-patient ante-natal care and obstetric intervention are discussed.

6.2.1 The Setting

As mentioned in chapter 5, adverse outcomes were defined as deaths, smalls, preterms, heavy for dates, congenital malformations and referrals to intensive care. However in the context of identifying the effectiveness of ante-natal outpatient visiting care has to be exercised in including preterms. Thus if (as was the case) there is a negative correlation between number of visits and the probability that a birth will occur pre-term, two explanations for this are possible: (i) the 'adverse outcome' is a result of the infrequency of visits; or (ii) the infrequency of visits is a result of the fact that the birth occurs pre-term. Since it is the former in which interest lies in the effectiveness analysis it was necessary to attempt to unravel this.

Table 6.5 Pattern of ante-natal outpatient visits in preterm deliveries[1]

Number of visits	Preterm Deliveries	Total Deliveries	Preterm as Percentage of Total Deliveries (%)
0	13	132	9.8
1 to 4	27	221	12.2
5 to 7	9	350	2.6
8 or more	5	356	1.4
Total	54	1059	5.1

1. One missing observation

First, Table 6.5 shows that the probability of a preterm birth is greater with less frequent visiting ($\chi^2 = 39.148$, d.f. = 2, $p < 0.001$). Secondly, an investigation was made of the timing of the first visit of mothers who had preterm births in relation to their frequency of visiting. Of those who attended for ante-natal care and who could be identified both by number of visits and timing of first visit (25), all (18) who had less than 5 visits were late attenders (i.e. the onset of care was after the 20th week) and all (7) who had 5 or more visits were early attenders. Thus while this evidence is not conclusive it suggests that the small number of visits among mothers with preterm deliveries is much more related to late attendance than to the delivery preterm curtailing the opportunity for ante-natal visiting. Thus it was felt legitimate to retain preterms as one possible indicator of adverse outcome of little ante-natal care.

The alternatives being appraised, i.e. differing levels of use of ante-natal outpatient care, are defined in terms of numbers of ante-natal outpatient visits. This involves two kinds of input: the medical input - doctor's time, paramedical staff time, routine tests, selective tests, etc. - and the patient's own time. Although traditionally established good obstetric practice has stressed the importance of both early attendance and frequent visits, in this study these two have been subsumed under 'number of visits' because there is a consistent direct relationship between early attendance at the Unit and the number of visits to the Unit, as indicated in Table 6.4. Consequently it was decided to use as a simple and more straightforward measure of input: the number of visits to the Unit by each woman.

It should be noted that as an underlying assumption visits have been taken to be 'homogeneous', at least in the sense that the doctors involved belong to the same 'team', share similar technical judgments with regard to the conduct of pregnancy and supply the 'same' service.

Another component of the overall surveillance of pregnancy is obstetric care at labour and delivery. Its influence on perinatal outcome cannot and should not be ignored, even although the extent of this influence is not directly a part of this study. (Indeed the nature of the problem and the data available are not wholly amenable to its analysis.) However, an attempt is made to determine whether obstetric intervention shows any systematic relationship with the level of intake of ante-natal care and/or adverse outcomes.

The concept of 'obstetric effort' is used to refer to the degree to which intervention occurs in the management of labour and delivery, and involves the presence of one or more of the following:

(1) Emergency and planned Caesarian section, instrumental delivery, breech delivery (as opposed to spontaneous caefalic delivery);

(2) administration of betaminetics;

(3) administration of occytocin;

(4) determination of pathological pH heath scalp sample of fetal blood;

(5) electronic fetal heart-rate monitoring (rather than just auscultation).

The pattern to emerge (see Table 6.6) is not consistent. For patients with relatively few visits obstetric effort is statistically significantly greater in the case of administration of betaminetics than for those visiting more frequently. The reverse is true for instrumental deliveries, administration of occytocin and electronic fetal monitoring, while for Caesarian section, breech delivery and pathological pH determination there is no significant difference. Overall therefore it may be that to ignore the effects of obstetric effort on the relative effectiveness of different amounts of ante-natal outpatient visits may result in some under- or over-assessment of such effectiveness. However

Table 6.6 Obstetric effort: association between number of visits and obstetric intervention[1]

Mode of Intervention	Number of visits	
	Less than 5 (n=353)	5 and over (n=697)
	Percent	Percent
Caesarean section	7.6	6.9
Breech delivery	3.7	2.9
Instrumental delivery*	35.4	47.5
Administration of betaminetics*	9.6	5.7
Administration of occytocin*	45.0	56.2
Pathological pH determination	3.1	3.6
Electronic fetal heart monitoring*	56.4	71.6

1. Ten missing observations
* Statistically significant, $p < 0.05$ (χ^2 test)

Table 6.7 Outcome, number of visits and type of intervention

Mode of Intervention	Less than 5 visits		5 or more visits	
Mode of Intervention	No. of inter-ventions	Percent with adverse outcome	No. of inter-ventions	Percent with adverse outcome
Caesarean section	27	59.3	48	47.9
Breech delivery	13	61.5	20	20.0
Instrumental delivery	125	24.8	331	20.8
Administration of betaminetics	34	67.6	40	3.0
Administration of occytocin	159	28.9	392	22.4
Pathological pH determination	11	45.5	40	25.0
Electronic fetal heart monitoring	199	30.7	499	20.8

In all modes of intervention (except pathological pH determination) the differences in adverse outcome were statistically significant, $p < 0.01$ (χ^2 test)

from the evidence presented there is little to suggest that this influence will be more than slight. Certainly for all types of intervention in Table 6.7 the proportion of adverse outcomes is consistently higher for low utilisers as compared with high utilisers (the difference as indicated by the asterisks being statistically significant in most cases).

The fact that some patients receive in-patient ante-natal care in addition to (or as a complement to) outpatient ante-natal care has potential implications for the general pattern of effectiveness, and hence for this study. An analysis of (i) those patients who received in-patient care and (ii) the extent to which the relationship between number of visits and proportion of adverse outcomes varied, with and without in-patient care, was conducted. It was possible to show, for risk groups 2 and 3 (which account for 93% of total in-patients), that the same general trend in effectiveness applies to both in-patient and 'non-in-patient' women. (See Table 6.8). However, the proportion of outcomes which were adverse was not significantly different for women with 5 or more visits as compared with those with fewer visits, for either in-patient or non-in-patient women.

Table 6.8 Adverse outcomes by number of visits for outpatient users who had or had not in-patient care. (Restricted to risk groups 2 and 3, constituting 93% of all in-patient cases. See Table 5.8.)

Number of visits	No In-Patient Care Adverse Outcome		In-patient Care Adverse Outcome	
	No.	Percent of Total Outcomes	No.	Percent of Total Outcomes
1 to 4	15	71	10	42
5 and more	10	42	22	27

6.2.2 The Results

The analysis of effectiveness was carried out with the aim of estimating variations in outcome arising in groups of utilisers with different levels of intake of out-patient ante-natal care, given their risk conditions. These risk groups had the patterns of visits shown in Table 6.9 A group of non-users of Unit ante-natal care (but who were delivered at the Unit) was identified for which no assessment of risk conditions during pregnancy was available. In addition a group of 141 women had to be omitted from the analysis because information reported on them was insufficient to allow categorisation by risk.

Figure 6.1 shows the general trend of a decreasing proportion of adverse outcomes with increasing numbers of visits. It can be seen that, although the differences for individual risk groups were not statistically significant, patients in risk group O, with less than five visits (pattern A), had a 9.3% higher probability of adverse outcome than patients in the same risk group receiving pattern B i.e. 5 to 7 visits. In risk group 1, and risk groups 2 and 3 combined, the respective, comparable figures were 5.4% and 25.7%.

When all groups were taken together the difference in observed incidence of adverse outcomes was found to be statistically significant on the χ^2 test ($p < 0.01$). Figure 6.1 depicts the association between observed and expected adverse outcomes by number of visits and a comparison is made of observed/expected outcomes weighted by women in each risk group and number of visits. While the general trend of increasing effectiveness is apparent, the increased marginal effectiveness of higher visits is less clear. A much larger sample would be required to make predictions on such marginal benefits. Nonetheless there is a clearly defined trend of diminishing returns associated with pattern C as compared with patterns A and B. Therefore comparisons between patterns

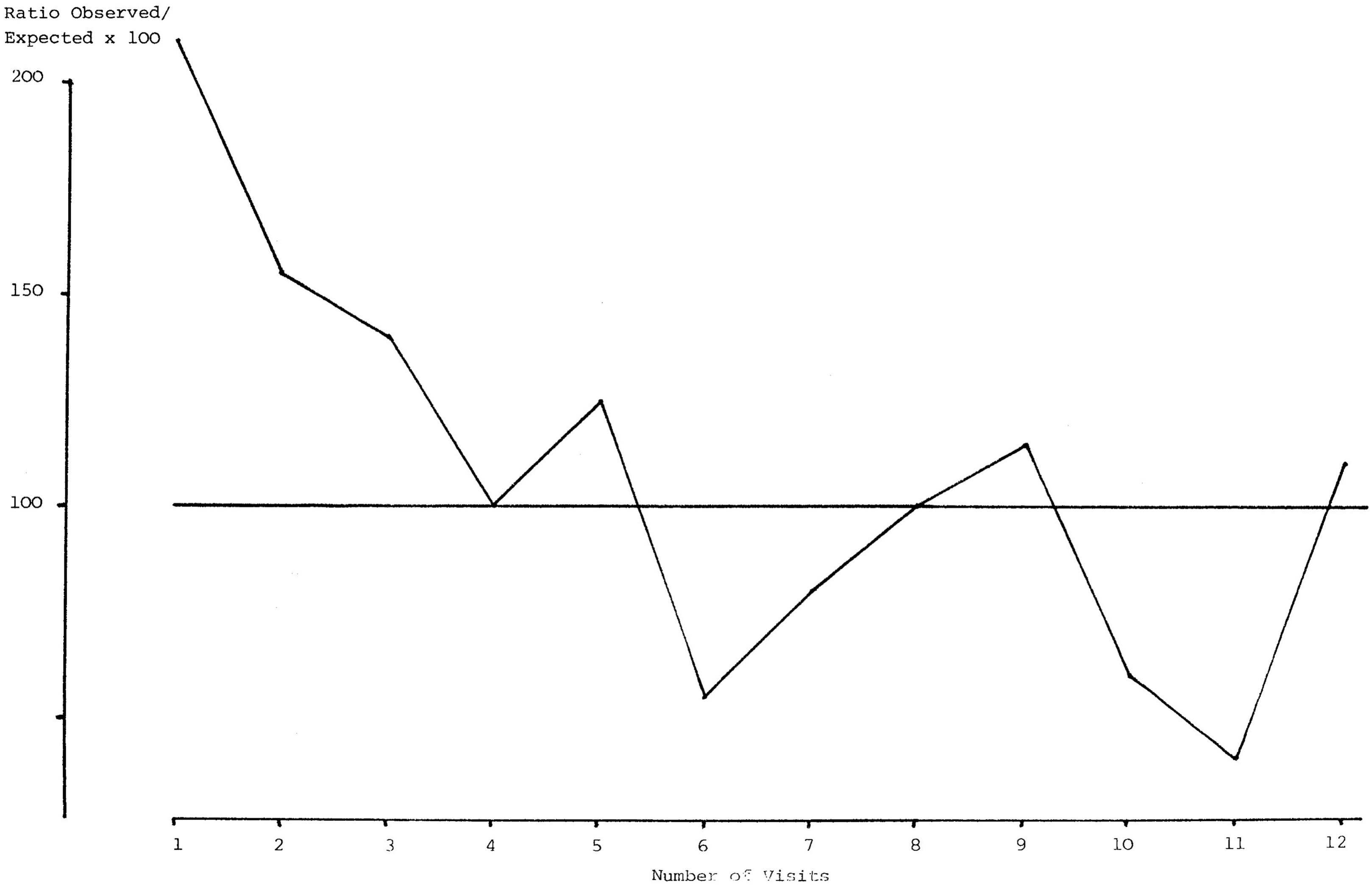
Table 6.9 Effectiveness Analysis[1]

Observed association between patterns of ante-natal out-patient care and outcomes

Observed Patterns of Visits	Risk Group 0		Risk Group 1		Risk Groups 2 and 3		All	
	Total Outcomes	Per Cent Adverse	Total Outcomes	Per Cent Adverse	Total Outcomes	Per Cent Adverse	Total Outcomes	Per Cent Adverse
Not seen	-	-	-	-	-	-	132	34.8
(A) 1 to 4 visits	53	26.4	93	28.0	39	56.4	185	33.5
(B) 5 to 7 visits	123	17.1	190	22.6	75	30.7	388	22.4
(C) > 7 visits	75	18.7	111	20.7	28	28.6	214	21.0
Total (A)+(B)+(C)	251	19.5	394	23.4	142	37.3	787	24.7
Total	-	-	-	-	-	-	919	26.1

[1]There were 141 missing observations

Figure 6.1 Observed/Expected x 100 Adverse Outcomes by Number of Visits to Unit (Weighted for risk group)



(as opposed to individual visits) have been made on the basis of the observed average frequency of adverse outcomes associated with each pattern.

6.3 The Costing Study

The conduct of an economic evaluative study has to consider the effect on resource allocation of any change in any programme. To this end, a special survey was conducted and an analysis of cost performed in order to assess certain variable costs over a range of out-patient ante-natal visits. As a part of the general survey on the utilisation of the ante-natal services of the Unit, information was also collected to identify some of the relevant costs falling on the patient. The costing study thus estimated the unit cost for each type of visit and listed the information required to identify the main costs currently borne by the patient. As indicated previously, almost the entire population under observation has social security coverage with the result that the provision of ante-natal care is generally provided at zero money price at the point of consumption.

The estimate of costs was inspired by Magee and Osmolski (1977 and 1978) and Russell et al (1974) on patient costing, but with some modification in order to cope with the special requirements of ante-natal out-patient care. Such redefinition meant identifying the patient care costs and treating them separately from some overheads of the Department of Obstetrics which were considered to be 'indirect' to the resource costs of the ante-natal sub-specialty. Hospital overhead costs were also considered indirect (and fixed) costs and apportioned to the sub-specialty ante-natal out-patient care. The underlying rationale for estimating the cost per patient (or rather the cost per type of visit) was that these costs appeared, from observation, to be a function of the demands that

each out-patient ante-natal visit made on variable and observable kinds of resources (i.e. doctors' time, nurses' time, supplies, laboratory analyses, selective screening tests, etc.)

A distinction was made between first visit 'risk', first visit 'normal' and follow-up visits because of the different nature of each with regard to the kind of procedures and the variable amounts of doctors' time involved. The first visit 'risk' differs from the first visit 'normal' in the kind and number of non-routine tests generated. Both differ from the follow-up visit in that this last, on average, involves many fewer resources, as was apparent from the description of the tasks for each type of visit that the staff of the Unit provided and the estimates made of the different amounts of resources consumed.

The main tasks associated with each type of visit can be summarised as follows:

	First visit 'risk'	First visit 'normal'	Follow-up visit
Recording of clinical history	x	x	
Updating the record			x
Physical examination	x	x	x
Routine tests:			
(i) performed during the visit	x	x	x
(ii) performed outside the visit	x	x	
Selective tests	x		
Assessment of risk	x	x	x

A special survey was designed to estimate the proportions in which each resource - medical and paramedical staff time, supplies, tests and laboratory analyses - was used on average at each type of visit. In total, over 14 days, 658 visits were studied. (The questionnaire used in the survey is reproduced in Fig. A6.1 in the appendix.) Doctors' time by category is shown in Table 6.10. Nurses' time was in fact jointly

consumed because the pool of nurses in the out-patient ante-natal service perform three different tasks:

(i) reception and calling of patients;

(ii) routine analysis: blood pressure reading, weight taking and other relatively straightforward analyses; and

(iii) assistance with physical examination.

The time of the nurses (of whom there were four) was allocated to each type of visit pro rata with the observed time of the doctors.

Table 6.10 Doctors' time, on average, (in minutes) by type of visit

Category	First visit 'risk' (N=22)	First visit 'normal' (N=78)	Follow-up visits (N=558)
Consultant	18.7	21.4	12.1
Senior Registrar	18.7	18.5	9.2
Registrar	20.5	19.9	8.9
Resident	28.4	19.0	9.6
Assistant	-	24.1	9.7

Detailed information on the different patterns of consumption of non-human resources are shown in Tables A6.3 and A6.4

Table 6.11 presents the relevant information on unit costs; in calculating the average direct costs, 1979 market prices were used whenever possible. The average unit cost per visit was determined by calculating the direct (variable) costs associated with each type of visit and the indirect (fixed) costs using, as a basis, the average annual number of out-patient ante-natal visits. Doctors' and nurses' costs were based on salary scales current in 1979-80. For each medical category, the cost of a unit of time was calculated, as well as the proportion of the total monthly departmental time for each category that was deployed for ante-natal visits (see Table 5.4). Both the average unit time per medical

staff category and the proportion of overall time on ante-natal out-patient care by category were used to calculate an average weighted cost of doctors' time, which was then applied to the estimates of doctors' time for each type of visit in order to calculate the medical staff cost per unit. In the case of nurses' time, the highly fragmented tasks of the pool of four nurses has already been mentioned. It was decided to estimate nursing costs using the proportion of the total nurses' time that was spent on ante-natal visits. Dividing this figure by the annual number of visits gave a nursing time per visit which was then costed using the appropriate nursing salaries.

Table 6.11 Unit costs by type of out-patient ante-natal visit

(December 1979 prices in pesetas)

	First visit 'risk'	First visit 'normal'	Follow-up visits
Direct Costs			
Medical staff	593	496	396
Nursing staff	320	308	291
Disposables	32	29	20
Routine tests	3,824	3,260	164
Selective tests	1,776	1,410	519
Total	6,545	5,503	1,389
Indirect Costs			
Departmental Overheads	568	568	568
Hospital Overheads	7,291	7,291	7,291
Total Costs	14,405	13,363	9,249

The cost of supplies was calculated by multiplying the average observed consumption for each type of visit (see Table A6.3) by the unit price which the hospital charges the private consumer. The same approach was used for routine and selective tests (see Table A6.4).

'Indirect costs' were taken to be departmental overheads and general hospital overheads and were derived from the Departmental Costing Records (1979-80) of the St. Pau's Hospital. Departmental overheads relate to the Department of Obstetrics as a whole - cleaning, heating, lighting, maintenance and the department's administration. These were apportioned to the ante-natal out-patient sub-specialty as opposed to those of obstetric, labour and delivery, surgical and post-natal, pro rata with their respective allocations of doctors' time, the rationale being that this factor was the one which provided the most reasonable proxy in the different sub-specialties on which to base relative activity for the cost headings involved.

General hospital overheads, general services, maintenance, nurse teaching, miscellaneous ancillary, etc., apportioned to the Department, were reapportioned to the ante-natal out-patient subsection on a similar basis to that used for departmental overheads, leading to the indirect costs shown in Table 6.11.

In addition to the costs falling on the Unit, other resource consequences for other bodies and persons were identified but their quantification and valuation were not pursued. These include the consumption of drugs, for which small expenditure social security is liable as well as some patients' costs incurred as a consequence of ante-natal care utilisation. These latter items were:

(i) Use of support services: Utilisation of marketed and/or non-marketed services for caring for children under five years of age while mothers were attending the Unit. (See Table A6.5).

(ii) Travel costs: Type of travel used to visit the Unit. (See Table A6.6)

(iii) Time off work: Average time off work by attenders in productive employment. (See Table A6.7)

6.4 Cost-Effectiveness Analysis

The primary objective of the cost-effectiveness analysis was to determine whether there were more efficient patterns of ante-natal out-patient provision at the Unit as compared with those currently in operation. Three patterns were identified, in addition to the group of women not seen by the Unit during their pregnancy:

Pattern A: 1-4 visits

Pattern B: 5-7 visits

Pattern C: 8 or more visits

Table 6.12, which summarises the calculations, forms the basis for considering shifts of patterns of visiting. Results are expressed in terms of the cost to obtain a unit of output i.e. an averted adverse outcome.

As was apparent from Table 6.9, increasing visiting will be more cost-effective if the change is from pattern A to pattern B rather than pattern B to pattern C. This applies in toto and for the individual risk groups. Making such a change from pattern A to pattern B is assumed to mean an increase in visiting from the average of pattern A to the average of pattern B. It is thus calculated by comparing the average number of visits observed in each pattern of care weighted by the proportion of women delivering before and after 40 weeks in each pattern. Such separation allows for the systematically more intensive ante-natal surveillance given to women with a gestational age of more than 40 weeks. On this basis the total number of 'supplementary' visits for each risk group can be estimated

and a calculation of the corresponding cost made on the basis of the costs of follow-up visits. At the same time, given the increased effectiveness of pattern B compared with pattern A, adverse outcomes for women receiving increased visits would be reduced. On this basis, the cost-effectiveness ratios have been calculated.

There is no doubt that, in terms of which group should receive more visits, the most efficient choice is the highest risk group (i.e. 2 and 3) because pattern B would achieve a comparable reduction in adverse outcomes at less cost than for the other groups. At the same time it is evident from the effectiveness analysis that the marginal effectiveness of pattern C over pattern B is very small and indeed not statistically significant. For all groups together, the additional reduction in adverse outcomes in moving from pattern B to pattern C is only 5.6, achieved at an additional cost per unit of output of more than 7 times that in going from pattern A to B. Thus if total visits can be increased it should be for current low attenders; if reduced, for current high attenders. As for pattern C all that can be said is that while exhibiting some increased effectiveness, however small, relative to pattern B, it is clearly less efficient than pattern B. Indeed, reallocating resources by releasing 'excess' visits from pattern C to increase visits for women currently receiving pattern A would lead to overall increased effectiveness for the patient population as a whole. Thus, if the average visits for users with pattern C were reduced to the average for pattern B, this would 'release' 792 follow-up visits, more than sufficient to provide the extra 661 follow-up visits (see Table 6.12) which would be required to increase the visiting pattern for group A women to that of group B. Alternatively, of course, women not seen at the Unit during pregnancy, but delivered there, might in future be offered pattern B but the change in overall effectiveness implied by such a decision is not apparent

Table 6.12 Cost-effectiveness analysis: some findings

	Risk Group 0	Risk Group 1	Risk Groups 2 and 3	Total
Implications of providing pattern B for all those currently receiving pattern A				
Number of patients receiving pattern A (1-4 visits)	53	93	39	185
Average supplementary visits per head required by a shift from pattern A to pattern B (5-7 visits)	3.3	3.0	5.3	3.6
Total extra visits required by a shift from A to B	174.9	279.0	206.7	660.6
Units of output (averted adverse outcomes) achieved by a shift from A to B	4.9	5.0	10.0	19.9
Ratio visits/output	35.7	55.8	20.7	33.2
Ratio direct cost/output (pts.)	49,587	77,506	28,752	27,641
Ratio total cost/output (pts.)	330,189	516,094	191,454	307,067

because of the non-availability of precise data regarding their risk distribution and therefore their requirement for extra visits and the effect of this on adverse outcomes.

6.5 The Need Analysis

In defining 'need' obstetricians are, by implication at least, suggesting that it is worthwhile meeting this need; that is, they are arguing that the cost of meeting need is justified by the benefit obtained. In this part of the analysis, the extent of fully met and only partially met need is determined, as well as the observed effectiveness associated with currently, fully met need as opposed to that of only partially met need. This allows an estimate to be made of both the cost of meeting currently unmet need and of the value implied per additional averted adverse outcome in the current definition of need. Such information, when compared with the parameters of the cost-effectiveness study already determined, allows examination of the extent to which a more efficient definition of need would induce a more efficient operation of the agency relationship and hence the Unit. Table 6.13 indicates the current definition of need as laid down by the obstetricians. It states a minimum and maximum number of visits by risk group, according to the gestational age at delivery.

Table 6.13 Definition of 'need' (in terms of numbers of visits) according to the staff of the Unit

	Risk groups							
Gestational age	0		1		2		3	
	min	max	min	max	min	max	min	max
32 to 40 weeks	5	6	6	9	9	10	14	15
41 weeks	9		11		11		18	
42 weeks	12		14		15		21	

On the basis of this, women being given 'adequate' and 'inadequate' care were identified and fully met and only partially met need estimated, as indicated in Table 6.14.

Table 6.14 Numbers of women by risk group receiving 'adequate' and 'inadequate' care

	Risk Groups			
Number of women with:	0	1	2 and 3	All
'Inadequate' care *G.A.D. ≤ 40 weeks	48	164	94	306
'Inadequate' care G.A.D. > 40 weeks	5	29	38	72
Need not fully met	53	193	132	378
'Adequate' care G.A.D. ≤ 40 weeks	83	68	3	154
'Adequate' care G.A.D. > 40 weeks	115	133	7	255
Need fully met	198	201	10	409
Total	251	394	142	787
Women with some unmet need as percentage of total	21.1	49.0	93.0	48.0
Women not seen at the Unit before delivery				132
Insufficient information				141
Total				1060

*G.A.D. = gestational age at delivery

For the population currently attending for some ante-natal care, the overall percentage who are not receiving 'adequate' care (i.e. have some unmet need) is 48% (378 women receiving 'inadequate' care according to the Unit's standards). Strictly speaking the women delivered at the Unit but who came for no ante-natal visits (141) should be added to this, giving 519 (56.5%) in toto of those classified as receiving inadequate care. The incidence of only partially met need is more pronounced in

in women giving birth before 40 weeks. Thus for risk group 0, whereas 36.6% of women giving birth before 40 weeks receive 'inadequate' care, only 4% of women giving birth after 40 weeks receive 'inadequate' care. In risk categories 1, and 2 and 3, the corresponding figures are 70.7% and 17.9% and 96.9% and 8.4% respectively. Such proportions, in themselves, serve as an indication of the desirability for reassessing the definition of need.

Table 6.15 compares the relative effectiveness of fully met and only partially met need. This analysis differs from the effectiveness study already discussed in that precise definitions of 'adequate' and 'inadequate' ante-natal out-patient care are considered. Statistically significant ($p < 0.001$) differences were found for all risk groups combined but none individually.

Thus 'adequate' care displays a consistently more effective performance in terms of reduced incidence of 'adverse' outcomes. Table 6.16 indicates the cost of meeting needs fully - in other words, the costs which obstetricians would incur in their running of the Unit under the present definitions of need. Consequently, assuming that they value the 'benefit' of their recommended patterns at no less than the cost incurred by such implementation, the array of implied valuations of avoiding an adverse outcome can be calculated for each risk group. The 'supplementary' visits implied by meeting need have been calculated taking account of the different distribution of gestational age at delivery within each risk group, as well as the average visits for patients who have received the corresponding 'adequate' pattern. Similarly to the cost-effectiveness calculation, estimates of the differential 'gain' in outcome are derived from the different incidence of adverse outcomes associated with 'adequate' and 'inadequate' patterns. Bringing in the cost data, the overall cost of meeting need would be 1.6 million pts. which would be the cost of the extra 1164 follow-up visits required to offer 'adequate' ante-natal care

Table 6.15 Effectiveness of 'Adequate' and 'Inadequate' Ante-Natal Care[1]

	Risk Group 1		Risk Group 2		Risk Groups 2 and 3		Total	
	Adverse Outcomes	Percent Adverse	Adverse Outcomes	Percent Adverse	Adverse Outcomes	Percent Adverse	Adverse Outcomes	Percent Adverse
Women with 'adequate' care	35	17.7	42	20.9	3	30.0	80	19.6
Women with 'inadequate' care	14	26.4	50	25.9	50	37.6	114	29.9
Total	49	19.5	92	23.4	53	37.1	194	24.5
Women not seen before delivery							46	34.8

to the group of 378 women presently receiving 'inadequate' care at the time of the enquiry (and excluding those who do not attend for ante-natal care at the Unit at all).

Such a large addition to visiting would lead to an increase in the overhead costs as well. If these were affected pro rata the overall total increase would be over 10 million pts.

What this reveals is that the value implied by the obstetricians' current definition of need is at least equal to the direct costs presented at the foot of Table 6.16. More likely however the overhead costs would rise with such a substantial increase in visits (both the Unit and the hospital face severe capacity constraints at present) and the value of an averted adverse outcome implied by the need definition may well be in the order of at least 0.5 million pts.

Such an analysis, particularly when seen alongside the cost-effectiveness analysis previously presented (in 6.4) suggests that, as will be discussed in more detail in the next chapter, there is much to be gained from switching the emphasis in the Unit from what appears to be overconcern with the concepts of 'adequate' and 'inadequate' care and unmet need to greater emphasis on using existing resources more efficiently.

Of course, how this is best done cannot be judged without consideration of some of the influences which affect the women's behaviour in deciding to attend for ante-natal care i.e. the factors affecting the demand for ante-natal care at the Unit. It is one thing to argue for a redeployment of the Unit's resources to provide different patterns of care; without the women's cooperation this cannot be achieved. It is with considerations of the women's demand for ante-natal care at the Unit that the next section is concerned.

Table 6. 16 Cost of meeting need: implied values of meeting need 'in full'

	Risk Groups			
	0	1	2 and 3	All
Number of women with need inadequately met				
(i) G.A.D.* ≤40 weeks	48	164	94	306
(ii) G.A.D. >40 weeks	5	29	38	72
Total	53	193	132	378
Supplementary visits on average required to meet need in full for:				
(i)	2.4	2.5	3.6	2.8
(ii)	5.6	3.9	4.2	4.2
Total additional follow-up visits required to meet need in full	143.2	523.1	498.0	1164.3
Units of output (averted 'adverse' outcomes)	4.6	9.6	10.1	24.3
Ratio of visits/output	31.1	54.5	49.3	47.9
Ratio of direct cost/output (pts)	43,198	75,701	68,478	66,533
Ratio of total cost/output (pts)	287,644	504,071	455,976	443,027

* G.A.D. = gestational age at delivery

6.6 Demand Analysis

The demand analysis examined various social personal and environmental factors in an effort to determine the extent to which they appeared to influence patient-generated ante-natal visits to the Unit. At the same time, an effort was made to identify whether, given the current objectives of the Unit, patients were being given the kind of service they wanted.

It was considered that the most appropriate dependent variable to measure demand was the registered onset of ante-natal care; in other words, the first visit. The reason for this is that, given the special characteristics of access to the Unit, the process of presenting herself on the waiting list, making claims on the Unit's services and attending for the first visit, can be viewed as being almost completely determined by the patient's preferences and willingness to bear some time and other costs. In the present context of lack of encouragement to attend early (which is an institutional characteristic) it is likely that only the better informed and more aware women will decide to face the institutional problems of obtaining care, which in turn translate into costs for the women - waiting list, waiting time, travelling, etc. - after balancing the utility and costs associated with early attendance and, therefore, more ante-natal care.

In short, the onset of ante-natal care measured in terms of gestational age at first visit was deemed to reflect the individual's utility maximising concept of demand. The use of the total number of visits given by the Unit as a suitable measure was discarded because, with the exception of the first visit, it does not reflect the effects of the individual consumer's behaviour but rather the 'imposed' - but in a sense, thereafter, voluntarily agreed - pattern of consumption dictated by the staff, acting in the agency relationship role.

The variables deemed to be potentially good predictors included:

Area of residence

Type of insurance covered

Number of visits during pregnancy without monetary compensation from social security

Period since the last child

Size of household

Number of children under five years of age

Occupation and working status

Normal hours per day at work

Provision of leave of absence before birth

Social class

Size of dwelling

Car ownership

Educational attainment

Educational level

Time spent on visits

Type of transport used to get to the Unit

Time on waiting list

Age

Parity

Obstetric history

Because of the multicollinearity found amongst these variables and because the situation seemed to require the simultaneous study of random variation in several variables, a multivariate method, linear discriminant analysis, was employed. A discriminant function of the form:

$$z = b_1x_1 + b_2x_2 \ldots + b_px_p + k$$

was used, where the two groups to be discriminated were defined as 'early

attenders' (Group I), i.e. women with a first visit before the 20th week, and 'late attenders' (Group II), i.e. women attending for the first time after the 32nd week.

The discriminant function derived from the factors listed below, in descending order of individual discriminative power, showed a highly significant power of differentiation ($p < 0.001$, $\chi^2 = 146.6$, d.f = 10, $r^2 = 0.60$) with the following classification of results:

Actual Group	No. of cases	Predicted Group	
		I	II
I: early attenders	105	85 (81.0%)	20 (19.0%)
II: late attenders	64	2 (3.1%)	62 (96.9%)

Table 6.17 indicates the factors contributing to discrimination as well as their respective effect in terms of early or late attendance.

Table 6.17 Predictive factors for early and late attendance

Factor	Contribution to discrimination (%)	Influence on early attendance
Type of insurance cover	46	Use of full social security
Educational level	12	Higher education level
Past obstetric history	11	Poor history
Car ownership	9	Car owner
Social class	6	SC I and II
Parity	5	Lower parity
School leaving age	4	Late leavers
Time spent on visits	3	Shorter time
Maternity leave given	2	Yes
Hours of work	2	Shorter hours

The most influential factor in the discrimination between early and late attendance is the type of insurance cover used by the patient. By this is meant the full or partial use of the social security scheme for obtaining free ante-natal care at the Unit or a combination of social security cover and attendance at a private doctor. The use of private doctors' ante-natal services is thus a powerful reason for attending at the Unit. It is probably associated with the practice of having the last month of pregnancy supervised at the Unit in order to secure a bed for delivery at the hospital. It may also be that women who are willing to pay for private ante-natal supervision are late attenders because they prefer to pay private doctors' fees rather than wait on the Unit's waiting list; or perhaps they use private doctors' services, while retaining their place on the waiting list.

Not surprisingly past obstetric history plays some role in the willingness to seek early ante-natal supervision. Educational level and car ownership - which were used as proxies for social environmental conditions - are of some importance in the differentiation. More unexpected was the low weight attached to variables traditionally associated with awareness of benefits of early attendance such as social class and parity. One of the main consequences arising from this analysis is that the factors themselves in the discriminant function which influence the timing of a woman's first attendance at the Unit are not amenable to manipulation by the Unit itself, with the exception of the time spent on visits, the influence of which is, in any case, small. In terms, therefore, of possibly altering the pattern of visiting to promote a more efficient use of resources most of these influences have to be accepted as given. This does not mean that the Unit staff cannot affect the visiting pattern; simply that attempting to alter the demand function is not the way to achieve this.

Turning to the second major question raised regarding demand, as was reported in Table 5.6, in the survey of attenders for out-patient care at the Unit views were sought on the nature of care received and and the extent to which this coincided with what the women wished. From this, evidence emerged of differences between the nature of what is received and what is wanted.

Certainly there was fairly general satisfaction (98%) with the more technical aspects of pregnancy control. However, many users expressed a wish for more information on such matters as fetal growth and development (23%), milk and diet (23%), skills to handle pain in labour (82%), the onset and stages of labour (70%) and the equipment and available procedures likely to be used at birth (55%).

There are thus some pointers here to suggest that, in terms of consumers' preferences at least, some redefinition, by the staff, of the Unit's objectives may well be justified. Perhaps the medical staff tend to overemphasise the importance of good, clinical outcomes at the expense of providing more information, reassurance and emotional support for the women during pregnancy. This 'felt', but largely unmet, need on the part of the woman attending is difficult to translate into demand as an aggregate relationship. Nevertheless the evidence of its existence, given the central role argued in this study for the agency-relationship, does suggest the need for some reappraisal of the Unit's objectives.

These two issues, the variation in demand for ante-natal care at the Unit as measured by early and late attendance and the degree of dissatisfaction expressed by the women regarding issues of emotional support by the Unit staff, can be considered together. (See Table 6.18.) What emerges clearly from this is that a larger proportion of late attenders are consistently more critical of the amount of information provided on various facets of support during pregnancy - on fetal growth, nutrition,

Table 6.18 Relationships between early/late attendance and desire for more 'emotional support'

	Fetal Growth	Nutrition	Exercise and Parentcraft	Labour and Delivery	Management of Labour
Percentage of early attenders (N = 211) i.e. first visit before 20th week, wishing more information on	15.2	11.8	68.7	60.7	42.2
Percentage of late attenders (N = 206) i.e. first visit after 32nd week, wishing more information on	26.7	26.2	88.8	73.8	61.2

(Using the χ^2 test, all the differences between early and late attenders are significant, $p < 0.01$)

exercise and parentcraft, labour and delivery and management of labour. Whether this in any way explains their late attendance or whether the direction of causation is the reverse (i.e. they are less happy with the information given because they are late attenders) cannot be judged from the data available. It may well be that the influence operates in both directions.

6.7 Conclusion

This chapter has attempted to present the empirical findings of the research study on ante-natal care. In doing so it has drawn on the theory and concepts outlined in early chapters - the nature of health and health care, in this context ante-natal care, as an economic good; utilisation; need; demand; and the agency relationship.

Since the next chapter in many ways serves as a brief summary here the comments are restricted to first, problems in the methodology and secondly, and consequent upon this, suggestions for further research. The measures of effectiveness used in all aspects of maternity care are less than ideal. For example, those restricted to neonatal mortality are too narrow; those using a composite index of clinical outcomes, as in this study, fail to weight different outcomes differently (or at least assume that they always occur in the same proportions) and fail to allow for outcomes defined in other terms (e.g. emotional support of the mother). However, the solution to this problem can only be tackled with the help of obstetricians. What this study has perhaps shown is that how this is attempted is very much related to the objectives underlying maternity care and whether the relative strengths of the need and demand concepts supporting these objectives are capable of being determined more precisely than has been possible in this project.

Such outcomes, however defined and measured, are a function of a complex web of interacting factors: e.g. socio-economic variables, medical variables, and those associated with different aspects of maternity care - ante-natal out-patient and in-patient care, obstetric practices, neonatal intensive care, etc. While this study has attempted to unravel these, and succeeded in doing so, at least in part, a much larger investigation is needed, jointly again with obstetricians, to answer the broader questions of the most efficient strategy of maternity care i.e. the mix of ante-natal, labour/delivery, post-natal, etc.

The agency relationship has been used in this study to bridge the potential gap between need and demand. The proxy used for demand, while most certainly defensible and preferable to others which more accurately measure utilisation, needs further research to determine its genuine appropriateness. Again the apparent gap between what the women attending are seeking and what they receive merits more investigation than has been possible in this thesis. This is an area of research where economists might fruitfully cooperate and liaise with sociologists.

More generally and perhaps most importantly the study has shown that despite some of these conceptual problems some sensible and practical recommendations for improving efficiency in health care can emerge from the application of economic analysis. Given the paucity of studies in economic appraisal which have done this, such demonstration is an added bonus from this research.

CHAPTER 6

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Appendix to Chapter 6

Table A6.1 Utilisation by social class

	Social Class					
Gestational age at first visit[1]	I and II		III		IV and V	
	No.	%	No.	%	No.	%
Less than 19 weeks	57	39.9	107	16.5	44	17.1
20 weeks to 32 weeks	63	44.1	327	50.4	115	44.7
33 weeks and over	13	9.1	136	21.0	57	22.2
Not seen	10	7.0	79	12.2	41	16.0
Total	143	100.0	649	100.0	257	100.0

1. Eleven missing observations

Number of visits[2]						
1-4	20	14.0	150	23.0	50	19.4
5-7	42	29.4	227	34.9	77	29.8
8-10	47	32.9	129	19.8	64	24.8
11-13	21	14.7	53	8.1	21	8.1
More than 13	2	1.4	13	2.0	5	1.9
Not seen	11	7.7	79	12.1	41	15.9
Total	143	100.0	651	100.0	258	100.0

2. Eight missing observations

Table A6.2 Utilisation by Parity (4 missing observations)

Gestational age at first visit	Parity		
	Primigravida (470)	Parity 1 and 2 (495)	Parity 3 or more (91)
	Percent	Percent	Percent
Less than 19 weeks	22.8	17.4	19.8
20 weeks to 32 weeks	45.5	52.7	36.3
33 weeks and over	21.9	17.6	17.6
Not seen	9.8	12.3	26.4
Total	100.0	100.0	100.0
Number of visits			
1-4	21.0	20.7	20.9
5-7	32.7	34.8	25.3
8-10	24.8	21.1	19.8
11-13	10.4	8.2	6.6
More than 13	1.1	2.8	1.1
Not seen	10.0	12.3	26.4
Total	100.0	100.0	100.0

Table A6.3 Estimated frequency of use of various items at different visits. (Source: survey of 658 visits)

Item	First visit 'risk'	First visit 'normal'	Follow-up visit
Gloves	0.045	0.1	0.31
Spatula	0.64	0.46	0.01
Base	0.64	0.44	0.01
Brush	0.64	0.44	0.02
Albumin test strip	1.00	0.97	0.89
Glucose test strip	1.00	0.99	0.89
Acetone test strip	-	0.03	0.005
Record form	1.00	0.77	0.46
Vaseline	0.80	0.87	0.79
Soap	0.80	0.79	0.58

Table A6.4 Frequency of routine and selective tests at different visits.
(Source: survey of 658 visits)

1. Routine	First visit 'risk'	First visit 'normal'	Follow-up visit
Haemoglobin	0.96	0.92	0.03
Blood group and Rh determination	0.86	0.83	0.02
VDRL	0.91	0.87	0.02
Urine	0.91	0.91	0.03
Pap test	0.55	0.49	0.02
Glucaemia curve	0.45	0.26	0.01
Glucaemia basal	0.57	0.93	-
Exudate culture	-	0.01	0.01
Coombs test	0.14	-	0.02
Fresh culture	0.05	-	0.004
Nelson test	-	-	0.002
2. Selective			
Hormonal determination	-	-	0.002
Transaminases	-	-	0.002
Amnioscopy	-	-	0.11
Electrocardiogram	0.09	-	-
Amniocentesis	-	-	0.02
Abdominal X-ray	-	-	0.01
Ultrasonography	0.41	0.29	0.1
Cardiology	-	-	0.02
Endocrinology	-	-	0.01
Pathological assessment	-	-	0.004
Gynaecological "	-	-	0.002
Pulmonary "	-	-	0.002

Table A6.5 Arrangements for caring for children under five while on ante-natal visits[1]

	Absolute frequence	Percent[2]
Non-marketed services (relatives, neighbours, friends, etc.)	211	50.8
Marketed services (paid babysitting, nurseries, pre-school, playgroups, etc)	145	34.9
Other (e.g left alone)	59	14.2
Total	415	100.0

1. Five missing observations

2. Percentage based on women with children under five years and excluding missing observations (N = 415)

Table A6.6 Main type of travel used to visit the Unit[1]

	Absolute frequency	Percent
Walking	279	26.5
Bus	211	20.1
Underground	174	16.6
Train	34	3.2
Bus and Underground	51	4.9
Private Car	218	20.7
Taxi	84	8.9
Total	1051	100.0

1. Nine missing observations

Table A6.7 Average time off work by users in gainful employment

Average time	Number of users in gainful employment	Percent
Less than 30 minutes	4	0.9
30 minutes to 1 hour	20	4.3
1 to 2 hours	68	14.7
2 to 3 hours	157	33.9
3 to 4 hours	152	32.8
4 to 5 hours	62	13.4
Total	463	100.0

Figure A6.1 Questionnaire used in the costing study

1. Date _____ 2. Questionnaire number _____

3. Clinical Record Number _____

4. Gestational Age

_____ weeks

5. Completion

Yes ☐

No ☐

Reason _____

6. Type of pregnancy

Normal ☐

Risk ☐

7. Type of visit

First visit ☐

Follow-up visit ☐

Control 48 hours ☐

Post Partum ☐

8. Time spent by the doctor in charge

	Hours minutes
Onset of the visit	☐☐
End of the visit	☐☐
	Hours minutes
Total time:	☐☐

9. Category of doctor responsible

Chief ☐

Registrar ☐

Senior Registrar ☐

Resident ☐

Assistant ☐

10. Consumables

- Gloves ☐
- Spatulas ☐
- Base ☐
- Brush ☐
- Albumin teststrip ☐
- Glucose teststrip ☐
- Acetone teststrip ☐
- pH vaginal teststrip ☐
- Others (specify) ☐

_____ ☐

_____ ☐

_____ ☐

11. Test requested

- Haemogram ☐
- Blood group and Rh determination ☐
- VDRL ☐
- Urine ☐
- Pap test ☐
- Glucaemic curve ☐
- Glucaemic basal ☐
- Exudate culture ☐
- Coombs test ☐
- Fresh culture ☐
- Nelson test ☐
- Hormonal determination ☐
- Transaminases ☐
- Other (specify): ☐

_____ ☐

_____ ☐

12. Other tests and diagnoses requested

- Ecography ☐
- Amnioscopy ☐
- Non stressing test ☐
- Electrocardiogram ☐
- Other: ☐

_____ ☐

_____ ☐

13. Amniocentesis

Yes ☐ No ☐

14. Referral from other Hospital Department

Yes ☐ No ☐

Department _____

15. In-patient ante-natal care requested

Yes ☐ No ☐

CHAPTER 7 CONCLUSIONS

In this brief chapter the potential consequences of the analysis are reviewed against the background of the definition of the objectives of the Unit.

Either on the basis of the maintenance of current objectives or their redefinition (e.g. taking patients' preferences into account to a greater extent) the following options should be considered in the relevant discussion:

(i) no increase or decrease in current resources;

(ii) an increase of resources; and

(iii) a decrease of resources

While the efficient deployment of the resources currently available is to be expressed in terms of the consequences for patient access to different patterns of care, the data do not allow a full analysis of priorities within groups of patients with the same visiting pattern because the differences between proportions of 'adverse' outcomes averted by altering patterns of care for individual risk groups are not statistically significant (despite the total sample size of more than 1000 women).

Certainly, most of the evidence from the cost-effectiveness analysis demonstrates that diminishing returns to visiting set in for those women attending under pattern C (i.e. more than 7 visits). There is a clear-cut argument for attempting to increase the number of visits of women currently visiting less than 5 times (pattern A) at the expense of women visiting according to pattern C. There is a less clear-cut argument which to be resolved, would require analysis of a larger sample, that this shift would be most cost-effective if it were made in favour of high risk low attenders (i.e. women in risk groups 2 and 3 visiting less than 5 times) at the expense of low risk high attenders (i.e. women in risk group 0 visiting more than 7 times).

Should the Unit have more resources made available to it, it follows from what has been said that more visits should be provided for current low attenders. And if its resources should be cut, then it is those women attending frequently, particularly those at low risk, whose visits should be curtailed.

In any event, these conclusions based on the cost-effectiveness analysis suggest that some reinterpretation of the Unit's activities could increase the efficiency of its ante-natal out-patient services. Instead of being overconcerned with the issues surrounding the definition and measurement of 'adequate' care which, as indicated in the analysis of need and implied values, could only be achieved with a substantial increase in resources, and indeed, for comparatively small gain in reduced adverse outcomes, it would seem more appropriate for the Unit staff to attempt to operate the agency relationship in a more efficient manner. This would entail two measures. First, it would mean attempting to get low attenders and, particularly, those at risk to attend more frequently and at the expense of high attenders. This could best be achieved by giving priority on the waiting list for first visits to those at risk and who apply in mid and late pregnancy. Indeed the arguments seem so powerful for this that it might well be justified to redirect some nursing resources to the questioning of women about risk factors and gestational age when they first apply to the Unit. As the analysis of demand has shown, there is little evidence that any other 'demand' factor (beyond insurance) could be manipulated to alter, to any great extent at all, the behaviour of the women in their attendance patterns. Consequently for the agency relationship to operate more efficiently the responsibility must rest with the Unit's staff to alter the utilisation pattern (i.e. changing the conditions of access from the present illdefined administrative criteria to those based more on risk characteristics).

Secondly, there is some evidence, albeit somewhat muted, that the objective of the Unit would warrant some respecification if more account is to be taken of women's preferences. Thus, whereas both the obstetricians and the women do place a high priority on the clinical outcome of the birth, the women would want to increase the relative weight currently given to such considerations as reassurance, information about state of pregnancy, advice on labour, etc. Indeed, some of the resources 'saved' by reducing high visiting patterns might well be redirected to this end.

More generally the analysis has shown that the approach of cost-effectiveness analysis as the king-pin in an evaluation of health care, when linked with conceptual and empirical findings on need, demand, implied valuation and the agency relationship, can provide a useful basis for reinterpreting not only the efficient operation of an ante-natal care unit but also the normative judgments and indeed objectives underlying the provision of such care. However, it is only when the Unit's staff have had the opportunity to assess and act on the results that the true value of the present study can be judged.